Application of Linear Programming Problem (LPP) For Minimizing the Cost at a Recently Opened Clothing Boutique

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Abstract

Cost is a major concern for any small new venture. It is really very difficult for a new business to get a break even very soon. Recently the researcher has come across an entrepreneur, who is going to start her specialized clothing boutique, but was not sure about the product quantities to be ordered from different suppliers. She was very clear about the product's demand, designs, their sizes, suppliers, delivery cost and her major focus was on minimization of the cost. This research paper is about the problem statement of the boutique owner and how the Linear Programming has helped the owner in deciding the variables (which can impact the cost). LPP is an optimization technique in operation research, which can be of two types i.e. maximization (Sales, Profit) & minimization (Cost, Use of Resources, Waste Minimization). In this research paper, cost minimization is achieved, with the help of LPP. To determine the most economical product structure, a mathematical model was created. With the help of the mathematical model, the decision variables, objectives, constraints and non – negative constraints were elaborated first and then Excel- Solver is used to solve the model. LPP problem can be solved with different kind of methods; here the researcher has used Excel- Solver to provide the optimal solution for the problem.

Keywords: Linear Programming, LPP, Optimization, Excel- Solver, Decision Variable, Minimization

Introduction

LPP is considered as one of the simplest and useful tools in operation research. Operation research deals with the optimization process. In general optimization can be of two types. The first one is maximization – where the objective involves attainment of maximum goal through the decision variables. Optimization through maximization involves goals like maximization of business profit, maximization of sales, maximization of optimal product mix. The second one is minimization - where the objective involves attainment of minimum of something, which can be minimization of total cost, minimization of total distance or minimum of waste generation.

LPP is considered as the simplest and basic method to solve all the problems of operations. It can be compared with addition in math's. As in mathematics, the simplest tool for solving any problem is summation. We can solve all the basic problems of mathematics like subtraction, multiplication and division with the help of simple addition. In same manner, we can solve different problems of Operations, with the help of LPP, be it Transportation problem, Assignment problem or Game theory. The only thing, we need to do is conversion of the problem into the LPP format. If we want to solve any business problem, with LPP, we need to make sure that the problem has certain basic characteristics. The four important characteristics are Linearity, additivity, constant over time and divisibility. Divisibility is characteristics of LPP, which says the decision variable and objective function may have any value (integer or non-integer). If we want our objective and decision variable should have just integer value, then we can add one additional constraint(integer) along with other limitations.

For LPP, first we need to identify the decision variable, through which, we are going to achieve our key variables (Objective). Later we can construct a mathematical model, which will involve the objective, constraints and non-negative constraints. After formulation of the model, the solution can be obtained with different methods like Graphical (when only 2 decision variables are present), Simplex, or Excel-Solver. Solver is the easiest and quickest method to obtain the result.

Problem- A clothing boutique owner, who wants to sell just 7 products in different sizes. The idea is not to make the products by her own (to get the product from wholesale suppliers and sell them to the customers, after certain modifications). The products are going to include Seven Product lines: Kurtis, Tops, T-shirts, Leggings, Jeggings, Suits & Wedding Gowns in different sizes. Theses seven products are going to be delivered by three suppliers. Suppliers are charging the product fee and shipping fee, according to the different sizes & quantities. The owner of the business wants to know that how many of each clothing item, should be ordered from these suppliers, so that the total supply cost should be minimum.The demand information was available with the owner.

Review of Literature

Linear Programming problem is very useful technique for solving the optimization problems in business.

Yahya, W. B. (2004) considered LPP as one of the best methods for optimization the things in business. He has used the LPP for obtaining the best Product Mix at the minimum cost in a manufacturing industry. The study was done in KASMO industry limited, Osogbo, Nigeria.(1)

As per Waheed (2012), LPP models are commonly used in OR & business management to answer the problems, related to limited and scare resources. They have also presented the use of LPP model in profit maximizationin a product-mix company.(2)

Kanu ,Success Ikech, Ozurumba Benedict etall(2014) stated that for any kind of LPP solution, certain assumption and conditions should be met. The assumptions are classified as linearity, additivity, divisibility, deterministic parameters, Non-negativity, independence of variables, and proportionality, He also described four components of LPP, which are objective function, decision variables, Structural constraint's and parameters. (3)

As per Akpan, N. P.&Iwok(2016), LPP is useful for the allocation of limited or scarce resources on the basis of the given optimality conditions. They have successfully used the LPP technique for optimal use of raw material in bread manufacturing in Goretta bakery Limited.(4)

Marivic G. Molina (2018) have done a similar study to find the Product Mix Optimization at for an Online Clothing Store. The objective of the study was to find the product mix with the minimum cost. He has also recommended LPP for the maximization of business profit, when the business grows for the clothing store. (5)

Gaurav Agarwal, Vijay Kumar (2022) have also shown the use of LPP to find the optimal product mix for a ready to eat snacks factory (RTE snacks, Gurgaon). They have used LINDO for analysing and finding the solution of LPP. In their research, they have used the maximization technique of optimization. With the use of LPP, they have obtained an

optimal product mix for maximizing the business profit of RTE snacks. (6)

Objective

The owner of the business wants to know that how many of each clothing item, should be ordered from the suppliers, so that the total supply cost should be minimum. So, the objective of this study is to get the most economical plan for ordering the product quantity from the suppliers through the LPP technique.

Research Methodology

For this study the data used was quantitative in nature. Personal Interview of the entrepreneur was taken for gathering the information about the product line, demand and shipping fee. Mathematical model was formulated to get the equations. LPP- Excel- Solver is used to solving these equations.

Data Collection & Analysis

The Clothing Boutique owner has provided information about the demand, product line and shipping fee. The information is used to make the mathematical model for the said problem. Table no. 1 indicates the demand of products, Table No. 2 indicates price of the products, according to the sizes, and Table No. 3 indicates the shipping fee of different suppliers.

Table No.1 – Demand of the products

Demand of the Products					
Sizes					
Products	S	M	L	XL	XXL
Kurtis	20	40	40	25	10
Tops	30	45	45	35	20
T-shirts	15	25	25	20	10
Leggings	30	50	50	35	20
Jeggings	15	35	35	20	5
Suits	20	30	30	30	15
Wedding Gowns	5	10	10	10	5

Table No.2 – Price of the products from different suppliers

Price of per unit of theproducts(Rs.)- Supplier 1					
Products	S	M	L	XL	XXL
Kurtis	600	650	650	700	750
Tops	350	350	350	400	450
T-shirts	299	299	299	399	499
Leggings	399	399	399	499	599
Jeggings	475	499	499	575	675
Suits	1200	1250	1250	1300	1350
Wedding Gowns	2500	3000	3500	4000	4500

Price of per unit of the products(Rs.)- Supplier -2

Products	S	M	L	XL	XXL
Kurtis	700	700	700	700	700
Tops	400	350	350	400	450
T-shirts	350	299	299	399	499
Leggings	435	399	399	499	599
Jeggings	500	500	500	500	500
Suits	1200	1250	1300	1300	1350
Wedding Gowns	2500	3000	3500	4000	4500

Price of per unit of the products (Rs.)- Supplier -3

Products	S	M	L	XL	XXL
Kurtis	650	650	650	700	700
Tops	350	350	350	400	400
T-shirts	380	380	380	400	400
Leggings	380	380	380	420	420
Jeggings	450	450	450	580	580
Suits	1200	1250	1250	1300	1350
Wedding Gowns	2500	3000	3500	4000	4500

Table No. 3 – Shipping fee (Rs.) from different Suppliers

Shipping fee (Rs.) from Suppliers					
Supplier 1		**Supplier 2**		**Supplier 3**	
Product Quantity	Shipping Fee	Product Quantity	Shipping Fee	Product Quantity	Shipping Fee
1 to 10	400	1 to 10	380	1 to 5	200
11 to 15	450	11 to 15	430	6 to 10	250
16 to 20	500	16 to 20	480		
21 or more	free shipping	21 to 31	520		Free Shipping
		31 or more	free shipping	more than 11	

LPP Model-After analyzing the nature of problem, the researcher has found the said problem can be formed in LPP format. One additional condition is that the solution should be in whole number, as the products can not have non-integer or decimal value. That's why the problem belongs to Integer LPP category.

STEP 1-The first step in formulation of any LPP problem is to define the no. of decision variables. Decision variables are the unidentified quantities of the products that are going to be projected from the Linear Programing solution. The objective function is also expressed with the inclusion of the decision variables. In this case the decision variables are the quantities of the clothing item, which the boutique owner will orders from different suppliers. In this case, total

seven no. of clothing items are present and each item has 5 variants (small, medium, large, extra-large and double extra-large). Thus, the total number of products will be Thirty-five (7*5= 35). As these Thirty-five product items can be ordered from three suppliers, so the total no. of product and supplier combination will generate One-hundred five numbers of variable(35*3=105), Hence total number of decision variables will be 105 in this case. Through these One-hundred five decision variables the key objective will be achieved, which can be defined as "minimization of the cost" in this case.

First there is a need to assume some value to the said One-hundred five numbers decision variables. Let the decision variables are-

a1-No. of small size Kurtis from supplier 1, a2- No. of small size Kurtis from supplier2,a3- No. of small size Kurtis from supplier 3

a4-No. of medium size Kurtis from supplier 1,a5- No. of medium size Kurtis from supplier2, a6- No. of medium size Kurtis from supplier 3

a7-No. of large size Kurtis from supplier 1, a8- No. of large size Kurtis from supplier2, a9- No. of large size Kurtis from supplier 3

a10-No. of XL size Kurtis from supplier1,a11- No. of X-large size Kurtis from supplier2, a12- No. of XL size Kurtis from supplier 3

a13-No. of XLL size Kurtis from supplier 1, a14- No. of XLL size Kurtis from supplier2, a15- No. of XLL size Kurtis from supplier 3

b1-No. of small size Tops from supplier 1, b2- No. of small size Tops from supplier 2, b3- No. of small size Tops from supplier 3

b4-No. of medium size Tops from supplier 1, b5- No. of medium size Tops from supplier2, b6- No. of medium size Tops from supplier 3

b7-No. of large size Tops from supplier 1, b8- No. of large size Tops from supplier 2, b9- No. of large size Tops from supplier 3

b10-No. of X-large size Tops from supplier 1, b11- No. of X-large size Tops from supplier 2, b12- No. of X-large size Tops from supplier 3

b13-No. of XLL size Tops from supplier 1,b14- No. of XLL size Tops from supplier 2, b15- No. of XLL size Tops from supplier 3

c1-No. of small size T-shirts from supplier 1, c2- No. of small size T-shirts from supplier 2, c3- No. of small size T-shirts from supplier 3

c4-No. of medium size T-shirts from supplier 1,c5- No. of medium size T-shirts from supplier 2, c6- No. of medium size T-shirts from supplier 3

c7-No. of large size T-shirts from supplier 1, c8- No. of large size T-shirts from supplier 2, c9- No. of large size T-shirts from supplier 3

c10-No. of XL size T-shirts from supplier 1,c11- No. of XL size T-shirts from supplier 2, c12- No. of XL size T-shirts from supplier 3

c13-No. of XLL size T-shirts from supplier 1,c14- No. of XLL size T-shirts from supplier 2, c15- No. of XLL size T-shirts from supplier 3

d1-No. of small size Leggings from supplier 1, d2- No. of small size Leggings from supplier2, d3- No. of small size Leggings from supplier 3

d4-No. of medium size Leggings from supplier 1, d5- No. of medium size Leggings from supplier 2, d6- No. of medium size Leggings from supplier 3

d7-No. of large size Leggings from supplier 1, d8- No. of large size Leggings from supplier 2, d9- No. of large size Leggings from supplier 3

d10-No. of XL size Leggings from supplier 1,d11- No. of XL size Leggings from supplier 2, d12- No. of XL size Leggings from supplier 3

d13-No. of XLL size Leggings from supplier 1,d14- No. of XLL size Leggings from supplier 2, d15- No. of XLL size Leggings from supplier 3

e1-No. of small size Jeggings from supplier 1, e2- No. of small size Jeggings from supplier 2, e3- No. of small size Jeggings from supplier 3

e4-No. of medium size Jeggings from supplier 1, e5- No. of

medium size Jeggings from supplier 2, e6- No. of medium size Jeggings from supplier 3

e7-No. of large size Jeggings from supplier 1, e8- No. of large size Jeggings from supplier 2, e9- No. of large size Jeggings from supplier 3

e10-No. of XL size Jeggings from supplier 1,e11- No. of XL size Jeggings from supplier 2, e12- No. of XL size Jeggings from supplier 3

e13-No. of XLL size Jeggings from supplier 1,e14- No. of XLL size Jeggings from supplier 2, e15- No. of XLL size Jeggings from supplier 3

f1-No. of small size Suits from supplier 1, f2- No. of small size Suits from supplier 2, f3- No. of small size Suits from supplier 3

f4-No. of medium size Suits from supplier 1, f5- No. of medium size Suits from supplier 2,f6- No. of medium size Suits from supplier 3

f7-No. of large size Suits from supplier 1, f8- No. of large size Suits from supplier 2,f9- No. of large size Suits from supplier 3

f10-No. of XL size Suits from supplier 1,f11- No. of XL size Suits from supplier 2,f12- No. of XL size Suits from supplier 3

f13-No. of XLL size Suits from supplier 1, f14- No. of XLL size Suits from supplier 2,f15- No. of XLL size Suits from supplier 3

g1-No. of small size Wedding Gown from supplier 1, g2-No. of small size Wedding Gown from supplier 2, g3- No. of small size Wedding Gown from supplier 3

g4-No. of medium size Wedding Gown from supplier 1, g5- No. of medium size Wedding Gown from supplier 2,g6-No. of medium size Wedding Gown from supplier 3

g7-No. of large size Wedding Gown from supplier 1, f8-No. of large size Wedding Gown from supplier 2,g9- No. of large size Wedding Gown from supplier 3

g10-No. of XL size Wedding Gown from supplier 1,g11-No. of XL size Wedding Gown from supplier 2,g12- No. of XL size Wedding Gown from supplier 3

g13-No. of XLL size Wedding Gown from supplier 1,g14-No. of XLL size Wedding Gown from supplier 2,g15- No. of XLL size Wedding Gown from supplier 3

STEP 2-The second step in the LPP formulation is to identify the constraints. Constraints are the basic limitations associated with the business problem. In any business, we do not have the unlimited resources (man, machine, money and management). Most of the resources are scarce, that's why any kind of business objective will come certain kind of limitations. Hence these limitations will act as constraints to the objective. In this problem, we have given with demand, product and shipping fee. We need to make sure that demand of the business should be fulfilled with the minimum product and shipping cost. Other constraints can be non-negative constraints and integer constraints in this case.

Demand Constraints-The business is dealing with Thirty-Five products, so total number of demand constraints will be thirty-five. As the business will make sure that the total demand should be fulfilled, that's why the minimum order quantity will be greater than or equal to the given demand. The demand of the products is going to make the right-hand side of the constraints. As the demand will be fulfilled by three suppliers, so the left-hand side of the constraints will be the product quantities ordered from three different suppliers (decision variables). We can write all the constraints with the help of decision variables.

1.a1+a2+a3>=20, **2.**a4+a5+a6>=40, **3.**a7+a8+a9>=40
4.a10+a11+a12>=25, **5.**a13+a14+15>=10

6.b1+b2+b3>=30,7.b4+b5+b6>=45, **8**.b7+b8+b9>=45
9.b10+b11+b12>=35, **10.**b13+b14+b15>=20

11.c1+c2+c3>=15,**12.**c4+c5+c6>=25, **13.**c7+c8+c9>=25
14.c10+c11+c12>=20, **15.**c13+c14+c15>=10

16.d1+d2+d3>=30, **17.**d4+d5+d6>=50,
18.d7+d8+d9>=50 **19.**d10+d11+d12>=35,
20.d13+d14+d15>=20

21.e1+e2+e3>=15, **22.**e4+e5+e6>=35, **23.**e7+e8+e9>=35
24.e10+e11+e12>=20, **25.**e13+e14+e15>=5

26.f1+f2+f3>=30, **27.**f4+f5+f6>=30, **28.**f7+f8+f9>=30
29.f10+f11+f12>=30, **30.**f13+f14+f15>=15

31.g1+g2+g3>=5, **32.**g4+g5+g6>=10, **33.**g7+g8+g9>=10

34.g10+g11+g12>=10, **35.**g13+g14+g15>=5

Constraints for availing free shipping –The objective of business is to minimize the total cost, that's why the business owner will try to avail the free shipping from all the three suppliers. To achieve the free shipping options, from all the three suppliers, the minimum order quantity should be ordered from the respective suppliers. In case of first supplier the minimum quantity is twenty-one, in case of second supplier, it is 31 and in third case it is 11. These quantities are going to be form the right-hand side of the shipping quantity constraints. The inequality will be of greater than type, as these are the minimum quantity to be ordered. The left-hand side of the constraints will be formed by the decision variables related to each supplier. So total three numbers of shipping constraints will be formed, which are as follows.

1.a1+a4+a7+a10+a13+b1+b4+b7+b10+b13+c1+c4+c7+c10+c13+d1+d4+d7+d10+d13+e1+e4+e7+e10+e13+f1+f4+f7+f10+f13+g1+g4+g7+g10+g13>=21

2.a2+a5+a8+a11+a14+b2+b5+b8+b11+b14+c2+c5+c8+c11+c14+d2+d5+d8+d11+d14+e2+e.+e8+e11+e14+f2+f5+f8+f11+f14+g2+g5+g8+g11+g14>=31

3.a3+a6+a9+a12+a15+b3+b6+b9+b12+b15+c3+c6+c9+c12+c15+d3+d6+d9+d12+d15+e3+e6+e9+e12+e15+f3+f6+f9+f12+f15+g3+g6+g9+g12+g15>=11

Non- Negative Constraints-Non- negative constraints means that all the decision variable should have positive value. As in this case, the minimum order quantity of any product can be zero, but it can-not be negative. So here, all the one hundred five decision variables should have non-negative value, means value greater than zero. The non-negative constraint can be written as -

a1,a2,a3,a4,a5,a6,a7,a8,a9,a10,a11,a12,a13,a14,a15,b1,b2,b3,b4,b5,b6,b7,b8,b9,b10,b11,b12,b13,b14,b15,c1,c2,c3,c4,c5,c6,c7,c8,c9,10,c11,c12,c13,c14,c15,d1,d2,d3,d4,d5,d6,d7,d8,d9,d10,d11,d12,d13,d14,d15,e1,e2,e3,e4,e5,e6,e7,e8,e9,10,e11,e12,e13,e14,e15,f1,f2,f3,f4,f5,f6,f7,f8,f9,f10,f11,f12,f13,f14,f15,g1,g2,g3,g4,g5,g6,g7,g8,g9,10,g11,g12,g13,g14,g15>=20

Integer ILP Constraints- Integer constraint means that the decision variable should have only the value, which is in whole number. Fraction value and decimal values are not allowed. So all the one hundred five decision variables should have integer value as well, the constraint can be written as

a1,a2,a3,a4,a5,a6,a7,a8,a9,a10,a11,a12,a13,a14,a15,b1,b2,b3,b4,b5,b6,b7,b8,b9,b10,b11,b12,b13,b14,b15,c1,c2,c3,c4,c5,c6,c7,c8,c9,10,c11,c12,c13,c14,c15,d1,d2,d3,d4,d5,d6,d7,d8,d9,d10,d11,d12,d13,d14,d15,e1,e2,e3,e4,e5,e6,e7,e8,e9,10,e11,e12,e13,e14,e15,f1,f2,f3,f4,f5,f6,f7,f8,f9,f10,f11,f12,f13,f14,f15,g1,g2,g3,g4,g5,g6,g7,g8,g9,10,g11,g12,g13,g14,g1 = should have the integer value

Step-3 – The third step is to formulate the objective for the LPP.

Objective-The objective function is also known as key variable, which we can achieve with the help of different decision variables. This is the basic goal of the business can be of minimization or maximization type.The objective function in this case is of minimization type, which is to minimize the total cost. The objective function can be written with the help of decision variables as –

Zmin=600a1+700a2+650a3+650a4+700a5+650a6+650a7+700a8+650a9+700a10+700a11+700a12+750a13+700a14+700a15+350b1+400b2+350b3+350b4+350b5+350b6+350b7+350b8+350b9+400b10+400b11+400b12+450b13+450b14+400b15+299c1+350c2+380c3+299c4+299c5+380c6+299c7+299c8+380c9+399c10+399c11+400c12+499c13+499c14+400c15+399d1+435d2+380d3+399d4+399d5+380d6+399d7+399d8+380d9+499d10+499d11+420d12+599d13+599d14+420d15+475e1+500e2+450e3+499e4+500e.+450e6+499e7+500e8+450e9+575e10+500e11+580e12+675e13+500e14+580e15+1200f1+1200f2+1200f3+1250f4+1250f5+1250f6+1250f7+1300f8+1250f9+1300f10+1300f11+1300f12+1350f13+1350f14+1350f15+2500g1+2500g2+2500g3+3000g4+3000g5+3000g6+3500g7+3500g8+3500g9+4000g10+4000g11+4000g12+4500g13+4500g14+4500g15

Result & Discussion-The LPP mathematical model can be solved with the help of Graphical, Simplex and Excel-Solver method. Graphical method is used, when we have just two variables. The reason is that it will be difficult to

plot more than two variables in graph and to identify the feasible region will be even more difficult. Simplex can be used for any no. of variables, but it is very complex and tedious exercise. In this case the decision variable numbers are very high, so use of simplex will not be feasible. So, for solving the LPP, the researcher has used Excel-Solver in this case. Excel-solver option can be found in the data tab of the excel sheet, where the objective, decision variable and constraints information need to be filled. After providing all the desired information there, Simplex option needs to be selected for getting the LPP solution.

The researcher got the optimum solution of the LPP in this case as all the optimality conditioned and constraints are satisfied with the solution. Table no. 4 is depicting the value of all the one hundred five decision variables, which is received from the Excel solver.

Table No. 4 – Decision Variables - Value obtained through Excel-Solver

a1	20	b1	30	c1	15	d1	0	e1	0	f1	30	g1	5
a2	0	b2	0	c2	0	d2	0	e2	0	f2	0	g2	0
a3	0	b3	0	c3	0	d3	30	e3	15	f3	0	g3	0
a4	40	b4	45	c4	25	d4	0	e4	0	f4	30	g4	10
a5	0	b5	0	c5	0	d5	0	e5	0	f5	0	g5	0
a6	0	b6	0	c6	0	d6	50	e6	35	f6	0	g6	0
a7	0	b7	45	c7	25	d7	0	e7	0	f7	30	g7	10
a8	0	b8	0	c8	0	d8	0	e8	0	f8	0	g8	0
a9	40	b9	0	c9	0	d9	50	e9	35	f9	0	g9	0
a10	25	b10	35	c10	20	d10	0	e10	0	f10	30	g10	10
a11	0	b11	0	c11	0	d11	0	e11	20	f11	0	g11	0
a12	0	b12	0	c12	0	d12	35	e12	0	f12	0	g12	0
a13	0	b13	20	c13	0	d13	0	e13	0	f13	15	g13	5
a14	10	b14	0	c14	0	d14	0	e14	5	f14	0	g14	0
a15	0	b15	0	c15	10	d15	20	e15	0	f15	0	g15	0

The number of each product with the corresponding value is presented in Table no. 5. Zmin value obtained through the Excel-Solver is 6,18,415 Rs.

Table No. 5 – Optimal Product- Mix for the Clothing boutique owner

Products to be ordered	Quantity	Price of the product	Total cost
No. of small size Kurtis from supplier 1	20	600	12000
No. of medium size Kurtis from supplier 1	40	650	26000
No. of large size Kurtis from supplier 3	40	650	26000
No. of X-large size Kurtis from supplier 1	25	700	17500
No. of XXL size Kurtis from supplier 2	10	700	7000
No. of small size Tops from supplier 1	30	350	10500

Products to be ordered	Quantity	Price of the product	Total cost
No. of medium size Tops from supplier 1	45	350	15750
No. of large size Tops from supplier 1	45	350	15750
No. of X-large size Tops from supplier 1	35	400	14000
No. of XXL size Tops from supplier 1	20	450	9000
No. of small size T-shirts from supplier 1	15	299	4485
No. of medium size T-shirts from supplier 1,	25	299	7475
No. of large size T-shirts from supplier 1	25	299	7475
No. of XL size T-shirts from supplier 1	20	399	7980
No. of XXL size T-shirts from supplier 3	10	400	4000
No. of small size Leggings from supplier 3	30	380	11400
No. of medium size Leggings from supplier 3	50	380	19000
No. of large size Leggings from supplier 3	50	380	19000
No. of XL size Leggings from supplier 3	35	420	14700
No. of XXL size Leggings from supplier 3	20	420	8400
No. of small size Jeggings from supplier 3	15	450	6750
No. of medium size Jeggings from supplier 3	35	450	15750
No. of large size Jeggings from supplier 3	35	450	15750
No. of XL size Jeggings from supplier 2	20	500	10000
No. of XXL size Jeggings from supplier 2	5	500	2500
No. of small size Suits from supplier 1,	30	1200	36000
No. of medium size Suits from supplier 1	30	1250	37500
No. of large size Suits from supplier 1	30	1250	37500
No. of XL size Suits from supplier 1	30	1300	39000
No. of XXL size Suits from supplier 1	15	1350	20250
No. of small size Wedding Gown from supplier 1	5	2500	12500
No. of medium size Wedding Gown from supplier 1	10	3000	30000
No. of large size Wedding Gown from supplier 1	10	3500	35000
No. of XL size Wedding Gown from supplier 1	10	4000	40000
No. of XXL size Wedding Gown from supplier 1	5	4500	22500
Total	**875**	**35076**	**618415**

The Optimal Product mix will include 875 products from these three suppliers-

Supplier 1 will provide total- 520 products

Supplier 3 will provide total- 35 products

Supplier 3 will provide total- 320 products

Conclusion & Recommendation-All the optimality conditioned and constraints are satisfied with the solution. According to the LPP solution, the clothing boutique owner should order Five hundred twenty product items from supplier-1,Thirty-five items from the Supplier - 2 and three hundred twenty products from the supplier 3. The total cost of this optimal product mix will be 6,18,415 Rs. As of now the business is just in starting stage, that's why more focus was given to the minimization of cost. But as the business grows other optimization technique should also be used to get more profit. The researcher recommends the entrepreneur should use LPP not only for minimization of cost, it should also be used for profit maximization of the business.

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