Mathematical Theory and Modeling
ISSN 2224-5804 (Paper) ISSN 2225-0522 (Online)
Vol.4, No.5, 2014

Optimization of Entrepreneurship by the Application of Linear Programming Technique

Nwankwo Steve .C

School of Science And Industrial Technology Department of Statistics, Abia State Polytechnic, Aba P.M.B 7166, Nigeria.
Email:stevenwankwo@yahoo.com; phone No: 08056330895

ABSTRACT

This study tries to factor O.R (optimization) into entrepreneurship for the purpose of profit maximization. Primary data from an entrepreneur was collected. The data analysis, optimization application software (TORA) was used. The optimal solution were X_2 (moccasin) = 9.09 and X_3 (Italian) = 6.36 for a profit of Z_{max} = ₦2836.36 and it was concluded that the entrepreneur (shoe producer) should produce 9.09 units of moccasin and 6.36 units of Italian shoes for a daily profit of ₦2836.36 and that they should not produce X_2 (paddock) and X_4 (cover front) types of shoes in the face of the constraints posed by the operating environment.

Keywords: Entrepreneur, optimization, profit maximization.

1.0 INTRODUCTION

An unemployed youth is a trained soldier for destruction. Any nation where unemployment is on the increase, no doubt, crime will also be on the increase because unemployment and crime are directly proportional to each other. The Nigerian government has gone a long way in tackling this problem by making entrepreneurship compulsory in schools. But this is not enough as no business runs without profit maximization as a goal. This is why optimization has to be factored into entrepreneurship to avoid wasted investments. Therefore, this work is promising its quota in boosting entrepreneurship through optimization.

Any business, anywhere in the world has common problem which is limitation or restriction. The inability to manage these restrictions can cause liquidation. And one may begin to wonder what are these limitations and how do the restriction bring about liquidation. This work seeks to encourage entrepreneurs by helping to maximize their profit in the face of constraints, to avoid losses. To help the government to fight unemployment through entrepreneurship development and encouragement, to the youths. Information on the number of products produced by an entrepreneur, their hours, which has to do with time taken to produce a product as well as the length of time staked per day, cost price, profit per day. All this together will help to estimate the best possible combination of this man-hour so as to make maximum profit and minimize losses. Those information, together will help minimum cost as well as knowing the product that requires most time or working hour, so as to make maximum profit and reduce wastage materials and human resources. This paper is organized into five sections namely Introduction, Literature Review, Methodology, Data Analysis and Conclusion.

2.0 REVIEW OF RELATED LITERATURE

Entrepreneurship is a French word used broadly to connote, innovative modern industrial business leadership. It originated from a French word “entreprendre” which means “undertake”. The name is as a result of the fact that the entreprendre can undertake the risk of the enterprise. Mr. Richard Cantillon, an Irish man, who was living in France, then first used the term entrepreneurship in the early 18th century.

George A.A. (2007) says entrepreneurship is concerned with innovation and management. He sees entrepreneurship as either a creative innovator that is creating something new that is capable of satisfying consumer’s wants or an adaptive innovator who can modify an existing or similar products or services for better performance while also engaged in managerial activities of planning, controlling, organizing, directing and co-ordinating his business to achieve the objectives of the enterprise.

This research work seeks to factor optimization into entrepreneurship to maximize profit. Optimization in operations research has a single goal of maximization of profit or minimization of losses.

Gupta and Hira (2010) define operations research as the application of scientific methods and techniques to decision-making problems.

Handy A.T. (2003) define operations research as the attack of modern science on complex problems arising in the direction and management of large systems of men, machine, materials and money, industry, business, government and defence. Its distinctive approach is to develop a scientific model of the system, incorporating measurements of factors such as change and risk with which to predict and compare the outcomes of alternatives, strategies or controls. The purpose is to help management determine its policy and actions scientifically. There is no doubt that its application into entrepreneurship will be an indispensible approach.

3.0 METHODOLOGY

The data used in the analysis of this work was collected from an entrepreneur who specializes in making shoes at Ariaria Aba. He was interviewed. We recorded the stages, and time taken to produce his shoes named as; Moccasin, Paddock, Italian and coverfront. The data collected summarized the current state of activities. The production process takes a repetitive approach unless a new product line is introduced or another worker employed. The observation process was carried out for two weeks each in the month of July and August so as to know if there will be any deviation in the mode of operation but everything proved to be the same since the process was repetitive enough. The recorded information from the entrepreneur is shown on the table at the Appendix.

4.0 Data Analysis

A linear programming model for the maximization of objective function type can be stated mathematically as follows:

Maximize $Z = C_1X_1 + C_2X_1 + C_3X_3 + \ldots + C_nX_n$

Subject to

$$\begin{array}{ccccccccc} a_{11}X_1 & + & a_{12}X_2 & + & \cdots & + & a_{1n}X_n & \leq & b_1 \\ a_{21}X_1 & + & a_{22}X_2 & + & \cdots & + & a_{2n}X_n & \leq & b_2 \\ \vdots & & \vdots & & & & \vdots & & \vdots \\ a_{m1}X_1 & + & a_{m2}X_2 & + & \cdots & + & a_{mn}X_n & \leq & b_m \end{array}$$

And

$$X_1 \geq 0;\ X_2 \geq 0, \cdots, X_n \geq 0$$

Where

i. $X_1, X_2, \ldots, X_n$ are decision variables to be maximize they are representing the entrepreneurs products i.e. X_1 = Moccasin,
X_2 = Paddock, X_3 = Italian and X_4 = coverfront.
ii. $C_1, C_2, \ldots, C_n$ are the unit profit of the different activities.
iii. a_{ij}'s are the input-output coefficients or the quantity of a resource i required a produce a unit of an activity j. For example, it takes 35 minutes at the first stage of moccasin production; the a_{ij} in this case is 35 (see appendix).
iv. $b_1, b_2, \ldots, b_m$ are the quantities of resources or their restrictions available where i = 1,2, …, m.
v. Z = the objective function to be maximized. The maximization of Z is carried out so that the m constraints are satisfied.

TORA MOMENT OPTIMIZATION SOFTWARE

TORA optimization system is a window-based software designed for use in operation research. It was used to solve and analysis the LP model in appendix. TORA is totally self-contained, in that all the instructions needed to drive the software are presented by menu, command buttons, check boxes etc.

To use TORA with the Reddy Mikks model, enter the model, from the solve/modify menu, select solve – Algebraic – iterations – all – slack. Next, click GOTO output screen.

You can generate one or all iterations by clicking next iteration or all iterations. If you opt to generate the iterations one at a time, you can interactively specify the entering and leaving variables by checking the headings of their corresponding column and row. If your selections are correct, the column turns green and the row turns red. Else, an error message will be posted.

DATA ANALYSIS USING OPTIMIZATION SOFTWARE

(TORA MOMENT)

TORA Optimization System Windows@version 2.00

Thursday, September 19, 2013 10.27

LINEAR PROGRAM – ORIGINAL DATA

Title: Reddy mikks model

	Moccas x1	Paddoc x2	Italia x3	Coverf x4		
Maximize	200.00	250.00	160.00	150.00		
Subject to						
(1)	35.00	40.00	25.00	20.00	<=	500.00
(2)	15.00	20.00	25.00	30.00	<=	540.00
(3)	30.00	50.00	20.00	25.00	<=	400.00
(4)	25.00	20.00	35.00	30.00	<=	450.00
Lower Bound	0.00	0.00	0.00	0.00		
Upper Bound	35.00	50.00	35.00	30.00		
Unrestr'd (y/n)?	n	n	n	n		

Mathematical Theory and Modeling www.iiste.org
ISSN 2224-5804 (Paper) ISSN 2225-0522 (Online)
Vol.4, No.5, 2014

SIMPLEX TABLEAUS – (Starting All-Slack Method)

Title: Reddy mikks model

Iteration 1	Moccas	Paddoc	Italia	Coverf		
Basic	x1	x2	x3	x4	sx5	sx6
Z(max)	-200.00	-250.00	-160.00	-150.00	0.00	0.00
Sx5	35.00	40.00	25.00	20.00	1.00	0.00
Sx6	15.00	20.00	25.00	30.00	0.00	1.00
Sx7	30.00	50.00	20.00	25.00	0.00	0.00
Sx8	25.00	20.00	35.00	30.00	0.00	0.00
Lower Bound	0.00	0.00	0.00	0.00		
Upper Bound	35.00	50.00	35.00	30.00		
Unrestr'd(y/n)?	n	n	n	n		

Basic	sx7	sx8	Solution
Z(max)	0.00	0.00	0.00
Sx5	0.00	0.00	500.00
Sx6	0.00	0.00	540.00
Sx7	1.00	0.00	400.00
Sx8	0.00	1.00	450.00

Iteration 2	Moccas	Paddoc	Italia	Coverf		
Basic	x1	x2	x3	x4	sx5	sx6
Z (max)	-50.00	0.00	-60.00	-25.00	0.00	0.00
Sx5	11.00	0.00	9.00	0.00	1.00	0.00
Sx6	3.00	0.00	17.00	20.00	0.00	1.00
X2	0.60	1.00	0.40	0.50	0.00	0.00
Sx8	13.00	0.00	27.00	20.00	0.00	0.00
Lower Bound	0.00	0.00	0.00	0.00		
Upper Bound	35.00	50.00	35.00	30.00		
Unrest'd(y/n)?	n	n	n	n		

Basic	sx7	sx8	Solution
Z(max)	5.00	0.00	2000.00
Sx5	0.00	0.00	180.00
Sx6	0.00	0.00	380.00
X2	1.00	0.00	8.00
Sx8	0.00	1.00	290.00

Iteration 3	Moccas	Paddoc	Italia	Coverf		
Basic	x1	x2	x3	x4	sx5	sx6
Z (max)	-21.11	0.00	0.00	19.44	0.00	0.00
Sx5	6.67	0.00	0.00	-6.67	1.00	0.00
Sx6	-5.19	0.00	0.00	7.41	0.00	1.00
X2	0.41	1.00	0.00	0.20	0.00	0.00
X3	0.48	0.00	1.00	0.74	0.00	0.00
Lower Bound	0.00	0.00	0.00	0.00		
Upper Bound	35.00	50.00	35.00	30.00		
Unrest'd(y/n)?	n	n	n	n		

Basic	sx7	sx8	Solution
Z(max)	4.11	2.22	2644.44
Sx5	-0.67	-0.33	83.33
Sx6	-0.15	-0.63	197.41
x2	0.03	-0.01	3.70
x3	-0.01	0.04	10.74

Iteration 4	Moccas	Paddoc	Italia	Coverf		
Basic	x1	x2	x3	x4	sx5	sx6
Z (max)	0.00	51.82	0.00	30.00	0.00	0.00
Sx5	0.00	-16.36	0.00	-10.00	1.00	0.00
Sx6	0.00	12.73	0.00	10.00	0.00	1.00
X1	1.00	2.45	0.00	0.50	0.00	0.00
X3	0.00	-1.13	1.00	0.50	0.00	0.00
Lower Bound	0.00	0.00	0.00	0.00		
Upper Bound	35.00	50.00	35.00	30.00		
Unrest'd(y/n)?	n	n	n	n		

Basic	sx7	sx8	Solution
Z(max)	4.11	2.22	2644.44
Sx5	-0.67	-0.33	83.33
Sx6	-0.15	-0.63	197.41
x1	0.03	-0.01	3.70
x3	-0.01	0.04	10.74

5.0 CONCLUSION

This research work has been able to analyze the current activity of an entrepreneur using linear programming technique. From the analysis and optimality tests carried out using TORA software, it is observed that an optimal solution has been attained at

X_1 = 9.09, X_3 = 6.363 and Z_{max} = 2836.08 while X_2 and X_4 did not appear in the final solution. It is worthy of note that X_1, X_2, X_3 and X_4 are the decision variables which represent shoe types, Moccasin, Paddock, Italian and coverfront. Also, the slack variables, S_1, S_2, S_3 and S_4 where not taking into consideration in the final result as they have no economic value.

From the above findings, for the entrepreneur to make a maximum profit of N2836.36, the should produce 9.09 units of moccasin and 6.36 units of Italian shoes and stop the production of paddock and coverfront as they (paddock and coverfront) do not contribute to the maximum profit the entrepreneur makes in the face of the constraints they operate upon. This conclusion holds for the current activity in the entrepreneur's office. If more products are introduced by this entrepreneur, no doubt, the result will be violated but for this four products (Maccasin, paddock, Italian, coverfront), and their profits together with constraints and available resource which are present in the data collected.

Based on the analysis made and the conclusion drawn, the entrepreneur is advice to stop producing paddock and coverfront and produce 9.09 units of moccasin and 6.36 units of Italian shoes per day for them make a maximum profit of N2836.36 per day.

This method of profit maximization should be adopted by other entrepreneurs in their business in order to escape liquidation and frustration. Nigerian graduates should embrace this entrepreneurial development and go into it, so as to reduce unemployment.

APPENDIX

The four shoes and the daily capacity of the four stages are given in the table below.

Source: An Entrepreneur (Shoes producer) Ariaria Aba

	Time per unit (minutes) of production				
Stages	Moccasin	Paddock	Italian	Coverfront	Capacity per stage (minute/day)
1	35	40	25	20	500
2	15	20	25	30	540
3	30	50	20	25	400
4	25	20	35	30	450
Profit(N)	200	250	160	150	

The linear programming for maximization is

Maximize (Z) = $N200X_1 + N250X_2 + N160X_3 + N150X_4$

Subject to

$35x_1 + 40x_2 + 25x_3 + 20x_4 \leq 500$

$15x_1 + 20x_2 + 25x_3 + 30x_4 \leq 540$

$30x_1 + 50x_2 + 20x_3 + 25x_4 \leq 400$

$25x_1 + 20x_2 + 35x_3 + 30x_4 \leq 450$

$X_1, X_2, X_3, X_4 \geq 0$

REFERENCE

George A. Anugwon (2007). Entrepreneurship in Nigeria, Rhyce Kerex Publishers, Enugu
Gupta P.K and Hira D.S (2010). Operations Research, Schand and company Ltd, New Dehi
Handy A. Taha (2003) Operations Research an Introduction, Seveth Edition, Prentice-Hall India
J.K. Olayemi and C.E. Onyenwaku (1999). Quantitative Methods for Business Decision, Bosude Printers Ltd, Ibadan