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Cost Volume-Profit Analysis: A Sine Qua Non For Decision Making Process

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Abstract
The role which cost volume-profit analysis plays in business decision making process can neither be underrated nor over- emphasized. This paper attempts to define the basic concept of cost volume- profit analysis both in mathematical term for those who are mathematically oriented and in graphical term for those who are mathematically biased. Simple application of cost volume profit analysis were made with regards to; change in fixed costs and sales volume, change in variable cost and sales volume, change in fixed cost sales price and sales volume and recommendation made to who would be an investor.

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I. Introduction

In the word of Oladipo (2002), virtually, all actions taking place in the universe today involve decisions making. To be able to take guided and reasoned decisions, there is a need to have information about the past as well as the present that will give a guide to the future. Today, the cost volume-profit analysis has become a veritable tool in decision making process.

The main focus of this paper therefore is to introduce us to some basic idea about the cost volume profit analysis and how it helps in decision making process.

The paper itself is divided into the following sections.
1. The basic concept of cost volume-profit analysis
2. Mathematical approach to cost-volume-profit analysis
3. Graphical approach to cost-volume-profit analysis
4. Simple applications of cost volume profit analysis

According to Garrison and Noreen (1997) Cost-Volume-Profit (CVP) analysis is one of the most powerful tools that managers and other classroom makers have at their command; it helps them understand the interrelationship between cost, volume and profit in an organisation by focusing on interactions between the following five elements:
(a) Price of products
(b) Volume or level of activity
(c) Per-unit variable costs
(d) Total fixed costs Mix of products sold.

Similarly, Warren, et al (1996) defined cost-volume-profit analysis as a systematic examination of the relationship among selling prices, sales and production volume, costs, expenses and profits.

Cost Behaviours

Cost behaviours as defined by with Warren, et al (1996) the way costs behave in response to a change in activity level of a business, costs are often categorized into two major headings viz: Variable Cost and Fixed Cost

Variable Cost: This is a cost that varies, in total, in direct proportion to the level of activity. The activity can be expressed in many ways, such as unit produced, unit sold, miles covered, bed occupied, lines of print, hour worked etc.

Fixed Cost: However, when a cost does not change with increase in volume, it is called fixed cost. Fixed costs remain at the same level irrespective of the changes in the volume. Examples of fixed costs are factory rent, insurance, salaries etc.

Contribution Margin Concept

One relationship among cost, volume and profit is the contribution margin. The contribution margin is the excess of sales revenues over variable costs. The contribution margin concepts is especially useful in business planning because it gives insight into the profit potential of a firm. Thus, it is the amount available to cover fixed expenses and then to provide profits for the period (Igben, 2000) note the importance of the sequence here, contribution margin is used first to cover the fixed expenses, and then whatever remains goes toward profits.

To illustrate, the income statement of Lamlad Nig. Ltd. has been prepared in a contribution margin format as below:

Sales	**Total**	**Per unit**
Sales (400bks)	100,000	250
Variable cost	60,000	150
Contribution Margin	40,000	150
Less fixed cost	35,000	
Net Income	5,000	

From the above, the contribution margin of ₦40,000 is available to cover the fixed costs of ₦35,000. Once the fixed costs are covered, any remaining amount adds directly to the operating income of the company. An analogy to the above is a situation whereby one think of the fixed costs as a bucket and the contribution as water filling the bucket. Once the bucket is filled, the over flow represents operating income up till the point of overflow, the contribution margin contributes to fixed costs then a loss occurs for the period. This can be illustrated with an extreme example,(filling the bucket). If the contribution margin is not sufficient to cover the fixed expenses, assume that by the middle of January, Lamlad Nig. Ltd. has been able to sell only one book out of his publication, at that point, the company's income statement will appear below:

Total	**Per unit**		
₦	₦		
Sales (1books)	250	250	
Less Variable expenses	150	150	
Contribution Margin	100		100
Less fixed costs	35,000		
Net loss	34,000		

For each additional book that Lamlad is able to sell during the month, ₦100 more contribution margin will become available to help cover the fixed costs. If instance, a second book is sold, then the total contribution margin will increase by ₦100 and the company loss will by N100 and the company loss will decrease by ₦100.

If enough books can be sold to generate ₦ 35,000 in contribution margin all of fixed costs will be covered and Lamlad will, at the point, neither make profit nor loss. Take for example a situation whereby Lamlad Nig. Ltd sold 350 books the income statement of Lamlad Nig. Ltd will be as follow:

Total	**Per unit**		
₦	₦		
Sales (350books)	87,500	250	
Less Variable expenses	52,500	150	
Contribution Margin	35,000		100
Less fixed costs	35,000		

Net loss	0

Therefore from the above analysis, the point at which Lamlad Nig. Ltd neither making profit nor loss is termed as **break-even point**. Hence the term Break-even point (BEP) can be defined either as the point where total sales revenue equal total expenses, variable and fixed, or as the point where contribution margin total equals total fixed costs.

Once the break-even point has been reached net income (profit) will increase by the unit contribution margin for each additional unit sold.

Contribution Margin Ratio (CM Ratio)

Apart from expressing per unit basis, revenues, variable expenses and contribution margin for Lamlad Nig. Ltd can also be expressed on percentage basis

	Total	**Per unit**	**percent**
	₦	₦	₦
Sales (350books)	100,000	250	100
Less Variable expenses	60,000	150	60
Contribution Margin	40,000	100	40
Less fixed costs	35,000		
Profit (income)	5,000		

The percentage of contribution margin to total sales is referred to as the contribution margin ratio (CM ratio This ratio can easily be computed as follows:

CM ratio = Contribution margin
Sales

For Lamlad above, the computation will be

In total **Per unit**

₦40,000 X 100 = 40% or ₦ 40,000 X 100 = 40%
₦ 100,000 1 ₦ 220 1

The contribution ratio is very useful in that it shows how the contribution margin will be affected by a given Naira change in total sales. This means that for each Naira increase in sales, the total contribution margin will increase by 40 kobo and vise-versa.

The mathematical approach to cost-volume-profit analysis involved the use of two major equations. The first equation is used to determine the units of sales necessary to achieve the break-even-point in operation while the second equation is used to determine the units of sales necessary to achieve a target or desired profit.

The two equations are as shown below.

Break-even sales (unit) = Fixed costs
Unit contribution margin

To illustrate the use of the above equation, assume that the fixed costs for Lamlad Nig. Ltd are estimated to be ₦90,000.

The unit selling price, unit variable cost, and unit contribution margin for Lamlad Nig. Ltd are as follows:

	₦	
Unit selling price	50	
Unit variable cost		40
Unit contribution margin	10	

Recurred to find the break-even point.

Solution

$$\text{Break-even sale (units)} = \frac{Fixed\ Costs}{Unit\ Contribution\ Margin}$$

$$\text{BEP (unit)} = \frac{N90,000}{N10} = 9,000 \text{ units}$$

The following profit statement verifies the above computation.

Sales (9000 x ₦50)	450,000	
Variable costs (9000 unit x ₦40)	360,000	
Contribution margin	90,000	
Less fixed cost	90,000	

Profit (operating income) 0

The effect of changes in the fixed costs, unit variable costs and the unit selling prices on Break-even point shall be explained when we get to the application of CVP analysis.

Modification of Break-even point equation above, the sales volume required to earn a target or desired amount of profit can be estimated.

To illustrate this, let us go back to our last illustration. Assume that Lamlad Nig. Ltd. desired to make a profit of say ₦100,000 required to find the number of units to be sold by Lamlad Nig.

Solution

(1) Sales (units) = ₦90,000 + 100,000 = ₦19,000
₦10
=19,000units

The following profit statement verifies this computation.

	₦	
Sales (19,000 unit x 50)		950,000
Variable costs (19,000 unit x 40)	760,000	
Contribution margin (9000 unit x 10)		190,000
Less fixed cost		90,000
Operating income (target profit)	100,000	

Graphic Approach to Cost-Volume-Profit – Profit Analysis

For the benefit of some managers who are mathematics biased, cost-volume-profit analysis can be presented graphically. This will enable them to know the operating profit or loss for any given level of sales or production to be determined visually. The above approach can be done in graphic form as below:

This is sometimes referred to as a break-even chart. This can be illustrated by taking into consideration the following extract from the book of Lamlad Nig. Ltd:

Unit selling price: 50
Unit variable cost: 30
Unit contribution margin: 20
Total fixed cost: ₦100,000

The above break-even chart is constructed as follows:

1. Volume expressed in units of sales is indicated along the horizontal axis. The range of volume shown on the horizontal axis should reflect the relevant range in the business expects to operate. In this illustration, the maximum number of sales units within the relevant range is assumed to be 10,000 units. Naira amounts indicating operating profit and losses will show along the vertical axis.
2. A point representing the maximum operating loss is plotted on the vertical axis at the left. This loss is equal to the total fixed costs at the zero level of sales.
3. A point representing the maximum operating profit within the relevant range is plotted on the right.
4. A diagonal profit line is drawn connecting the maximum operating loss point with the maximum operating profit point.
5. The profit line intersects the horizontal axis at the break-even point expressed in units of sales, and the areas indicating operating profit and loss are identified. Any changes in the unit selling price, total fixed costs, and unit variable costs can be analyzed by using a cost-volume-profit chart.

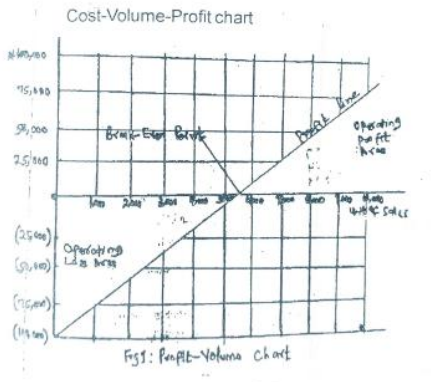

Fig1: Profit-Volume chart

Sales Mix Consideration

In most businesses more than one product is sold at varying selling prices. Such is the case of Lamlad Nig. Ltd for the company at present is producing and selling about five different textbooks on science subjects. The products of this company often have different unit variable costs and each product make a different contribution to profits. Thus, the sales volume necessary to break-even or to earn a targeted profit descend upon the sale mix.

According to Warren, etal (1996): The sales mix is the relative distribution of sales among various products sold by a business.

This can be illustrated by assuming that Lamlad Nig. Ltd sold 10,000 units books i.e 8,000 units of books on physics and 2000 unit of book on chemistry during the past year. The sales mix for physics b0oks and chemistry books can be expressed as percentages as below:

Product	unit sold	sales mix
Physics text books	8,000	80%
Chemistry text books	2,000	20%
10,000	100%	

Lamlad Nig. Ltd fixed costs are ₦100,000. The unit selling prices, unit variable costs and unit contribution margins for Physics and Chemistry

Product	units selling price	unit variable cost	unit costs margin
Physics	₦90	₦70	₦20
Chemistry	₦140	₦95	₦46

To compute the break-even points, the researcher think of the individual product as components of one overall product. For Lamlad Nig. Ltd let the overall unit selling price be represented by Z. Therefore the unit selling price equal to the total of the unit selling prices of the physics text books and that of the chemistry textbooks,multiplied by their sales mix percentage.

This can be as shown below:

Unit selling price of Z = (₦90 x0.80) + (₦140 x0.70) = ₦100
Unit variable cost of Z= (₦ 70X0.80) = (₦ 95 X 0.70) = ₦75
Unit contribution of Z - (₦20 x 0.80) = (₦45 x 0.70) = ₦25
In determine the break-even point

$$\text{Than BEP} = \frac{\text{Fixed cost}}{\text{Unit contribution margin}}$$

100,000 = 4000 units
₦ 25

Simple Applications of CVP Analysis

Mr. Owonikoko the accountant of Lamlad Nig. Ltd wanted to demonstrate to the Coys president Prof. O. Ajaja how the concepts developed above can be used in planning and decision making. Mr. Owonikoko gathered together the following basic data.

Per unit	Percent			
Sales Price		₦		₦
Sales Price	250		100	
Less variable expenses	150		60	
Contribution margin		100		40

Assumed that the fixed costs are ₦35,000 Owonikoko will use the above data to show the effect of changes in variable costs, fixed costs, sales price and sales volume on the company's profitability.

Change in Fixed Costs and Sales Volume

Assuming Lamlad Nig. Ltd is currently selling 400 books per month (monthly sales of ₦100.00)

The sales manager feels that a ₦10,000 increase in the monthly advertising budget would increase monthly sales by ₦30,000 should be advertising budget be increased?

Solution

Using incremental contribution margin.

₦30,000 x 40%	12,000	
Less incremental advertising expenses	= 10,000	
increase in net income	2,000	

Yet based on the information above and assuming that other factors in the company remain constant the advertising budget should be increased.

Change in Variable Cost and Sales Volume

With reference to the original data, and with Lamlad Nig. Ltd currently selling 400 books per month, management is contemplating the use of higher quality components, which would increase variable costs by ₦10 per book thereby reducing the contribution margin. However, the sales manager projects that the higher overallquality would increase sales to 500 books per month should the higher-quality component be used?

Solution

The ₦10 increase in variable costs will cause the unit contribution margin decrease from ₦100 to ₦ 90.
Expected total contribution margin:

		₦
500 books x N90	=	45,000
Present total contribution margin 400 x ₦100		40,000
Increase in total contribution margin:		5,000

Based on the information above the higher quality components should be used sincethe fixed cost will not change net income will increase by the ₦5,000 increase incontribution margin as shown above.

Change in Fixed Cost Sales Price and Sales Volume

With reference to the original data and the company current selling 400 booksper month, to increase sales, the sales manager is contemplating to cut the sellingprice by ₦10 per book and increase the advertising budget by ₦15,000 per month.

The sales manager argues that if these two Steps are taken, unit sales will increase by 50% should changes be made2

Solution

A decrease of ₦10 per book in the selling price will cause the unit contribution margin to decrease from N 100 to ₦ 90

Expected total contribution margin		**₦ ('000)**
400 books X 150 x 90		54,000
Present total contribution margin 400 books x ₦100		40,000
Incremental contribution margin	=	14,000
Change in fixed costs:		
Less incremental advertising expense		15,000
Reduction in net profit (income)		(1,000)

Based on the information above, the changes should not be made.

Change in Variable Cost, Fixed Cost and Sales Volume

With reference to the original data, as before, the company is currently selling 400 books per month. The sales manager would like to place the sales staff on a commission basis of ₦15 per book sold, rather than on flat salaries that now total ₦6,000 permonth. The sales manager is confident that the change will increase monthly by 15%should the change be made?

Solution

Changing the sales staff from a salary basis to a commission basis will affect the fixed and variable costs,₦29, 000 variable costs will increase by A15 from ₦150 to ₦165 and the unit contribution fixed cost will decrease by ₦6,000 from ₦35,000 to margin will decrease from ₦1 ,000 to ₦85.

Expected total contribution margin	₦	
400 books x 115% x ₦85	39,100	
Present total I contribution margin		
400 books x ₦100		40,000
Decrease in total contribution margin	=	(900)
Change In fixed costs		
Add salaries avoided if a commission is paid	6,000	
increase in net income	5,100	

Yes, based on the information above, the change should be made.

For proper application of CVP Analysis the following assumptions should be taken into consideration,

1. Total sales and total costs can be represented by straight lines
2. Within the relevant range of operating activity, the efficiency of operations does not change.

3. Costs can be accurately divided into fixed and variable components.
4. The sales mix is constant
5. There is no change in the inventory quantities during the period.

Since the assumptions are often valid for the relevant range of operations under Consideration, cost volume-profit analysis is often used by managers as an aid to decision making. (Billie,. et al 2000})

II. Conclusions

In conclusion, the task of developing and sustaining any business entity be it small, medium and large enterprises will surely be enhanced by employing cost Volume- profit analysis in decision making and to operate such business(es) with maximum profitability. This is because it enables manager to determine the following.

1) How changes in activity affect contribution margin and net income.
2) The effects on contribution margin of changes in variable cost, fixed costs, selling price and volume
3) The break-even point by both the equation method and the contribution margin method.
4) Compute the margin of safety and explain its significance.

III. Recommendations

For business owners to be able to appreciate the relationship between cost, sales (volume and operating income profit) CVP analysis must be in place for use.

Investors should be familiar with the operations of CVPA Would be investors should engage the services of business owners, financial experts tor proper understanding of the intricacies of CVPA.

Investors intending to breakeven profitably must appreciate the workings of CVPA and its associated advantages.

The use of CMR is a factor, as it affects sales in volume and also in value which is a factor to be considered in CVP analysis.

Finally, this paper is recommended to investors, would be investors and all that Wishes to own a business and be able to take sound decision.

References

[1] Behin, R.D. And J.Vaupel, (1982): Quick Analysis For Busy Decision Makers, New York, Basic Books Inc.
[2] Bille M. Cunningham Et Al (2000) Accounting: Information For Business Decisions. Harcourt College Publishers. New York City.
[3] Garrison, R.H. And Noreen, E.W (1997): Managerial Accounting . Mcgraw Hill Companies, Inc. USA.
[4] Igben. R.O. (2000) Financial Accounting Made Simple. ROI Publishers, Isolo, Lagos.
[5] Warren, Et Al (1996) Accounting: South Western College Publishing Cincinnati, Ohio.
[6] Oladipupo, A.A. (2002) "The Role Of Probability Theory In Decision Making". ICAN Students Journal 7(4), 16-20.
[7] Billie M. Cunningham And John D. Bazeley. Accounting Information For Business Decisions. Harcourt College Publishers. New York City.
[8] Bunn, O.W. (1984); Applied Decision Analysis. New York Mc Graw - Hill Book Co.
[9] Erc. W. Noreen And Garrison, Managerial Accounting Eight Edition
[10] Harrison And Horngren (1977), Financial Accounting Standard University New Jewelry Third Edition. Managerial Accounting: A State Of The Art Survey. The Accounting Journal, Winter, 218-42.