

# Financial Modeling in Non-Profit Organizations: The Cost-Volume-Profit Approach

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## Abstract

The ability of an organization to test the interactions of economic variables in a variety of setting is important in effective decision-making and ultimately profitability and survival. This paper posits the use of Cost-Volume-Profit (CVP) analysis in this regard and applied it to non-profit organization. Using a case study approach, the study demonstrates practically the application of CVP framework to decision problems. Thereafter, primary data were collected by means of questionnaire and analyzed using frequency percentage to investigate why cost/management accounting decision frameworks in general are not popular among non-profit organizations in Nigeria. The traditional technique of CVP analysis including its assumptions and limitations were addressed. The paper suggested the use of Activity-Based Costing as a potent means of overcoming the perceived limitations of the traditional CVP analysis.

**Keywords:** CVP analysis, Non-profit organizations, Activity-Based-Costing, Financial Modeling.

## 1. Introduction

A financial model is a simplified representation of the critical factors in a projected course of action facilitating exploration, prediction and control of the financial repercussion of organization's decisions. Thus, it allows an organization to test the interaction of economic variables in a variety of settings. It requires analysts to develop a set of equations that represent a company's operating and financial relationships such as, the relationship of variable costs to sales, inventory turnover ratios, and the relative proportion of various products sold. The model is then processed through software, often a spreadsheet, allowing a user to explore the effects of different situations on the business. This activity is technically called sensitivity analysis. An analyst can construct an appropriate financial model and in a matter of seconds, predict the outcome of various scenarios. It therefore has the advantage that it allows an organization to study the impact of a possible business action by reviewing the potential results before that action really occurs (Hilton, Mahar and Selto, 2000).

Many types of financial models abound, ranging from simple static models to complex dynamic models (Synthesis Partnership, 2012). This paper focuses on one, that is, the cost-volume-profit (CVP) model. The CVP model summarizes the effects of sales volume changes on an organization's costs, revenues and incomes. Such analysis can however be extended to cover the impact on profit of changes in selling prices, service fees, costs, income-tax rates and the organization's mix of products or services. For example, how many patient days of care must a hospital provide to cover its costs for the year? What happens, if the hospital leases a new computerized system for record-keeping? What effect on profit can a particular airline expect if it adds a flight on to one route? What would be the consequences of different increases in salaries and benefits combined with other costs and fees that are rising at different rates? These questions concern the effect on costs and revenues when activity changes and appropriately, are candidates for study by the CVP model.

It is important to state that the CVP model is not restricted to profit seeking enterprises because the word profit appears in its title (Adeniyi, 2004). This paper seeks to reinforce the fact that it could be useful to non-profit organizations. There is a gap in the empirical literatures especially in Nigeria, on the application of accounting models to research into accounting problems of organizations. This has largely affected the growth of accounting into an academic endeavour. One aspect of accounting that is often emphasized is financial accounting which provides historical reports about the financial activities of an organization at the end of its financial year. The other aspect of accounting called cost and management accounting which provides continuous day-to-day reports for strategic and tactical decision making is often neglected. Organizations need reports that are futuristic to enable them manoeuvre through the threats in their environment. Therefore, how to apply the CVP model to typical decision problems of non-profit organizations is the central concern of this paper. In this regard, the study seeks to show that cost and management accounting techniques in general and CVP analysis in particular, are not limited in application to manufacturing organizations though they evolved from the factory settings of the classical management school. The typical application areas of CVP model can corroborate this point. Such applications succinctly put by Mahar and Deakin (1994); Pandey (2000); Erhirhie (2004) and Adeniyi (2009) include:

- 1) Should a company produce a particular good or service internally or acquire it from an external source?
- 2) Should a business drop an unprofitable product, business unit or activity?

- 3) In the face of limited resources, what goods or services should be produced to generate the most profitable results?
- 4) Should an organization accept a one-time special order at a reduced price? What price should the company charge for the order (and other goods and services in general)?
- 5) What will be the impact of plant expansion on cost-volume-profit relationship?

## 2. Theoretical Framework

Cost-volume-profit analysis provides a sweeping financial overview of the planning process. It handles questions of the “what if” theme and is built on simplifying assumptions about the pattern of behaviour of revenue and cost (Horngren, Foster and Datar, 1999). The profit maximization model of classical economics provides the foundation for CVP analysis. In the profit maximization model, firms in a perfect competition environment earn normal profit if their marginal revenue is equal to their marginal cost. The underlying assumption in such analysis is that management’s goal is profit maximization where profit is the difference between total revenue and total cost. Therefore, management’s job is to determine and take the most profitable course of action.

Generally, accountants do accept the classical economists’ model. However, as noted by Mahar and Deakin (1994), they make two simplifying assumptions viz: (i) they assume linearity of total revenue and total cost curves which economists usually assume to be non-linear. However, the linearity simplifications are usually considered valid within some appropriate range of volume termed the relevant range. (ii) The opportunity cost of invested equity capital is usually excluded in the accountant cost measures, while it is included in the economist’s model. Accordingly, in economic terms, the accountant measurement of total cost is understated.

Furthermore, Horngren, Foster and Datar (1999; 2002) while agreeing with the points above, detailed the assumptions on which CVP model is based in its common application to include:

- 1) Changes in the level of revenues and costs arise only because of changes in the number of product (or service) units produced and sold. In other words, output is the only revenue and cost driver.
- 2) The analysis either covers a single product or assumes that the sales mix when multiple products are sold will remain constant as the level of total units sold changes.
- 3) All revenues and costs can be added and compared without taking into account the time value of money.
- 4) Total cost can be divided into a fixed component and a component that is variable with respect to the level of output.
- 5) The unit selling price, variable costs and fixed costs are known and constant.
- 6) When graphed, the behaviour of total revenues and total costs are linear.

### 2.1 The Mechanics of Cost-Volume-Profit Analysis

Essentially, decision making is concerned with what cost and revenues will be and it stands on the assumption that managers will take decisions which maximizes profit (Agbadudu, 1998; Malomo, 1999). Typically, CVP analysis can be used to examine how various “what if” alternative being considered by a decision maker affect operating income. In this regard, the breakeven point is frequently one point of interest. Since managers wish to avoid the stigma of making a loss, they have become desirous of having an idea of the breakeven point. This point is that quantity of output where total revenues and total costs are equal resulting in zero operating income. (Horngren, Foster and Datar, 1999).

There are three commonly used approaches to ascertaining the breakeven point namely: the Equation approach, the Contribution-Margin approach and the Graphical approach. Each of these is now explained.

#### The Equation Approach

This approach is founded on the simple relation of:

$$\text{Profit (Income)} = \text{Total Revenue} - \text{Total Cost}$$

Now, total cost can be decomposed into fixed and variable elements. Also, total revenue is a product of quantity and price. Using this, the profit equation becomes:

$$\text{Profit} = (\text{selling price} \times \text{quantity sold}) - (\text{variable cost per unit} \times \text{quantity sold}) - \text{fixed cost.}$$

Thus,

$$\text{Profit} = (\text{selling price} - \text{variable cost per unit}) \text{ quantity sold} - \text{fixed cost}$$

At breakeven point, Profit is equal to zero, so that;

$$(\text{Selling price} - \text{variable cost per unit}) \text{ quantity sold} = \text{fixed cost.}$$

Since we are interested in quantity sold, the expression becomes:

$$\text{Quantity (at breakeven)} = \frac{\text{Fixed Cost}}{\text{Selling Price} - \text{Variable Cost Per Unit}}$$

#### The Contribution Margin Approach

This is simply the algebraic manipulation of the equation approach. Contribution margin is equal to revenues

minus all costs of output that vary with respect to the units of output. From the equation approach, it is obvious that the contribution margin in total is the expression: (selling price - variable cost per unit) quantity sold. This expression represents the amount unit sold contribute towards covering fixed costs and providing operating profit.

Now, if we define unit contribution margin as: selling price less variable cost per unit, then the breakeven quantity becomes:

$$\frac{\text{Fixed Cost}}{\text{Unit Contribution Margin}}$$

Note that this approach assumes all fixed costs as period costs; that is, they are not allocated to products and 'unitized'. In this connection, the CVP model is consistent with variable or marginal costing and inconsistent with full absorption costing (Mahar and Deakin, 1994).

### The Graphical Approach

This approach discloses more information than the other two approaches in that it enables managers to see the effects of changes in volume on profits at a glance. By plotting the total cost line and the total revenue line using unit sold on the horizontal axis and cost/revenue amount on the vertical axis, their point of intersection is the breakeven point. All points before the breakeven point represent loss areas while those after the breakeven point represent the profit areas.

A variant of the CVP graph is the profit volume (PV) graph. This shows the impact on operating profit of changes in the output level. Using units sold on the horizontal axis and operating profit on the vertical axis, where the operating profits line cuts the horizontal axis is the breakeven point or unit.

To conclude this section, a summary of formulas that could be used to work out the information required for typical decisions are presented below as in Lucey (1990).

- 1) Breakeven Point (in units) =  $\frac{\text{Fixed Cost}}{\text{Contribution Per Unit}}$
- 2) Breakeven Point (in sales amount) =  $\frac{\text{Fixed Cost}}{\text{Contribution Per Unit}} \times \text{Selling price/unit}$   
 OR  $\text{Fixed cost} \times \frac{1}{\text{C/S ratio}}$
- 3) C/S ratio =  $\frac{\text{Contribution Per Unit}}{\text{Selling price/unit}} \times 100$
- 4) Level of sales to result in target profit (in units) =  $\frac{\text{Fixed Cost} + \text{Target Profit}}{\text{Contribution Per Unit}}$
- 5) Level of sales to result in target profit after tax (in units)  

$$= \frac{\text{Fixed Cost} + \left[ \frac{\text{Target Profit}}{1 - \text{Tax rate}} \right]}{\text{Contribution Per Unit}}$$
- 6) Level of sales to result in target profit (in sales amount)  

$$= \frac{\text{Fixed Cost} + \text{Target Profit} \times \text{Sales Price/Unit}}{\text{Contribution Per Unit}}$$

These formulas are readily applicable to single product firm or one with unvarying mix of sales. For a multiple product firm or firms with varying mix of sales the breakeven point in sales value is commonly expressed as:

$$= \frac{\text{Fixed Cost} \times \text{Sales Value}}{\text{Contribution}}$$

### 3. Illustrating Application of Cost-Volume-Profit Analysis in Non-Profit Organizations

Having explained the idea of financial modeling, the paper is now in a position to demonstrate practically its applicability in non-profit organizations. The choice of this type of organization is informed by the fact that their number is on the increase in Nigeria. As such, government has come to recognize them as veritable instruments for promoting overall economic growth and societal development. However, for them to attain this feat, they need effective management of resources of which planning and decision making are essential elements.

Managing non-profit organizations has attracted research interests (see Handy, 1988; Hudson, 1999; Powell and DiMaggio, 1991; Anheier, 2000). The different dimensions to the appropriate management models and practices of non-profit organizations draw largely from the fact that they vary in terms of mission, size, mode of operation and impact especially in a cross national sense. Some resemble the business firm, others a little more than an informal network; and yet others a model of a government agency. Notwithstanding these variations, empirical studies have some agreement on what they are and how to define them. In this regard, Salamon and Anheier (1997) and Anheier (2000) pointed out the following as their characteristics. (1) They are non-profit distributing; which means not returning any profit generated to owners. (2) They are equipped to control their own activities; that is, self governing. (3) Institutionally separate from government, setting them apart from the public sector. (4) Possessing some institutional reality which differentiates them from informal entities as families, gatherings or movements. (5) Non-compulsory in nature with some degree of voluntary input in either the agency's activities or management. It is seen as philanthropy, compassion and a concern for the public good.

Anheier (2000) noted that the management of non-profit organizations is often ill- understood because we do not understand these organizations well, and it is frequently ill-conceived because we operate from the wrong assumptions about how non-profit organizations function. Drawing from the management concept suggested by Gomez and Zimmermann (1993), he therefore posited the following facets of managerial approach to non-profit organizations.

- (1) A strategic-development dimension that sees organizations as an evolving system encountering opportunities and threats that frequently involves fundamental dilemmas for management.
- (2) A holistic conception of organization which sees a relationship between the organization and its environment, the divergent orientations within and outside the organization, and the complexity of demands put on it.
- (3) A normative view of management that includes not only economic aspects, but also the importance of values and the impact of politics.
- (4) An operative dimension that deals with the everyday functioning of the organization such as administration, accounting, finance, and service-delivery.

Clearly therefore, the key to effective management of non-profit organizations is to see them as an economic and political systems that have normative, strategic as well as operative dimensions. If this perception is appreciated, then non-profit organizations will be on the right pedestal to accentuate societal development.

Non-profit organizations generally provide welfare services (such as social services for people with disability, international humanitarian assistance, advocacy group, the socially excluded and minorities, hospices and care facilities for frail older people, and local community associations) and obtain their accumulated funds from subscription, contributions, donations and grants (Asaolu, 1998). For such organizations, there is the absence or relative unimportance of profit motives (Inanga, 1985; Agboh, 2007). Clearly the key to applying CVP analysis in such organizations and other service organizations is measuring their output. However, their outputs being largely intangible need to be quantified so that they can be capable of objective measurement. For example, the measure of output for Hospitals is patient-days and Tertiary Institution is student credit hours (Horngren, Foster and Datar, 2002).

#### 3.1 Data Analysis of the Case-study

Now, consider a socio-economic welfare agency of the government like the Delta State Millennium Development Goals Office. This agency is concerned with attaining the targets set under the eight goals of Millennium Development. One of the strategies adopted by this agency in realizing its objectives is partnering with Non-Governmental Organizations (NGOs) in the different localities and encouraging the formation of cooperative societies. Funds are normally disbursed through these NGOs and cooperative societies to meet the developmental challenges of the local communities. Lift Above Poverty Organization (LAPO) is one of such organizations partnering with MDGs Office to train youths and rural women to acquire skills needed to make them self-employed and become economically empowered, thus reducing illiteracy and rural poverty. This paper takes the empowerment scheme of LAPO as a case study. It identifies that the management of the scheme would ordinarily be concerned with knowing how many "units" the scheme could assist in any financial period in the light of budget appropriations received. Now, this study wants to demonstrate that this kind of critical decision, which is common to most non-profit organizations, could be resolved using CVP analysis.

Information gathered about the scheme for 2013 are: There is a budget appropriation of ₦4.05 million. At the end of the training programme with duration of one year, each trainee is assisted with ₦19, 500. The scheme

incurs running cost totaling ₦350, 750. Components of this running cost amounting to ₦265, 750 are independent of the number of trainees. The question now is how many youths could be trained in 2013.

#### **Solution**

The question before us is technically finding the breakeven point. Using the equation approach of the CVP analysis, operating income/profit is set equal to zero. Also, let the number of youths that could be trained be represented by  $\beta$ .

Recall our earlier equation of the form:

$$\text{Total Revenue} - \text{Total Cost} = \text{Profit}$$

At breakeven, profit is equal zero so that Total Revenue - Total Cost = 0..... (1)

In this problem, the total revenue is the budget appropriation of ₦4.05 million.

Since the financial assistance of ₦19, 500 given to each trainee at the end of the programme varies with the number of trainees; this expenditure is a variable cost. Also is the balance ₦85, 000 of the total running cost (₦350, 750 less ₦265, 750). So total variable cost is ₦19, 500  $\beta$  plus ₦85, 000  $\beta$  = ₦104, 500  $\beta$

The running cost of the scheme of ₦265, 750 is the fixed cost since it does not vary with the number of trainees.

Substituting these values into the equation (1) above and decomposing total cost into fixed and variable components, we have:

$$₦4, 050, 000 - 104, 500 \beta - 265, 750 = 0$$

Solving for  $\beta$ , we have

$$3, 784, 250 - 104, 500 \beta = 0$$

$$3, 784, 250 = 104, 500 \beta$$

$$\text{So that } \beta = 36.21$$

Therefore, the number of youths that could be trained in 2013 is 36.

#### **3.2. Answering Questions of “What if”**

From the analysis above, various “what if” scenarios could be addressed. For example, what if the budget appropriation is reduced by say 12.5% for the year 2014 and other cost elements remain unchanged? How many youths can the scheme sustain?

To answer this, we make adjustment to total revenue which is now;

$$₦4, 050, 000(1 - 0.125) = ₦3, 543, 750.$$

Then substitute into the profit equation (1) we have:

$$₦3, 543, 750 - 104, 500 \beta - 265, 750 = 0$$

$$\text{Then, } 3, 278, 000 - 104, 500 \beta = 0$$

Such that,  $\beta = 31.36$

Thus, 31 youths can now be trained.

Note that the percentage reduction in number of trainee  $[(36 - 31) \div 36]$  13.89% is more than the 12.5% reduction in the budget appropriation because of the existence of fixed cost. The scheme manager can adjust operations to stay within this reduced appropriation in one or more of three basic ways namely: (1) reduce the number of trainees assisted, (2) reduce the variable cost (the assistance to trainee) or (3) reduce the total fixed costs.

#### **3.3 Analysis of Questionnaires Administered**

In contrast to the observation by DiMaggio and Powell (1983) and Deakin (1995), that non-profit organizations in the EU countries and the United States now have to deal with uncertainty arising from cut in government budgets, and therefore look more to profit corporations and commercial enterprises for management tools and models for resolving financial challenges, the same cannot be said of their Nigerian counterparts. Here in Nigeria, they have been less subject to business cycles and market volatility and are still being pampered by government budgetary support (Uwhejevwe-Togbolo, 2008). Against this background, the study delve into finding out why financial models and cost/management accounting decision frameworks are yet to be fully embraced by non-profit organizations in Nigeria.

The study used a survey research method where questionnaires were administered on sixty (60) non-profit organizations drawn from the six geo-political zones of the country. This coverage was to ensure that environmental cum cultural factors that affect accounting practices in the different parts of the country are duly captured. The result of the analysis of the questionnaires is summarized in table 1.

**Table 1: Result of Analysis of Questionnaires Administered**

	<b>Reasons for non-application of Financial modeling framework (and Cost and Management accounting decision framework) to operations of Non-profit organizations</b>	<b>Percentage of Respondents who adduced such reasons</b>
1	Most non-profit organizations are relatively small and therefore cannot employ experts in cost and management accounting	93%
2	The public attitude is disposed mainly towards financial accounting reports of non-profit organizations	95%
3	Lack of accounting standards for small and medium scale enterprises that non-profit organizations can follow	92%
4	Lack of awareness that decision problems fundamental to the effective management of non-profit organizations can be resolved using cost/management accounting framework and techniques	83%
5	The activities of non-profit organizations are simplified warranting routine decisions which do not call for expert knowledge	67%
6	Non-profit organizations are philanthropy and do not perceive the complexity of demands put on them by their interactions with the environment	90%
7	Non-profit organizations have several bottom lines	78%
8	No price mechanisms are in place that can aggregate the interests of clients, staff, volunteers and other stakeholders that can match cost to profits, supply to demand, and goals to actual achievements	82%
9	The interest and needs of clients who may not be in a position to reveal their preferences (for example, persons with disabilities, children, and older people) nor able to pay prices that cover the cost of service delivery that are catered for.	75%
10	The difficulty in answering the question: “cost control for what, and for whom”	85%

Source: Author’s Field Survey, 2013

#### **4. Overcoming the Limitations of the Basic CVP Model via Activity Based Costing**

Some limitations of the CVP model have been identified in the literatures. For example, the model requires that the sales mix must remain as predicted, as a change would influence the cost, volume and profit relationships of the firm. Similarly, a company’s technology, efficiency and management must remain as constants, (Pandey, 2000; Brockington, 1987). Additionally, the model is also based on a linear relationship among revenues and cost thus ignoring basic factor as quantity discounts. Perhaps, and most disturbing, is the model’s use of a single cost driver (Hilton, Mahar and Selto, 2000).

Imagine in a more generic situation the number of items that could cause revenue and cost to change. Revenues are driven not only by volume, but also by selling prices, number of competitive products, quality considerations, general economic conditions, target markets, promotional programmes e.t.c. Similarly, costs, say for a non-profit organizations like University, are influenced by number of students, number of employees, number and size of building, buildings operating conditions (such as new, in need of repair, energy efficient), number of graduate teaching assistants, number of research grants, the level of state support or private funding, the number and types of programmes offered (such as undergraduate versus postgraduate) class size, commitment to technology among others. These examples show how multiple drivers affect financial performance. The issue of multiple cost drivers is the central concern of Activity-Based-Costing (ABC). It involves tracing cost of resources to activities and then to products and services based on the use of activities (Horngren, Foster and Datar, 2002; Drury, 2004). Activities like resources may be classified into five categories depending on the type of decision to use the resources viz (Hilton, Mahar and Selto 2000).

- 1) Unit level activities (produces unit level costs): This is the work efforts that transform resources into individual products and services.
- 2) Batch-level activities (produces batch-level costs): This reflects the organization’s manufacturing or service technology to perform certain activities that affect multiple units of output equally and simultaneously.
- 3) Product-level activities (produces product level costs): This support specific product or service lines and include such activities as designing, advertising, manufacturing, supervision and quality management that are specific to each type of product or service. These activities would be uncalled for if the related products or services were no longer provided.
- 4) Customer-level activities (produces customer level costs): These are performed to meet the needs of specific customers. Examples of related costs include those attributable to unique packaging, shipping

- and distribution needs and personnel who are designed to handle specific customers' accounts.
- 5) Facility level activities (produces facility-level costs): These are required for an organization to have the capacity to produce goods and services. Such activities are at the highest level of the activity hierarchy and tend to support all organizational processes. Typical examples include operating the physical plant and the activities of top management.

The activity categories will change the nature of the CVP model. The basic model assumes that variable cost vary with sales volume while other cost remain constant. With ABC, costs vary because of drivers other than sales. The following is an example of a total cost expression under ABC.

$$\text{Total Cost} = (\text{Unit variable cost} \times \text{number of units}) + (\text{Batch Cost} \times \text{Batch CDA}) + (\text{Product cost} \times \text{Product CDA}) + (\text{Customer cost} \times \text{customer CDA}) + (\text{Facility Cost} \times \text{Facility CDA}).$$

Where;

CDA = Cost driver activity such as number of batches, number of changing orders, number of customers, number or sizes of facilities and so on).

By applying ABC approach, some costs viewed as fixed under the traditional CPV analysis is now considered variable with respect to the appropriate cost drivers. The several limitations of the traditional analysis such as non-linear and stepped cost functions, difficulties of extrapolation outside normal activity levels and inappropriateness for long-term planning purposes would have been overcome.

## 5. Summary and Conclusion

CVP analysis as a technique of financial modeling is both a management tool for determining the impact of selling prices, costs and volume on profits and a conceptual tool or way of thinking about managing a company. It helps management focus on the objectives of obtaining the best possible combination of prices, volume, variable costs and fixed costs. An advantage of the CVP model is its simplicity. Be that as it may, the price of such simplicity is a set of limiting assumptions that result in some loss of realism with one of the most troubling being the use of a single cost driver. When CVP analysis is applied to a multiple-product company, it is assumed that there is a constant sales mix of products as the total quantity of units sold changes. In this connection, whenever assumptions are made, it is advisable to perform sensitivity analysis to determine whether and how the assumption affects decision. Also, activity-based costing can be used to discard some of the simplifying assumptions of the traditional CVP analysis. By recognizing the existence of multiple or several cost drivers and then incorporating this into the equation formulation of the model, more realistic results can be obtained.

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