Volume 19 Issue 37
Originally issued as D4

Global Journal of Management and Business Research: D
Accounting and Auditing
Volume 19 Issue 4 Version 1.0 Year 2019
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals
Online ISSN: 2249-4588 & Print ISSN: 0975-5853

Examining the Relationship Between Contribution and Production Capacity

By Ahmed Mohamed Ameen

Abstract- This paper examines the relationship between production capacity and contribution. A total of 81 companies in Michigan City are to be sampled and their views analyzed so as to make a policy making recommendations to the cost accountants and production managers. Both production/ optimal output and contribution are factors of Cost Volume Profit (CVP) analysis. While many perceive fixed cots be the main factor influencing the production capacity, there is a research gap on this fact. This is due to the fact that variable cost varies with production levels. Being that contribution takes into consideration only the fixed cost, it is a critical factor in determining the production capacity and the optimal production levels thereof. This has been proven from the literature conducted in this research paper. 81 emails were sent, but only 73 responded which is 90%.Over 80% of the 73 companies from which views were sampled confirmed this fact, though an overwhelming majority, were yet to make their production decisions based on the level of contribution.

This paper, therefore, recommends that contribution be included in determination of production capacity, the current system be changed, sensitivity analysis be done for all assumptions and a further research be done on this topic, whenever assumptions are made, it is advisable that a sensitivity analysis be performed to determine to ensure that more realistic results are realized and a further research conducted on this topic.

GJMBR-D Classification: *JEL Code: M40*

EXAMININGTHERELATIONSHIPBETWEENCONTRIBUTIONANDPRODUCTIONCAPACITY

Strictly as per the compliance and regulations of:

© 2019. Ahmed Mohamed Ameen. This is a research/review paper, distributed under the terms of the Creative Commons Attribution-Noncommercial 3.0 Unported License http://creativecommons.org/licenses/by-nc/3.0/), permitting all non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

Examining the Relationship between Contribution and Production Capacity

Ahmed Mohamed Ameen

Abstract- This paper examines the relationship between production capacity and contribution. A total of 81 companies in Michigan City are to be sampled and their views analyzed so as to make a policy making recommendations to the cost accountants and production managers. Both production/ optimal output and contribution are factors of Cost Volume Profit (CVP) analysis. While many perceive fixed cots be the main factor influencing the production capacity, there is a research gap on this fact. This is due to the fact that variable cost varies with production levels. Being that contribution takes into consideration only the fixed cost, it is a critical factor in determining the production capacity and the optimal production levels thereof. This has been proven from the literature conducted in this research paper. 81 emails were sent, but only 73 responded which is 90%.Over 80% of the 73 companies from which views were sampled confirmed this fact, though an overwhelming majority, were yet to make their production decisions based on the level of contribution.

This paper, therefore, recommends that contribution be included in determination of production capacity, the current system be changed, sensitivity analysis be done for all assumptions and a further research be done on this topic, whenever assumptions are made, it is advisable that a sensitivity analysis be performed to determine to ensure that more realistic results are realized and a further research conducted on this topic.

Chapter One

I. Introduction

a) Background

Contribution is one of the critical concepts used by business owners in assessing the ability to produce a certain volume of goods and/or services. This concept focusses on the effects of variable cost on the volume of output targeted. In essence, contribution is a subsection of Cost Volume Analysis (CVP) (Hanna & Kyoung, 2016).This concept focuses on the returns that a company or a business makes from each unit of a product sold and whether that returns are enough to allow the subject business make profit, after taking into account the fixed costs (Choo & Tan, 2011). This concept looks at the profit made on individual products. It is used in calculating how many items that should be sold to cover all the business cost which are variable in nature.

Production capacity, on other hand, is a major concern for many business owners as it is used to determine the ability to meet the market demand and win the trust of customers (Sherif, 2018). It is, however, worth noting that the primary factor from which the above emanates from is the amount of capital which has been set aside by an entrepreneur. This paper, therefore, examines the relationship between contribution and production capacity, as Cost Volume Profit (CVP) elements.

b) Problem Statement

According to Horngren, Dataand Rajan (2012), in expediting their duties, accountants must ensure that they avail sufficient financial information, using the required concepts, to aid the users of financial information in making prudent decisions. Contribution and production capacity is a subset of CVP analysis, which is a very powerful tool in financial and production decisions. The origin of contribution and production capacity can be traced back to Horngren, Datar and Rajan (2012), whose work found out the need for assumptions of more than a single product when making production planning. In making this assumption, the planners are able to predict the various risks that are likely to be associated with production. Planning using this assumption, however, is possible only if production managers as well as cost accountant appreciate the relationship between contribution and production capacity.

Plant managing requires that the mangers have efficient skills in costing and production costs. This will ensure continuous development, especially to production managers and production thereof. The tendency to determine production capacity and costs per product based on the projected selling price and not contribution is common. This is due to the fact that many production managers do not understand the relationship between contribution and production capacity. This mistake has always let to inability of companies to produce optimally. This paper, therefore, examines the relationship between contribution and production capacity.

c) Research Objective

The main goal of this paper is examining how production capacity can be optimized using contribution as an accounting tool. This will aid in planning for production as well as sale of the produced goods and services.

d) Research Questions

Based on the above objective, the following questions will be answered by this research project:

Author: e-mail: moataz_fathi_ahmed@yahoo.com

© 2019 Global Journals

i) What is the effect of contribution in developing an optimal production capacity?
ii) Is the current production planning favorable enough to give a clear relationship between contribution and production capacity?
iii) Can production per margin standard form the basis for optimizing production capacity?

e) Research Hypothesis

i. *Null Hypothesis*

i) The full costing for developing an optimal production, without considering contribution is wrong.
ii) In order to apply contribution in ensuring that an optimal production capacity is achieved, then the current system must be improved.
iii) Contribution per margin per standard hour is the criterion which can be used in achieving an optimal production capacity.

ii. *Alternative Hypothesis*

i) The full costing for developing an optimal production, without considering contribution is not wrong.
ii) In order to apply contribution in ensuring that an optimal production capacity is achieved, then the current system should not be improved.
iii) Contribution per margin per standard hour is not the criterion which can be used in achieving an optimal production capacity.

f) Justification for the Study

As had been pointed out earlier, there is a research gap on establishing the relationship between capacity optimization and contribution margin. Many production managers have made mistakes in the past for relating production to profit, fixed cost among other factors, but sidelining contribution, an important tool. This paper, therefore, targets policy makers in production management as well as cost accountant. The paper can also benefit business owners who intend to enhance their output levels.

g) Limitation of the Paper

The scope of this paper is limited to production management only. This means that it does not analyze how turnover and lead time can be improved.

Chapter Two

II. Literature Review

a) Introduction

This part reviews past papers which have analyzed the concept of production capacity optimization in relation to contribution. Both empirical and theoretical concepts will be analyzed.

b) Theoretical Review

Contribution can be defined as the difference between revenue and variable cost. From this definition, it is evident that contribution is a subset of cost volume analysis. Contribution helps production managers when they are making decisions on production of single and multiple products.

i. *Contribution as Part of CVP Model*

Cost-Volume Model Analysis is used in examining the relationship between changes in the volume of output and changes in profit. Profit in this case refers to realizable revenue after all costs have been deducted. Unlike fixed cots which do not change with the level of output, variable cots change with change in output level (Horngren, Data, & Rajan, 2012). This means that the higher the output level, the higher the level of variable cost and vice versa. This is the reason as to why attention should be given to contribution, as it takes into consideration only the variable cost. In addition to the above, contribution which is part of CVP plays a key role in strategic planning by assisting management in deciding the goal of an organization, as well as the main strategies which can be employed in achieving the set goals of an organization (Drury, 2008).The objective of alienating the elements of CVP such as contribution from the equation, or model is to help in identification of an optimal cost which will ensure that the company realizes its target profit and operates within the margin of safety.

According to Edo and Denis (2015), in order to determine optimal production level using contribution as factor of CVP, the various costs in production must be identified. Typically, the costs incurred in manufacturing include; automation costs, outsourcing costs, and total quality management. This alienation of costs, will also be handy, especially if the subject firm is following the principle of differentiation as a strategy. For proper prediction, one must ensure that contribution and ideal optimal production levels are identified at an early phases of the cost life cycle (Elsiefy & Gammal, 2017). Through this, the profitability of all products, including new ones in the system and their features can be analyzed to ensure that the equation written is accurate. In essence, identification ensures that the typical production errors are eliminated, leaving room for only the errors which cannot be predicted using contribution and optimal output production model.

Contribution and production capacity have been proven to be one of the most useful model components in exploring business decisions and situations. This is due to the fact that these components obliges managers to appreciate and understand how costs and revenues vary with changes in the output levels, hence making the realizable revenue and profit thereof predictable (Goertzen, 2017). In essence, by focusing on the contribution and production capacity,

© 2019 Global Journals

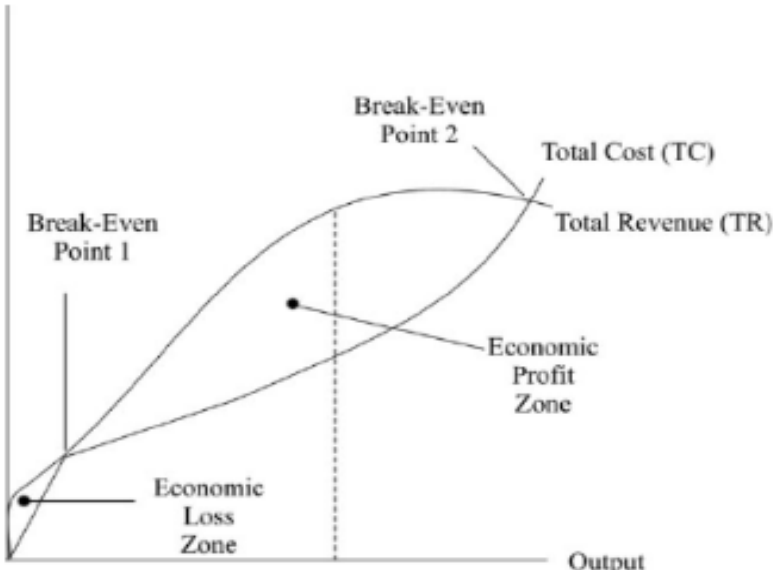
production mangers are able to understand the interrelationship between cost, output and revenue realizable. An assumption which is made in this case is that the firm or the production department is able to make a commitment to hold the various forms of capacity for at least one full period of operations.

This model also helps in identifying inventories which can be carried forward. This t means that the production managers will be able to plan for the current and future production schedules (Greshko & Kharabara, 2017). While variable costs may be very significant due to their varying nature, fixed cost are occasionally insignificant, as they are properly planned and provided for.

c) Empirical Review

i. *The Economist's Model*

Horngren, Datar, and Rajan(2012) believe that in focusing at contribution as a factor of production capacity, the production managers or planner must take into consideration the diminishing marginal utility. Research done in the past has proven that diminishing marginal productivity and contribution tends to have the same curves. Just like the total revenue increases the proportionate output, contribution also affect the proportionate output levels. Based on the predictable or planned output, one is able to plan the production capacity. This is due to the fact that the adverse effects on variable costs outweighs the benefits accrued by the revenue realizable out of the output. The figure below summarizes the economist's model.



Source: Greshko & Kharabara (2017):p.117

Figure 1: Graph of Economic Profit Zone

ii. *The Accountant's Model*

In accountant's model, it is assumed that there is a constant variable cost and selling price per unit which are used in setting the desirable or optimum production capacity. This, therefore, means that there is linear relationship between optimal production level or production capacity and contribution (Hilton, Maha, & Selto, 2014). The result is a single break-even point, which is unlike the economist's model. It is, however, worth noting that the economists view has proven to be more practical to many reduction managers, due to its assumption of a non-linear total cost or production.

d) Conclusion

From the above analysis, it is possible to conclude that the concept of influence of contribution on production capacity has not been analyzed in depth. This is due to the fact that professionals have contradicting ideas and evidences on how these two factors of CVP behave in a production equation.

Chapter Three

III. Research Methodology

a) Introduction

This chapter focuses on the approach that will be used to conduct the research and also a brief description of material to be used. In every research, it is imperative to have a research methodology section which illustrates the steps involved in conducting the study. These steps should include research participants, instruments, procedures, data analysis and limitations.

© 2019 Global Journals

The rationale is that another researcher should be able to replicate the study accurately by going through this part. The participants section involves subjects that were used in the analysis. How they are expected to affect the study will also mentioned. This will be clearly stated, including the rationale of picking them.

b) Participants

Participants in this case refer to the various people whose input will be required in conducting this research. The project will seek to sample the views of 81 companies in Michigan City. The view will be sampled by collecting the views of cost accountants and production managers. While collecting the required data, high levels of ethical standards was upheld, such that information collected through email will remain confidential. Some of the specific participants that this project will involve are as follows:

Table 3.1: Summary of Participants in the Study

Participants	Role
Cost Accountants	Data of on the current production equations
Business Owners/ Company Directors	Information on how they use contribution to optimize their expected earnings
Production Managers	Data on the current production trends

c) Materials

The main materials used include special design questionnaires. Questionnaires were sent through email to the owners of the company as well as employees. It is, however, important to note that some of the owners of the enterprises were not competent enough to fill the questionnaires and send back via email. For such people, oral questions through phone calls were used in order to get the desired data. This was done in order to ensure utmost accuracy of the data collected. It is however, worth to note that a greater percentage of the data, was collected through emails.

d) Variables

Horngren, Datar, and Rajan (2012) defines variables as parameters which are affected or not affected by factors within a given equation. There are two main variables namely dependent and independent variables. Dependent variables vary with change in independent variables, while independent remains constant with change in other parameter. Dependent variable in this case is contribution, while production capacity or else optimal production levels is the independent variable. In this case the equation of the problem is as follows:

$Y = a + bX_1 + U$, where;

a= y- intercept

b= co-efficient of X_1

X_1 = the independent variable

U= the error term

e) Study Population and Sample Size

As had been stated earlier, the research sampled views of 81companies within the city of Michigan, while taking into consideration the main objective of the research question. According to Horngren, Datar, and Rajan (2012), population study is the most suitable, since all the elements of the population stands a chance of being a representative of the sample. The target population for this study will be companies which use CVP analysis in the production equation, within United States. Calculation of the sample size has been done as follows:

$$\frac{Z^2 * (p) * (1-p)}{d^2}$$

Z = Z is the SD at 1.96 confidence level

p = the estimated target population measured at (0.5)

d^2= Statistical significance level at 0.1%

If no determined estimate for the target population proportion assumed to have desired characteristics, 50% should be adopted (Horngren, Datar & Rajan (2012). It is estimated that the number of companies using CVP in Michigan is 161, hence the sample to be studied is 81. This can also be calculated using the above formula as follows:

Given the following;

Z-Score = 1.96

P = 0.3

Margin of error = ±5%

Confidence interval = 0.05

Sample size therefore =

$$\frac{1.96^2 * (0.3) * (1-0.3)}{0.1^2}$$

= 81 companies

The sample companies will be 81 drawn from respondents within Michigan, giving a provision of 10% over and above the desired sample in size, in the event of non-response on some of the respondents in the sample size.

f) Data Analysis procedure

Upon completion of data collection, cleansing of the data followed before commencement of the data using various statistical tools. Data collection as well as

© 2019 Global Journals

analysis took a period of two months. Data was then analyzed using SPSS software.

Chapter Four

IV. Data Analysis

a) Introduction

This chapter presents findings of the analysis of this study which was done for a period of two moths and in 81 companies. These findings are presented thematically based on the hypothesis of the study. Both quantitative and qualitative results of the analysis from the data collected from this study were done. Quantitative findings were analyzed by the use of parametric and non-parametric statistical inferential methods and data has been presented using three strategies including exploratory analysis, descriptive analysis, and correlation analysis. Qualitative data was analyzed thematically using content analysis by categorization, summarization, and comparison of the study findings. Data is presented in text, charts and histograms as per each hypothesis.

b) Response Rate

The study sampled 73 companies, which is 90% of the 81 companies which were targeted. Sampling focused on companies which employ CVP analysis in their production planning and execution.The questionnaires were administered through email. The survey was carried out in a period of two months which was ample enough for all the respondents to be reached and reply. This explains the 90% response rate experienced, from the sample size identified.

c) Trend on Contribution and Optimal Production Capacity

Since hypothesis of the study involved studying of Cost Volume Profit, focusing on its main factors which are contribution and optimal production levels or else production capacity, it was deemed important for the descriptive on contribution as variable to be analysed. The results were as follows:

Table 4.1: Extent of respondent's application of Contribution in Production Capacity Determination.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	5	6.85	6.85	6.85
	Low	13	17.81	17.81	24.66
	Medium	20	27.40	27.40	52.06
	High	28	38.36	38.36	90.42
	Always	7	9.58	9.58	100.0
	Total	73.0	100.0	100.0	

Table 4.1 above displays the extent to which the respondents are using contribution in determination of production capacity in their respective companies. A majority of them reported high involvement (38.36%) with those having never involved with it being the least at 6.85%. The research also sought to analyse the frequency of application of contribution in determination of production capacity. The results was as follows:

Table 4.2: Frequency of Employing Contribution on Determining Production Capacity

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 - 4 weeks ago	3	4.11	4.11	4.11
	5 - 12 weeks ago	15	20.55	20.55	24.66
	13 - 52 weeks ago	51	69.86	69.86	94.52
	More than a year ago	4	5.48	5.48	100.0
	Total	73	100	100	

This being part of financial accounting, there are a number of standards which must be adhered to. It was an interest of the research paper to analyse the levels of adherence to these standards. The results showed that the level of adherence for International Accounting Standards (IAS) was 51%, followed by adherence to

© 2019 Global Journals

GAAP at 23% and lastly IFRS at 26%. In valuing the inventories, the accountants take into consideration the Net Book Value (NBV).This was mainly due to the practices of book keeping employed by these companies. This can be analysed as follows:

Table 4.3: Main standards of reference in CVP Analysis

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	IFRS	19	26	26	26
	IAS	37	51	51	77
	GAAP	17	23	23	100
	Total	73	100.0	100.0	

Chapter Five

V. Discussion

a) Descriptive

As had been stated earlier, the research realized a commendable response rate of 90% from the sample size of 81companies which were identified. Chi-square tests conducted on the data gave values which were not significant. All the respondents employed CVP analysis in production. This is despite the fact that not all respondents used it in their production management. The distribution was actually normal with higher percentage between those employing CVP analysis and those not employing it being zero to 10. A normal distribution ensure that that the whole process of conducting research is simple (Goertzen, 2017). The same normality was observed in terms of seeking for responses on application of variable costs to predict revenue.

A significant number of respondents were aware of contribution as a component to CVP. 80% of the emails agreed that there is a close relationship between production capacity and contribution as a factor of CVP. This further affected the opinions availability on fixed cost as well as valuation of inventories on the market value. In essence, there was biasness towards contribution to the already stated reason.

b) Inferential

i. *T-test Results*

For the period t-test analyses, it was found out that, there was a significant difference in the preferred scores depending on the experience of the respondents. In fact, it was found out that the scores decrease with low experience in the field of production management. On further analysis, the paired t-test was conducted for each gender individually since it was found in the descriptive statistics that each company changed in different ways. This is an indication that although there was an overall significant difference in the contribution scores, this overall difference could be attributed to the significant changes in the scores of experience.

ii. *ANOVA Results*

As for ANOVA results, it was found that the overall preference on contribution as a means of determining the level of production had a significant score. Depending on the type of preferred methods and factor of evaluation used is significant enough to change the scores. Just as it was found in t-test, the level of experience had contributed to appreciation of contribution as a preferable factor for determining the optimal production levels.

Chi-Square Test.

Chi-Square Test

The-chi square test represents a useful method, which is used in comparing experimentally obtained results, with those which would be theoretically expected on the subject. This this measure has been used in measuring the divergence of the observed and expected frequencies. It is very obvious from the study which has been conducted that this measure has helped in establishing the divergence between theory and fact. Theoretically, it is expected that companies base their production on the level if contribution. The result from the research however, has proven otherwise. The divergence is 30% as is gotten from the chi-square test.

Chapter Six

VI. Conclusion and Recommendations

a) Conclusion

Based on the previous analysis, it is possible to conclude that contribution is acritical factor in determining the level of production. This is due to the fact that it focuses on variable cost, which is a cost that changes with the output level. More than 80% of the respondents confirmed that contribution as a factor of CVP analysis is the main factor for determining production capacity. There search therefore accepts the null hypothesis. The respondents noted that production level as well as profitability levels are key factors

© 2019 Global Journals

influencing the going concern of a company, hence should be treated with the deserving weights.

b) Recommendations

Based on the above conclusion, this research makes the following recommendations:

i) Contribution should be included as a key consideration in developing full costing for developing optimal production level.
ii) The current system, which takes fixed cost as the main factor of determining production capacity should be reviewed.
iii) Whenever assumptions are made, it is advisable that a sensitivity analysis be performed to determine whether and/ or the assumptions affects the production level decisions.
iv) When coming up with an equation for production, it is advisable to identify the various cost drivers and then incorporate them in to the formulation of the model. This will ensure that a more realistic results are realized.
v) A further research be conducted on this topic.

Abbreviations

Abbreviation	Meaning
CVP	Cost Volume Profit
NBV	Net Book Value
IFRS	International Financial Reporting Standards
GAAP	Generally Accepted Accounting Principles

References Références Referencias

1. Choo, F. & Tan, K.B. (2011). An income statement approach for cost volume profit (CVP) analysis by using a company's CVP model. Journal of Accounting & Finance 11(4), 23-26.
2. Coram, Mock & Monroe (2011). Financial analysts' evaluation of enhanced disclosure of non-financial performance indicators. *The British Accounting Review*, *43*87-101.
3. Drury, C. (2008). Management and cost Accounting (7th Ed.). Andover, Hampshire:
4. Edo, C, & Denis, S (2015).Beyond Budgeting', *FIP: Journal Of Finance And Law, Vol 3, Iss 1, Pp 113-120 (2015)*, 1, p. 113, Directory of Open Access Journals.
5. Elsiefy, E., & ElGammal, W. (2017).The Effect of Using Fair Value Accounting on Fundamental Analysis: Some Evidence from the Emerging Economies. *Journal of Developing Areas*, *51*(3), 103-121.
6. Goertzen, M. J. (2017). Chapter 3: Introduction to Quantitative Research and Data. *Library Technology Reports*, *53*(4), 12–18.
7. Greshko, R., & Kharabara, V. (2017).The Stages of Establishment and Development of Financial Management. *USV Annals of Economics & Public Administration*, *17*(1), 112-117.
8. Hass, S. C. (2017).Lessons from the Rearview Mirror of Financial Education. *Journal of Financial Service Professionals*, *71*(2), 7-11.
9. Hilton, W. R., Mahar, W. M., & Selto, H. F. (2014). Cost Management Strategies for Business. Decisions. USA: Irwin McGraw-Hill Inc.
10. Horngren C.T., Datar, S.M., & Rajan, M. (2012). Cost Accounting; A Managerial Emphasis, 14th ed.New Jersey: Pearson Education Inc.
11. Hanna, S. D., & Kyoung Tae, K. (2016).Household ratio guidelines for the amount of investments. *Financial Services Review*, *25*(3), 263-277.
12. Sherif, V. (2018). Evaluating Preexisting Qualitative Research Data for Secondary Analysis. *Forum: Qualitative Social Research*, *19*(2), 26.

© 2019 Global Journals