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Improving Production Planning and Control through the Application of Breakeven Analysis in Manufacturing Firms in Nigeria

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ABSTRACT
The study was on Improving Production Planning and Control through the Application of Breakeven Analysis in Manufacturing Firms in Nigeria. Manufacturing in Nigeria cannot be left out of the global connectivity in technological breakthrough of our time. Ideals, policies and procedures for achieving global connectivity very often lead to business effectiveness and efficiency. In production planning and control, tools for achieving success are varied. Today manufacturing firms in Nigeria are almost extinct. Poor planning and control of productive systems arise and make operations less efficient. Manufacturing firms fail as a result of operational inefficiency and ineffectiveness. The problem of the study therefore was the incessant closure of manufacturing firms in Enugu urban, Nigeria. The study sought to ascertain the practical application of breakeven analysis in production planning and control; to determine the relationship between the application of breakeven analysis in production planning and control and the frequency or rate of meeting due dates; to ascertain the relationship between the application of breakeven analysis in production planning and control and profit generation and to ascertain the relationship between the application of breakeven analysis and the generation of scrap in manufacturing firms. The study was conducted using the survey approach. The area of study was Enugu Urban, Nigeria; the idea of choosing Enugu Urban being the growing clusters of firms or industrial parks in urban areas in Nigeria. Two sources of data were utilised in the study: they included primary and secondary sources. The primary sources were personal interview and the administration of questionnaire to the CEOs or managers in-charge of production planning and control in the affected firms. Out of a population of 300 manufacturing firms including block industries, 171 firms were sampled. The sample size of 171 was chosen after applying the Taro Yamane formula for the determination of adequate sample size. Out of 171 firms sampled 150 firms returned the questionnaire accurately filled; that gave 88 percent response rate. The close-ended questionnaire was utilised. The validity of the instrument was tested using content analysis and the result was good. The reliability was tested using the Cronbach's alpha reliability coefficient. It yielded a reliability co-efficient of 0.82 which was also good. The data were analysed using frequency tables, and simple percentages. The hypotheses were tested using Chi-square test of independence and the contingency table. It was found that a significant relationship existed between application of breakeven analysis and scrap generation; that breakeven analysis could be applied in production planning and control to improve on due dates, profit and to reduce scrap generation. It was concluded among others that the application of breakeven analysis was more likely to lead to efficiency, profit generation, scarp reduction and meeting of due dates. It was recommended that beakeven analysis should be taught in secondary schools and that it should be applied in the short run by manufacturing firms; and that block industries should be more conscious in the application of breakeven analysis in production planning and control.
Keywords: Breakeven Analysis, Production Planning and Control, Global Connectivity, Efficiency.

1. Introduction

We live in the era of great change. In just a few decades we have witnessed the transition from an industrial nation – based resource-oriented economy to a global, networked knowledge intensive economy. Kelly (2005:22) informs that corporations haven been powerful catalysts for change; opening markets, promoting privatisation and globalising goods, services and production processes. As more of the world has adopted market mechanism to promote wealth creation, millions of people have gained access to new products as well as technology, information and ideals. The new economic opportunities have improved the quality of life for many. It has however brought both

invited and uninvited consequences as Crown (2006:355) puts it, 'if global connectivity is the technological breakthrough of our decade, then the outburst is just beginning'.

Manufacturing in Nigeria cannot be left out of this global connectivity in terms of technologies, ideals, policies and procedures for achieving business effectiveness and efficiency. In production and operations management, the task of production planning and control is primary; the tools for achieving it varied. The success story of any manufacturing starts with the success of the production planning and control function. Imaga (2003:244) describes production planning and control as the factory's nervous system. Production planning entails the forecasting of demand and adjustment for defective units (Orga, 2006: 104), while production control, as Imaga (2003: 244) puts, details what assembled products to make and when, and out of what parts. The end result of production control according to Ejiofor (1989:111) is the production of an operations schedule. No doubt the function of production planning and control is not a mean task, more so in Nigeria.

Nigeria's economic growth has slowly but steadily moved from an agrarian one to a petrol-dollar economy. The discovery of oil in Oloibiri in 1956 after half a century of exploration and the dire consequences of under development are clear. Little attention is presently paid to the real sector of the economy and entrepreneurs concentrate in the services sector which has few hope or chance of employment. Nigeria has been turned into a transit route and dumping ground for manufactured goods (Shola, 2010:6). The above is indicative of the fact that government has been carried away by the windfall in the oil sector to design programmes for sustainable development in the non oil sectors. The fact that oil is an exhaustible and non-renewable resource imposes duty on government at all levels to support development of the real or manufacturing sector. Igbo (2005:11) warns that less than 15 percent of the gross domestic product comes from non-oil sources and less than 9 percent comes from the manufacturing sector.

The picture, no doubt is gloomy for Nigeria because any economy not hinged on the real sector has prepared for collapse. The few manufacturing firms in Nigeria still grapple with their own inefficiency due to unintended internal environmental problems of poor and inaccurate decisions resulting from poor planning and control of men and other resources of the enterprise. Egui (2000:8) asserts that development starts from the convention of the resource owner to plan productive activities to ensure control and a system without adequate control measures is bound to fail. Production planning and control tools abound. Though details differ depending on the size and type of enterprise, the very essence and need for production efficiency, high quality products, optimal allocation of resources and competitive pricing remain same. Orga (2006; 104) emphasises that the products, the units, time and other resources require control to ensure that deviations are detected and corrective action taken. He further states that in the management of production, basic tools are required to ensure proper control and resource scheduling which include linear programming, transportation methods, cost-volume-profit analysis and queuing theory.

An aspect of cost-volume-profit analysis called breakeven analysis has proved a needful tool in production planning and control. Breakeven analysis which is a process for determining both the naira and units of production at which there will be no profit, no loss, has found considerable application in firms all over the world. The not- for-profit organisations, service firms and manufacturing firms alike, utilise the tool in taking decisions. The soundness of technical and indeed all production planning and control decisions, in the short-run, is determined to a large extent by the manner the tool of breakeven analysis is employed. In the study, the application of breakeven analysis as practised in the manufacturing sector in Enugu Urban, Enugu State was examined.

1.1 Statement of Problem

As Schumpeter (2001:7) puts it "capital and output growth depends on the entrepreneur, the quality of performance of the entrepreneur determines whether capital would grow rapidly or slowly and whether the growth involves innovation where new products and production techniques are developed. The implication of the above statement is that the difference in the economic growth rates of countries (or companies) of the world is largely due to the quality of entrepreneur in the countries (or companies), the development of technical and analytical skills create growth potentials in micro, small and medium scale enterprises (Shola, 2010:8).

Conscious development in the industrial or manufacturing sector of the economy began with the promulgation and the subsequent amendment of the Indigenisation Decree in 1987 and the introduction of the Privatisation and Commercialisation Decree in 1988, 1989 and 1995; the structural adjustment programme of 1986 became a turning point. Nigeria began to look inwards, industrial centres were established and apprenticeship programmes

inaugurated. The world economic forum report of 2006 ranked Nigeria as 88 out of 117 countries in its global competitiveness indicators (Shola, 2010:10).

The foregoing efforts have not produced the desired result. Nigeria is predominantly a poor nation, productivity has dropped significantly and many industries have closed shop. Retrenchment of workers has been the order of the day, and government jobs and politics seem to be the only succour left for an average Nigerian. The main problem of the study was the incessant closure of manufacturing firms in Enugu urban. The study addressed the above problem with the hope of finding solutions using manufacturing firms in Enugu Urban.

1.2 Objectives of the Study

The major objective of the study was to investigate the possibility of improving production planning and control through the application of breakeven analysis and to determine the applicability of breakeven analysis in the production planning and control of manufacturing firms in Enugu Urban in order to curb the rate of closure of manufacturing firms in Enugu Urban. The sub-objectives were:

(i) to determine the relationship between the application of breakeven analysis in production planning and control and the profitability of the manufacturing firms in Enugu Urban.

(ii) to determine the relationship between the application of breakeven analysis in production planning and control and the frequency or rate of meeting of schedules of the manufacturing firms in Enugu Urban.

(iii) to determine the relationship between application of breakeven analysis in production planning and control and the frequency of generation of scraps in manufacturing firms in Enugu Urban .

1.3 Research Hypotheses

The followings hypotheses guided the study:

Ho_1: There is no relationship between the application of breakeven analysis in production planning and control and profitability of manufacturing firms in Enugu Urban

Ho_2: There is no relationship between the application of breakeven analysis in production planning and control and meeting of schedules/due dates in manufacturing firms in Enugu Urban

Ho_3: There is no relationship between the application of breakeven analysis in production planning and control and the frequency of generation of scraps in manufacturing firms in Enugu Urban

2. Review of Related Literature

2.1 Conceptual Framework of the Study

Man is rationally economic and will undertake only those activities that will give benefit over and above his initial investment or seed money. The production manager in carrying out the planning and control of production is therefore guided.

The dynamism of the world production and market poses a duty on the planning and control of production to be up-to- date with modern methods. According to Levin et al (1999: 99-100) “the pattern of consumer demand has been altered partly as a result of a widespread and basic reappraisal of one’s economic stability and growth in the light of recent experience and future expectations. Sequel to that, Dissenberry and Modigilani postulate that an individual’s present consumption is a function of his past previous peak income (Dissenberry, 1999:25). Friedman (1957:123) however postulates that present consumption is greatly determined by one’s perception of his “permanent” income. The two theories have the same basic interpretation that consumption is dependent on income. This further means that the production manager aware that goods are not produced until sold and that sales depend on competitiveness of prices should strive to organise the production activities to ensure competitive pricing. To do this, the first three functions of efficiency, quality and optimal allocation have been assumed.

The production planning and control manager’s philosophy or thinking determines what efforts he channels in the production process. The production manager is an entrepreneur and. entrepreneurs have reasons for engaging in entrepreneurship, in this case planning production, Penrose (1959) as quoted in Udu, Udu and Eze (2008:33) propounded the Resource Based theory which holds that entrepreneurship is facilitated where there are capabilities and resources which the manager either possesses or can acquire and deploy in sustainable manner. The implication

of the above theory is that a vision of the resource potentials will lead to choice of a particular industry. Jimngang (2004) identifies resources to include physical resources, reportorial resources, organisational resources, intellectual and human resources and technological resources.

The sociological theory sees entrepreneurship as a function of social and cultural or religious factors (Udu, Udu, and Eze 2008:35). No doubt intentions and means come through interaction. Another theory, the psychological theory sees strength of will to achieve power as responsible for efforts made to improve one's fortunes. The Economic theory of production states that the reasons for becoming entrepreneurs or owners of factors of production are purely economic. The theory accepts resource-based theory and emphasises the principles of supply and demand. The supply of managerial services is a function of need of the society.

The economic theory of production was considered appropriate for the study. The need to improve production planning and control is a function of the need for the output the process would engender. If there is no hope of the demand for the products of the manufacturing firm, the need for the improvement of schedule dates, forecasts of demand and invariably forecasts of resources to achieve the demand will be irrelevant. The overall relationship between cost-volume - profit is fundamental to the objectives and the survival of the firm (Levin etal, 1999:60).

The concept of production planning and control is better understood if the root of the word is extracted. Production planning and control is an important task of the production unit of any manufacturing firm. Production as Imaga (2003:29) puts it, "is any process or procedure designed as well as organised to transform a set of components into a specified set of output elements. Thus the production system in the scientific sense consists of inputs, the transforming processes, outputs and elements of control and /or monitoring devices." The above definition specifies the key function of production management which is to optimise the production system. Optimising simply means achieving the best possible in a given situation. It also implies production control and implementation, modification of production policies and according to Imaga (2003: 30) modification of designs with the help of the production engineer based on feedback from the system and varying circumstances. The production management function, which is the function that ensures judicious application of scarce resources to produce anything of value (Iwu, 1998: 106), is an interdependent exercise with interacting components or departments

Production planning and control is a function which can safely be separated into production planning and production control. Production planning according to Ejiofor (1989:214) is the activity of forecasting the future demand for each product and translating this forecast to the requirement of inputs so that the products can be produced without disruption to meet demand. Orga (200:6) defines production control as part of production management function which involves the design and implementation of a certain schedule showing activities to be performed on certain products at given intervals. Clearly, the result of production control is the production of operations schedule which shows time, activity and the product on which operation should be performed.

The foregoing suggests that production planning and control is a function which is separable into planning and control. However, the objectives of the two are the same – to ensure efficiency in operation and meeting of demand dates or schedules. It is also clear that the task is a primary task because failure at the stage of planning or control nullifies the objective of production management. It is also indicative that the production and operations system must do it. In inventory, quality, wages and salary administration, plant layout, and materials handling/scheduling, planning and control must be applied. The tools for planning and control of production activities range from network analysis, simulation, linear programming queuing theory, probability theory, to breakeven theory or analysis.

Wanted dates or schedules are usually set and met using tools for analysis of past data and forecasting of the future. The breakeven analysis according to Nwachukwu (2004:266-267), is the production volume at which a firm makes neither profit nor loss. According to Imaga (2003:500) breakeven point shows the relationship between output/throughput on one hand and cost on the other hand. Revenue is also usually plotted alongside cost to determine the naira value at breakeven point. Imaga (2003:501) in a two-system analysis finds that in systems dependent upon greater fixed costs, great output must be achieved before a breakeven point is reached but that rewards are likely to occur at a greater rate. The value of the fixed cost therefore greatly determines the breakeven point or how soon the breakeven point could be reached.

Also necessary in the analysis we are following is forecasting. Imaga and Dibua (2004:3) identify two types of forecasting – business forecasting and technical forecasting, and define business forecasting as "the predication of market demands, prices of material, and costs of conversions, cost and availability of labour and allied issues". It should be noted that business decisions are greatly influenced by forecasts which are in form of extrapolation of past

data levels into the future. Linear and mathematical relationships are adopted. Most business forecasts are short term forecasts. The breakeven analysis is an example of short term forecast tool.

In the short-term, fixed and variable costs behaviour is adopted. The analysis of breakeven also assumes that prices are constant and variable cost factor varies proportionately with output. A single product firm is also envisaged in most of the analyses. Stock is expected to synchronise with sales; fixed costs, at the activity level envisaged, remains fixed, however analysis could be done with multi-product firms (Ndaliman and Bala, 2007).

2.2 Applicability of Breakeven Analysis in Manufacturing Firms

Breakeven point is the production volume or naira sales at which a firm is neither making profit nor loss. Nwachukwu (2004: 2657) however sees breakeven point as a point in production volume where neither profit nor loss is made. This definition somehow did not recognise that breakeven can occur and be related to naira value of production. Beyond the breakeven point, profit results from further sales. Typically, the costs and revenue are graphed on the vertical axis while units of sales or level of activity is graphed along the horizontal axis (Anyigbo, 1999:123).

The question very often is the practical application of breakeven point. Ndaliman and Bala (2007), in a study on block industry, however discovered that "sales revenue and total cost were not linear, two or more breakeven points were found to exist, some costs fall under both fixed and variable portions and that beyond certain optimal production levels sales revenue decreases and total cost also increases." The above is usually not expected in a breakeven chart usually adapted to plan and control production. The implication of the study according to Ndaliman and Bala (2007:61) is that practical realities exist and breakeven point (analysis) should be used with caution. In practice, some conditions exist that are not taken into account by the breakeven analysis. They include:

(i) semi-variable costs do exist among the cost components and must be considered for appropriate estimation (apportionment) into both fixed and variable costs.(Adediran, 2001:4-10);

(ii) the sales revenue and total costs are not always liner in production as normally assumed in the theory (Amrine , Ritcher and Hulley, 1983:342-344);

(iii) two or more breakeven points may exist for a particular industry depending on a number of factors (Benyman and Nobe, 1999:26-37);

(iv) Economic factors such as demand, supply and prices do affect the breakeven point and profitability (Pollack,1995:43-46); and

(v) Actual sales determine the profit margin achieved by an enterprise (Powers, 1987:35-41).

The above five contributors, though looked at each of the realities, revealed that the use of breakeven analysis is a matter for absolute regard for the firm since within the industry differences exist. It should be noted also that manufacturing firms hardly operate or manufacture single product. It therefore means that the application of the breakeven analysis in a multi-product firm may be difficult if nor impossible. However a mix of the products if established may be necessary; the cost and revenue apportionment is therefore important to determine the real characteristic behaviour of costs and revenues accruing to the firm before applying the breakeven analysis

The breakeven analysis is an aspect of cost- volume- profit analysis. It deals with the relationships between volumes of output, costs and profit. Nweze (1992:46) assures that "these relationships are critical to almost all major decisions and to the evaluation of most alternative cost-volume structure". At a selected price, sales revenue will increase steadily as volume increases. Revenue from a product can be estimated by multiplying the number of units to be sold by the unit price. The total sales revenue is the sum of the revenue from the products being offered. This model -total sales -revenue ignores incomes from non operating sources such as investments or sales of assets. Nweze (1992) insists that the costs of a firm are multiple and include materials and labour which go directly into a unit of output while others are incurred in more generalised activities such as marketing of goods, the salaries of maintenance men, and fees for members of board of directors.

Constant BEP, lower BEP and higher BEP are achievable based on conscious manipulation of the revenue and cost and volume variables in the cost – volume – profit analysis. Single or multiple product firms can adopt breakeven analysis in production planning and control. It is however easier either algebraically or graphically to manipulate

profit, volume and costs where the company is a single product firm. For multiple products, where the company has more than one line of products, and can change the price or cost of line of products, without necessarily changing others, Levin (1999:50) believes that most realistic problems have to be solved with multiple product approach to cost-volume – profit relationships.

Other areas of application of the breakeven model (C-V-P).exist and these include equipment selection, make – or-buy decision, advertising programmes, choice of channels of distribution, and plant additions. These decisions are the essence of planning and control. No doubt product planning and control in manufacturing firms is a necessity and can be facilitated and improved upon by breakeven analysis.

2.3 Profit Levels, Breakeven Analysis and Production Planning and Control

The rational economic man theory was adopted in the study. It therefore presupposes that manufacturing firms would do only those things that would bring profit and improved return on investment. Idemobi (2008:139) contends "although much regard has been given to competition as a cause of business failure, it must be noted that an efficiently managed existing business can weather any storm raised by a new competitor". The above contention implies that despite the raging competition nationally and globally, efficiently run businesses including manufacturing firms will survive. Efficiency is achieved if the least cost of operation is incurred in the utilisation of resources in the production of the highest volume of output or throughput possible. Efficiency cannot be achieved if efforts are not made to reduce cost and address constraints in production.

Adediran (2001:9) posits that a strong positive relationship exists between profit levels and proper application of tools of production planning and control. He (Adediran) suggests in the short run breakeven analysis and other tools requiring short term factor analysis are appropriate but warns that breakeven should be best used as a preliminary tool in project appraisal. Powers (1987:40) concludes that efficiency is synonymous with profit attainment and therefore any thing that ensures efficiency, ensures profit growth

In our local Nigerian example, Ndaliman and Bala (2007:58) suggest that block industry operators because of the short pay back period of the investment and rising profit levels when efficiently managed using breakeven tool of analysis should adopt breakeven theory frequently. Although they found slight variation in the principles of breakeven theory between the two industries studied, they emphasise adequate production planning and control using breakeven theory. Corroborating the study by Ndaliman and Bala (2007), Onwuka (2009) suggests a thorough application of breakeven analysis to improve profit levels of small manufacturing firms. She (Onwuka) further states that the mathematical involvement was little, while the advantage was enormous. Most managers are too afraid of figures; they would find this method a safe- landing.

Efficiency in production planning and control presupposes an adoption of cost effective approach to planning and control. In production management, planning and control function is instituted to guide against chaos and to answer the question, 'what if'? The wellness of a firm depends on the firm's ability to anticipate and tackle emergencies. Profit, which is the excess of revenue over expenditure or cost, is the major objective of the economic man. Ulo (2010: 19) asserts that specialised programming is a very important tool in the physical distribution of products that are homogenous so as to minimise cost". Minimisation of cost invariably increases profit. Ulo's assertion implies that a well thought out planning and control of even a distribution programme assures cost minimisation which means profit improvement.

Application of breakeven analysis aims at determining that volume of production at which no profit no loss occurs. However the model can be used to determine profit levels at gross and after tax. Orga (2006: 163) emphasises that breakeven analysis is applied to determine profitability of a given course of action as compared with alternatives to predict just the profit, which gives the desired breakeven point in units and naira".

Profit, breakeven points and the production planning and control function are related in the sense that an appropriate determination of breakeven point will result in proper planning and control. Proper planning and control will in turn result in high returns in the form of profit -either before or after tax. Therefore, strictly a well applied breakeven analysis will result in an improved planning and control and an improved planning and control will result in greater levels of profit in the firm, other things being equal.

2.4 Breakeven Analysis, Production Planning and Control, Scheduled Dates and Scrap Generation

The essence of production planning and control is to meet scheduled dates and ensure no collision. Where scheduled dates are met, customers have confidence in the organisation and will be prepared for a repeat business. Emphasising

the need for planning, Ilesanmi (2010:37) informs that 'the convenient way of planning product and technical feasibility is to draw an activity chart which shows the type of work that is to be involved in each activity and the sequence of work that individual will do'. No doubt, activity chart is useful for assessing the time and for further thinking through the problems that are likely to occur. When problems are identified and forestalled in the future the meeting of due dates is sure. Due dates are invariably the result of production planning and control and breakeven analysis as Iwu (1998:92) puts it "conveniently helps in production planning and control.'

In setting production rate as personnel schedules, the schedules may be faced with either great rigidity or reasonable flexibility depending on the nature of processes and the productive system design. According Buffa (1980:300), "to obtain flexibility one needs: (a) to schedule the workforce to work shorter or longer hours (including overtime) or (b) the entire line can be rebalanced to achieve a somewhat higher or lower rate of input". The above arrangement is possible if a rate is fairly fixed either on monthly or hourly basis. The aggregate plan or master schedule should be followed which must take into account the relative costliness of changing production rates through changing hours, using overtime and rebalancing (hiring or laying off). The constraint under which the schedule must operate is therefore achieved by the aggregate plan. The basic tool of aggregate plan, the breakeven analysis, specifies based on the forecast, the quality of the resource to use to achieve the target or objective. (Ndaliman and Bala, 2007)..

To create effective systems of planning and control, managers should understand the dependency relationship. In intermittent system, extreme complexities of plan, scheduling and control are faced. These according to Buffa (1980:342), are maximum when the production system must cope with different levels of dependency of items in assembly, subassembly and component manufacture. Basic qualities are there to be planed at each stage and the use of breakeven analysis as a short period approach becomes necessary. It should be realised that the nature of requirements planning for primary products is substantially different from that for parts and components of the primary products, Buffa (1980:343)

The demand for parts and components are not only in terms of quantity needed but also on the timing of supply (Moodie and Novotny, (1997:648-671). Where interlocking or dependent structure is in use, the implication here is that the components must be ready for use at a precise time. Where they are too late, production of primary items will be disrupted and delayed. If too early, in- process inventory costs will increase. Where orders must be recovered in time, due- date oriented rule is favoured for the flow of orders instead of shortest operations time (SOT) rule of flow of production. Jones and James (2003) however insist that optimising the product value stream instead of asset, and activity one would identify ways of eliminating interface wastes". They further identified interface waste as over production inventories, defects, waiting, excess transportation, excess movement and excess processing. The identification of the whole value stream for a given product (both the flow of orders upstream and the flow of products downstream) ensures optimising is not done in isolation and that waste is not created. Managing the product stream from raw material to customer requires lean manufacturing, the objective of which is to eliminate waste through reconfiguring operations into continuous flow cells linked by levelled pull systems. The expected gain apart from avoidance of waste include as Shook and Rother (1999:14) put it, "defect- free products, on time delivery, big reductions in inventories, and freed- up people, machine, and space".

Tauchi Ohno in World War II implemented the lean production after over 20 years of experimentation in Toyota of Japan. The basic principles of lean thinking are: (i) specify value from the stand point of the end customer; (ii) identify the value stream for each product family; (iii) link value creating steps so the product can flow; (iv) enable your customers to pull what they need; (v) manage toward perfection- where every action and asset creation has value (James and Jones, 2005:11). Defining value, from the stand point of the end customer, results in realisation that only tiny fraction of actions and the time actually create value. Schedule, the core function of production control therefore should gear towards utilisation of appropriate tool of breakeven analysis in determining at each stage what quantity and values are needful. Imai (1997) believes that product batching should be converted to Just- in- time (J.I.T) or Lean Production system if the task of quality improvement could be achieved. Imai (1997) further advises that conversion of batch to J.I.T/ / Lean Production as the most urgent task for any manufacturing company today in order to survive in the next millennium. Truly the prediction of Imail (1997) has come true as companies of the 21st century who fail to have a product value approach are groaning under the weight of waste and inefficiency. Time therefore is an important element in product and adequate production planning and control mechanism premised on sound analysis based on the breakeven has the key to efficiency, waste avoidance and new time dimension for the manufacturing firm.

Scraps are often a common feature in manufacturing operations. They become more pronounced where workers are not trained and plans not made to forestall the occurrence. Ndaliman and Bala (2007) however do not find any link between breakeven analyses and scrap generation in block industries. They however accept that scraps are more likely to be generated in a firm where production is not planned to avoid waste.

3. Methodology

The study was conducted using the survey approach. The area of study was Enugu Urban; the idea of choosing Enugu Urban being the growing clusters of firms or industrial parks in urban areas in Nigeria. Two sources of data were utilised in the study: they included primary and secondary sources. The primary sources were personal interview and the administration of questionnaire to the CEOs or managers in-charge of production planning and control in the affected firms. Out of a population of 300 manufacturing firms including block industries, 171 firms were sampled. The sample size of 171 was chosen after applying the Taro Yamane formula for the determination of adequate sample size. Out of 171 firms sampled 150 firms returned the questionnaire and accurately filled. That gave 88 percent response rate. The close-ended questionnaire was utilised. The validity of the instrument was tested using content analysis and the result was good. The reliability was tested using the Cronbach alpha reliability test. It yielded a reliability co-efficient of 0.82 which was also good. The data were analysed using frequency tables, and simple percentages. The hypotheses were tested using Chi-square test of independence and the contingency table.

4. Presentation of Data

Table 4.1: Distribution of Respondents on the Application of B/E Analysis

Use of BEP in PPC	**Frequency**	**%**
Use of Break even Analysis	100	67
No use of BEP	50	33
Total	**150**	**100**

Source: Survey Data, 2011

Table 4.1 shows that 100 (67 percent) of the manufacturing firms apply B/.E analysis in production planning and control, while 50 (33 percent) do not apply B/.E analysis in production planning and control.

Table 4.2: Application of B.E Analysis and the Level of Profit of the Firms

Application of B.E	**LEVELS of Profit**									**%**
	1 No.	**%**	**2 No.**	**%**	**3 No.**	**%**	**4 No.**	**%**	**Total**	
Use B.E	12	60	35	70	46	77	7	35	100	67
Do not use BE	8	40	15	30	14	23	13	65	50	33
Total	**20**	**100**	**50**	**100**	**60**	**100**	**20**	**100**	**150**	**100**

Source: Survey Data, 2011

Table 4.2 indicates that out of 20 manufacturing firms who are in the level 1 of profit rating, 12 (60 percent) of them apply B./E analysis in production planning and control, while 8 of them, i.e. 40 percent do not apply B/.E analysis in production planning and control. At the level 2 of profit rating, out of 50 firms in this bracket, 35 of then, i.e. 70 percent apply B./E analysis, while the balance do not. At level 3 profit rating, of the 60 firms, 46 (77 percent) apply B/E analysis, while 15 (30 percent) do not. At level 4 of the profit rating, out of 20 firms in this bracket, 7 (35 percent) apply B/E analysis, while 13 (65 percent) do not apply.

Table 4.3: Distribution of Respondents (Firms) on Application of B/.E Analysis and Frequency in Meeting Schedules (Due Dates)

Application of B.E	Frequency of Meeting of Schedules									&
	LEVELS									
	1 No.	%	2 No.	%	3 No.	%	4 No.	%	Total	
Use B.E	15	75	31	62	46	77	8	40	100	67
Do not use BE	5	25	19	38	14	23	12	60	50	33
Total	**20**	**100**	**50**	**100**	**60**	**100**	**20**	**100**	**150**	**100**

Source: Survey Data, 2011

Table 4.3 shows that of the 20 firms within the highest (i.e. level 1) frequency bracket of meeting due dates, 15(75 percent) use B/E analysis, while 5(25 percent) do not use BE analysis. At level 2, out of the 50 firms, 31 (62 percent) use B/E analysis, while 19 (38 percent) do not use B./E analysis in production planning and control. At level 3, of the 60 firms, 46 (77 percent) use B.E analysis, while 14 (23 percent) do not use B.E analysis. At level 4 (the least level), of the 20 firms, 8(4) percent) use B.E analysis, while 12 (60 percent) do not use.

Table 4.4: Distribution of Respondents (Firms) on the Application of B./E Analysis and Frequency of Generation of Scrap (Waste) in Production Planning and Control Levels of Frequency Scrap of Generation

Application of B.E	Frequency of Scrap Generation									%
	LEVELS									
	1 No.	%	2 No.	%	3 No.	%	4 No.	%	Total	
Use B.E	8	40	10	50	36	72	46	77	100	67
Do not use BE	12	60	10	50	14	28	14	23	50	33
Total	**20**	**100**	**20**	**100**	**60**	**100**	**60**	**100**	**150**	**100**

Source: Survey Data, 2011

Table 4.4 shows that out of 20 firms with high unsatisfactory levels of scrap generation (Level 1), 8 (40 percent) of them apply B./E analysis, while 12 (60 percent) do not apply B/.E in production planning and control. At the fair level (level 2), out of 20 firms in the bracket equal number of 10 (50 percent) apply or do not apply B./E analysis in production planning and control. At the good level (level 3), out of 50 firms, 36 (72 percent) apply B./E analysis, while 14 (28 percent) do not. At the outstanding level (level 4) out of the 60 firms, 46 (77 percent) apply B/.E analysis, while 14 (23 percent) do not apply B./E analysis in production planning and control.

5. Test of Hypotheses

The hypothesis that there is no relationship between application of B/.E analysis and profitability in production planning and control in manufacturing firms was tested using the chi-square test statistic. At 5 percent level of significance, the null hypothesis was rejected, and it was therefore concluded that there was a significant relationship between application of B/.E analysis in production planning and control and the level of profit of the firm. Profit was

found to be higher among firms that applied B.E analysis in production planning and control than those that did not apply B/E in production planning and control. The critical chi-square value of 7.815 was lower than the calculated chi-square value of 10.924 at alpha level of 5 percent and at 3 degrees of freedom.

The null hypothesis two was also rejected at 5 percent level of significance and degrees of freedom of 3. The hypothesis states that there is no relationship between the application of B./E analysis in production planning and control and the frequency of meeting of due dates (schedules) in manufacturing firms. It was concluded that a relationship exists between application of B./E analysis in production planning and control and the frequency of meeting of due rates (schedules). The calculated value of 9.901 was more than the critical value of 7.85. In fact it was established that the application of B/.E analysis in production planning and control resulted in higher frequency of meeting due dates (schedules) in the manufacturing firms surveyed.

On Hypothesis three, the null states that there is no relationship between the application of B./E analysis in production planning and control and the frequency of generation of scraps in manufacturing firms in Enugu Urban. At 5 percent level of significance and at 3 degrees of freedom, the critical value of 7.815 was found to be lower than the calculated value of 9.540. The null hypothesis was rejected and it was concluded that there is a significant relationship between the application of B./E analysis in production planning and control in manufacturing firms and the production of scraps. More scraps were likely in a manufacturing firm which does not apply B/.E analysis.

Table 5.1: Analysis of Hypotheses at 5 percent alpha level

Hypotheses	X^2 Critical	X^2 Computed	Decision
Ho_1	7.815	10.924	Reject Ho
Ho_2	7.815	9.901	Reject Ho
Ho_3	7.815	9.54	Reject Ho

Source: Research Data, 2011

6. Discussion of Findings

It was found that B/.E analysis could be applied in production planning and control of manufacturing firms even where it is a multi-product firm. This is in line with the studies of Ndaliman and Bala (2007) and the assertion of Levin et al (1999) and Nweze (1992). These studies indicate that B./E or C.V.P is applicable in many situations. It was found that the application of B./E analysis in production planning and control enhances profitability of the firm, this again is in accordance with Pollack (1995) and Ndaliman and Bala (2007) and Powers (1987). The third finding is that a relationship exists between the application of B/.E analysis in production planning and control and the frequency with which due dates/schedules are met by the firm. This is in agreement with Ilesanmi (2010) who informs that the convenient way of planning production and technical feasibility is to draw activity chart and that activity charts forestall problems connected with due dates. The fourth finding is that a relationship exists between the application of B/.E analysis in production planning and control and the production of scraps. This is however not in agreement with Ndalima and Bala (2007) who found no link between scraps and application of B./E analysis in production planning and control. It should however be noted that their study was on Block Industries and that the present study indicated that block industries undertake B.E analysis unconsciously. In fact in the study none of the block industries had a conscious approach to B/.E analysis. Many of the CEOs were however found to be semi-literate entrepreneurs with one clerk and block moulders. Many of the block moulders were found to be casual workers. Scrap was found to result from lack of or poor planning in production and scheduling.

7. Conclusions and Recommendations

The results and findings suggest that multi- product firms can apply breakeven analysis to great advantage. The single product firms can easily apply breakeven analysis in production planning and control. Manufacturing firms in

Enugu Urban that apply breakeven analysis in production planning and control were more likely to be profitable. Also such firms were more likely to meet due dates/schedules. Manufacturing firms that apply breakeven analysis in production planning and control were less likely to generate scraps. Most block industries do not consciously engage in breakeven analysis as a production planning and control tool.

Based on the above conclusions, it was recommended as follows:

1. That manufacturing firms in the short run, should apply breakeven analysis as a tool for production planning and control.
2. That block industries should consciously apply breakeven analysis to reduce the level of scraps resulting from unplanned production and control.
3. That the breakeven analysis should be applied to increase the chances of meeting due dates/schedules in manufacturing firms in Enugu Urban.
4. That the breakeven analysis should be applied in production planning and control to improve the profitability of the manufacturing firms in Enugu urban.
5. That the teaching of production planning and control tools, especially breakeven analysis or cost -volume-profit analysis should be introduced in secondary schools under the subject – Business studies. The early introduction of breakeven analysis in schools would encourage entrepreneurs to use it later in business.
6. A study should be carried out to investigate the best method or criterion for evaluating scrap. It would help in determining whether frequency of generation, weight/mass generated, cost of scrap generated, etc would be appropriate in relation to the industry. A relative measure should be determined and applied in all situations.
7. To better appreciate the function of production planning and control, the function should be divided into production planning and production control; they should be treated as specific and different functions by medium and large manufacturing firms.

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