Effect of Capacity Planning On Performance in Nigeria Brewing Industry: Southeast Perspective

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Abstract: Effect of capacity planning on performance in the Nigerian brewing industry: Southeastern Perspective. This study was designed to find out the effect of capacity planning on performance in the selected Nigerian brewing industry. The study population comprised of 745 staff of selected brewing firms in South-South Nigeria with a derived sample size of 509. Two research questions were raised and two hypotheses were formulated and tested at 0.05 significant level. The questionnaire was adequately validated by experts and the instrument had a reliability coefficient of 0.93. This was then used to obtain data from the respondent. Data analysis was carried out using z-test of population proportions and spearman’s rank correlation. The study findings revealed that capacity planning enhance performance also that there is a positive relationship between capacity requirement planning and materials requirement planning. Recommendations were also made along that lines that management should continue to encourage this synergy between capacity and material requirements planning to boost performance in these brewing firms.

Keywords: Entrepreneurship, Creativity, Innovation, Performance, Economic Growth, Diversification

1. Introduction
Capacity Planning has enhanced the performance of the brewing industry in Nigeria right from 1946 when Nigerian Breweries Limited set up the First Brewery in Nigeria (Nigerian Breweries PLC, 2011). The direction has been to increase the number of breweries. Guinness Nigeria Plc set up a Brewery in Lagos in 1963. The magnitude is now five breweries located at Ikeja, Oqba, Benin, Jos and Aba (Guinness Nigeria Plc; 2011). Capacity has continued to be the production capability of a facility in terms of the inputs, throughput and outputs.

In 1989, the Federal Government policy of using local inputs such as sorghum and corn instead of milled barley negatively affected a lot of the breweries. Both Nigerian Breweries Plc and Guinness Nigeria Plc depended on the assistance of the Parent Companies. The Brewing Industry in Nigeria have relied on capacity planning for meeting the increased demand for beer, stout and malt products through Demand Forecasting and Capacity Requirements Planning (Guinness Nigeria Plc, 2011; Nigerian Breweries Plc, 2011).

Capacity building has followed capacity planning in the creation of the enabling environment with appropriate policy and legal frameworks, institutional development including community development (of women in particular). Human Resource Development and strengthening of managerial systems, adding that, UNDP recognizes that capacity building is a long-term, continuing process, in which all stakeholders participate (ministries, local authorities, non-governmental organizations and water user groups, professional associations, academics and other (citation: UNDP). Capacity building is very necessary for capacity planning. Planning is deciding in advance what is to be done, when, where, how and whom it is to be done. In that it bridges the gap from where we are to where we want to go in any business building and performance. It is continuous, periodic managerial activities and reduces uncertainty. Capacity is the production capability of a facility and it is measured in terms of inputs, throughput and outputs. Manufacturing is that aspect of industry in which products, waste products and services are produced (UNDP, 2012). By 1992, capacity building became a central concept in Agenda 21 and in other United Nations Conference on Environmental and Development
The WSSD recommended that GEF resources be used to provide financial resources to developing countries to meet their capacity needs for training, technical knowhow and strengthening national institutions. Capacity Building is, however, not limited to international aid work. More recently, the term is being used by governments to transform community and industry approaches to social and environmental problems.

2. Statement of the Problem
There is difficulty in determining the extent to which capacity planning enhanced performance in the brewing firms in Southeastern Nigeria from the inception of brewing industry in Nigeria in 1946 to date. This problem leads to other challenges in ascertaining the relationship between capacity requirements planning and material requirements planning and the extent to which capacity planning sustains organizations’ competitive advantage. The capacity planning problem of a brewing firm would make it have less output in the form of Lager beer, Stout and malt than is demanded by the present and potential customers. One of the numerous ways of solving this problem is to build a new brewery firm. This is a long term decision that will raise new issues of plant location, plant layout, selection and design of the product, selection of equipments and processes, production design of items processed, and job design. If these issues are not properly handled, performance will be negatively affected. This is why the topic on capacity planning and performance in the Nigerian brewing industry

3. Objectives of the study
1) To evaluate capacity planning and performance in the brewing industry in Southeastern Nigeria.
2) To assess capacity and materials requirements planning in the brewing industry in Southeastern Nigeria.

4. Research questions
i. To what extent does capacity planning enhances performance in the brewing industry in South Eastern Nigeria?
ii. What is the nature of the relationship between capacity requirements planning and material requirements planning?

5. Hypotheses
(i) Capacity planning to a large extent does not enhances performance in the brewing industry in South Eastern Nigeria.
(ii) There is no significant relationship between capacity requirements planning and material requirements planning.

6. Literature Review
Capacity Planning is the process of determining the production capacity needed by an organization to meet changing demands for its products. In the context of capacity planning, ‘design capacity’ is the maximum amount of work that an organization is capable of completing in a given period, ‘effective capacity’ is the maximum amount of work that an organization is capable of completing in a given period due to constraints such as quality problems, delays, material handling, etc. Capacity planning is also used in business computing as a synonym for Capacity Management.

Planning is necessary in all complex organizations. In the absence of planning, different work units may pursue the possibly conflicting objectives of their own (Sheu and Wacker, 2001). However, not all organizations are complex and thus heavy planning efforts are not always necessary. In simple settings, where specialization, action variety, and task interdependence are low, coordination can be achieved through rules and heuristics (Cyert and March, 1963). Capacity planning in the literature has been applied to the manufacturing industry. The Research Gap here is to determine the effect of capacity planning on the
Performance factors include: efficiency, effectiveness, productivity, profitability, solvency, leverage, activity and morale (Nwachukwu, 2004). Dictionary’s definition of efficiency as fitness or power to accomplish or success in accomplishing the purpose intended, adequate power, effectiveness, efficacy. Later on, it is pointed out that efficiency acquired a second meaning – the ratio between input and output, between effort and results, expenditure and income, cost and the resulting pleasure, this second meaning became current in Business and Economics, only since the beginning of the 20th Century. Still later on, influenced by the scientific management movement, efficiency was defined as the ratio of actual performance to the standard performance (Bell, 2006).

7. Conceptual Framework

Capacity Planning
Capacity Planning is the process of determining the production capacity needed by an organization to meet changing demands for its products (North Caroline State University, 2006). In the context of capacity planning, ‘design capacity’ is the maximum amount of work that an organization is capable of completing in a given period, ‘effective capacity’ is the maximum amount of work that an organization is capable of completing in a given period due to constraints such as quality problems, delays, material handling, etc. Capacity planning is also used in business computing as a synonym for Capacity Management (Gunther, 2007). Capacity planning is important because it makes the manufacturing organization to determine the production capability of the facility. This will enable the organization to have the appropriate throughput. By having the appropriate throughput, the production process will be properly ascertained. It will consist of the appropriate machinery, methods and maintenance (Vollmann, Berry, Whybark and Jacobs, 2005). Capacity planning also makes the organization to have the appropriate outputs. In a brewery, the output will be in hectar-litres of beer produced per month.

Capacity planning is the process of taking future decision today on the inputs, throughput and outputs to meet the production requirements in a manufacturing organization such as brewery. He pointed out that there is a hierarchy for the system linkages for the capacity planning modules and one of the items in the hierarchy is resource planning. It is linked directly to the sales and operations planning modules. It is the most highly aggregated and longest range planning decision Eguijie(2001). The master production schedule is the primary information source for rough-cut capacity planning. The rough-cut capacity planning stage is the next stage lower than the resource planning stage. For breweries using materials requirements planning to prepare detailed materials plans, a much more detailed capacity planning is possible with the capacity requirements planning (CRP) is the third stage lower than rough-cut capacity planning stage.

The Concept of Performance

Performance factors include: efficiency, effectiveness, productivity, profitability, solvency, leverage, activity and morale (Nwachukwu, 2004). While efficiency is concerned with measuring the ability of inputs to produce outputs, or relationship between performance and standard efficiency is concerned with the failure of inputs to achieve desired outputs, the gap between actual performance and expected, and between results and efforts (Abernathy and Townsend, 2005).

Apart from the efficiency another closely related performance variables is effectiveness. To be literally means to have effects, when we say that something is effective we mean that it has effects that we desired that we recognize as international in the design of the thing in question. When we say that a television set is effective we mean that it provides clear picture and reasonable reproduction of sounds. Such an example serves in this simple case in which the system under study has felt outcomes and the relevant observers are decided on what is intended to design and use. When the system under study has few outcomes and the relevant observers are decided on what is intended in design and user. When the system is more complex like in the case of a public enterprise, operationalisation becomes difficult. However, one public enterprise is more effective than another if: it has more chances of survival than the other; It meets its essential function or throughput than the other; it contributes more to the suprasystem than the other; and if it maximizes more than its benefits like profit subject to some constraints like taxes and other obligations than the other. Apart from efficiency and effectiveness another important performance variable is productivity (Nwachukwu, 2004).

Productivity has been defined as the measure of how well resources are brought together in organization and utilized for accomplishing a set of results. It is reaching the highest level of performance productivity in a public expenditure or resource. To operationalise productivity in a public enterprise the ratio of total output to total input in very handy. Total input is the naira value of all the factors of production for that year which include land, labour and capital. The limitation of this
method of operationalising productivity is that entrepreneurship or management which is the factor of production is difficult to quantify in monetary terms. Another limitation is that of public enterprises that render a service, it becomes difficult to quantify the output in monetary terms since the outputs are not tangible (Buffa and Sarin, 2007).

This measure of productivity has the advantage that it aggregates the effectiveness of the use of the factors of production of the public enterprise to produce goods and services. It draws attention to the fact that a good integration of resources physical and human will yield higher output of the public enterprises shown by the result of total output/total input being greater than 1 (Cohen and Zysman, 2007).

Another performance variable apart from productivity is profitability or the ability of the enterprise to make profit. Profit is the income or the difference between sales revenue and total cost. The profitability of enterprise is summarized in the valuation of that enterprise. Indeed the basic objective of measurement of profitability is to provide a valuation, the enterprise which will be a critical assessment of the worth of the investment. In effect, the value of an enterprise may be stated as being the present value of its future stream (Bell, 2006).

The profitability of a privatized or commercialized public enterprise can be operationalised by using profitability ratios. Profitability ratios are classified into two categories; ratios which express income as a percentage of sales, and, and ratios which express income as a yield associated with the employment of resources. For the purpose of the analysis of profitability, income is generally expressed as earnings before interest and tax (EBIT) in terms of profitability ratios.

8. Theoretical framework

There are various theoretical underpinnings about Capacity Planning theories such as ;Contingency or Situational Management Aggregate Planning Models, Capacity Planning Supply Chain Model, Capacity Mathematical Model, Capacity Planning and Utilization, Contingency theory of capacity planning and Capacity Planning Theory. However, the Capacity Planning Theory will be applied for this study because it deals with a procedural structuring of manufacturing processes towards effective performance.

Capacity Planning Theory

There is a classic dilemma in maintenance work. If the maintenance people are busy the place is not earning money. If they are not busy they are usually first on the redundancy list. Scheduling of maintenance work exists against a background of unusual breakdowns, which have to be accommodated in a hurry. The only 100% reliable way of managing this situation is to have spare capacity either through sub-contracting or through re-deploying maintenance personnel to other duties when not busy. This is very difficult unless routine scheduled maintenance predominates. Another problem is the lack of outline scheduling information (standard methods and times) for non-routine operations. A typical problem of this type of work measurement is the establishment of loose standards, which if used to drive incentive schemes gives rise to serious problems. As an aside: incentive schemes are no substitute for good supervision. However rule of thumb time estimates and Rough Cut Capacity Planning is possible. Skills are the usual resources that need to be scheduled, not plant. If Total Productive Maintenance is being utilized scheduling becomes simpler because a higher proportion of the work is scheduled rather than breakdown dominated (SM Thacker Associates, 2012).

9. Theories of Performance

Performance occupies a key interface between organization behaviour, strategy and international management. In organization behaviour the position of performance in the structural contingency theories and research studies was marginal.

Organization behaviour is at the leading edge in developing a more substantial understanding of performance. The structural contingency theory requires extensive revision. There are two major areas of revision. First, to account for the hidden impacts on performance in the national context of the firm. The hidden aspects include the roles of actor endowments (for example, raw materials), the institutions and the market characteristics (for example, size, homogeneity and speed of saturation). These hidden aspects impact on the performance of firms by creating a zone of manoeuvre. Firms have to be aware of the zone, yet can enroll elements in the context which reshape the zone. Second, it is important to be aware of the differences in approach between the practices of auditing performance within firms from the concepts and theories used in organization behaviour. Within firms of all kinds – public and private, commercial and custodial – there are extensive arrays of performance data covering very diverse aspects. The financial dimensions of the array are highly influential in constituting the recipe knowledge about strategic directions. The influence of accountancy on the everyday understanding of performance is significant, but
should be closely scrutinized. The aim is to develop a theory which links organizational learning to the selective usage of performance measures, in particular, to explain the role of intangible assets but undertaking these revisions is a major challenge (Sorge, 1991).

The limits of the structural contingency theory of performance are handled in two major revisions. First, to include the national context and second, to develop a procedural, learning theory of performance.

![Figure 1: System Theory of Performance](source)


10. Theories of Manufacturing

Manufacturing and national economies

Wealth and manufacturing theory

Wealth may be categorized into two types; namely: natural wealth and man-made wealth. Natural wealth is derived from crude materials, that is, materials occurring in the natural state such as mineral deposits in the earth’s crust and agricultural products. Natural wealth especially that based on mineral deposits is delectable. Also, wealth obtained from agricultural products without man-made inputs is unsustainable in modern times. Natural wealth is fate-dependent and its location can hardly be influenced by man. On the other hand, man-made wealth is one derived from refined or manufactured products, in which man exercises enormous control. This type of wealth is usually sustainable. In this case, the wealth usually is created by manufacturing (Ibhadode, 1993a).

Importance of Manufacturing to National Economies

Engineering manufacture is, undoubtedly, one of the most important sectors of industry. It provides machines of different purposes to the economy. The economic and industrial growth of a nation is largely dependent on the development of engineering industry. Food, clothing, shelter and all the benefits of civilization determine how well a people live. How well a people live depends on how much it produces is determined by its level of manufacturing activities (Ibhadode, 2006).
The global economy has become knowledge and technology-driven. While innovation and rapid technological changes are the reasons for unprecedented prosperity and growth in industrialized countries, many developing countries and countries with economies in transition are risking marginalization by being trapped in the technology-divide and investment gap. Research and development (R&D) and innovation-intensive products are increasingly driving world trade. According to a UNIDO report in 1998, high – and medium – technology products accounted for 63.6%. 67.8% and 53.8% of manufactured exports of world developed economics and developing economies respectively. Regrettably they accounted for only 12.7% of manufactured exports from Sub-Sahara African countries. This poses serious industrial and economic development challenges to the Sub-Saharan region (World Bank, 2008).

To prove further that manufacturing drives the economy, despite the endowment of large reserves of oil in the major oil producing countries, their GDP, per capita income, per capita value added in manufacturing and longevity are 3%, 14%, 7% and 28% respectively of those for the G7 countries. The contribution of manufacturing to the GDPs of the major oil producing countries is at about the same level as for the world’s 20 poorest countries (World Bank, 2008).

**The Manufacturing Sector in Nigeria**

The Nigerian economy is in a precarious state. The manufacturing sector seems to be hardest hit. While the mean contribution of manufacturing to GDP in the world’s 20 poorest countries was 9% in 2003, that of Nigeria was only 4%. Further, whereas the world’s 20 poorest countries had a mean per capita value added in manufacturing in 2003 of $22, Nigeria had only $16. The picture is even worse when Nigeria is compared with the 5 oil-producing nations.

The Manufacturers Association of Nigeria (MAN) gives the following as constraints to the manufacturing sector:

- Sector is highly importing dependent.
- Hampered by policy inconsistencies.
- Besieged with multiple taxation.
- Burdened with weak infrastructural base and ineffective public utilities.
- Tormented by acute funding problems, weak capital base as well as high cost of fund.
- Inundated with fake, counterfeit and substandard imported products.
- Burdened with poor sales partly as a result of low purchasing power of the citizenry.
- Bugged down with delay in clearing consignments due to existence of multiple inspection agencies at the ports.

This state of affairs is lamented! Engr. Charles Ugwu, President of MAN, has said that the manufacturing sector is ‘threatened with collapse due largely to deficiencies in infrastructure, lack of appropriate funding and other policy inconsistencies and frustrated implementation of otherwise well intentioned strategies’ he added that “the sector can make enormous contribution to the growth of Nigeria if the necessary drivers and vital investment in energy, petrochemicals and human capacity can be made to uplift the level of value – addition’ Furthermore, the Engineer advised that: “the federal Government must muster the courage to make the vital investments (in partnership with the private sector) that add value to our natural resources of crude oil, gas and solid minerals in a way that multiplies the national wealth so all Nigerians can share the prosperity within our reach. He summed up with the epigram: “Poverty has no place in Nigeria”. 
Capacity measurement definition
Capacity as a term is in directly aimed at the rates of output of the operations in question. The output is normally indicated through a rate which presents the amount of deliverables completed in a period of time. For a small pub, a fairly demonstrative measurement could be for instance drinks sold in a day. The actual output rate gives a mere indication of the daily result. In order to assess the rate further to determine the actual effectiveness, two capacity efficiency performance indicators are to be used. Those indicators alongside the formula are presented in the equation below:

\[ \text{Efficiency} = \frac{\text{Actual output}}{\text{Effective capacity}} \]
\[ \text{Utilization} = \frac{\text{Actual output}}{\text{Design capacity}} \]

The efficiency ratio expresses the give day output of the pub in correlation to the best possible daily rate. The effective capacity is a measure which the process was designed for, but which can be realistically expected as a result; while taking into consideration miscellaneous factors which keep the process reaching its peak due to their inevitability.. (Jacobs and Chase, 2008; Beamer, 2010)

Capacity decisions
By their nature, capacity decisions are generally strategic involving investments and therefore commitment in resources such as equipment, buildings and manpower. In light of this factor, capacity decisions affect greatly into a myriad of organizational functionality. These decisions have an enormous impact on the ability to meet the future demands for the goods an organization is offering. Costs are widely influenced by capacity decision as operating costs are larger when there are investments in resources. Additionally, the initial cost of the product is determined by the unit cost which is normally a direct derivation from the costs of the capacity used. Other areas which are affected are the ease of management; better capacity, easier to manage, and competitiveness of the company. Coming to the 21st century, globalization has added its share into the capacity decision mix by highlighting the importance as the markets and competitors are operating in a global scale and increasing the complexity. All these reasons emphasize the need to plan these crucial choices in advance. (Hope and Muhlemann, 1997; Beamer, 2010)

11. Methodology
A research design study used oral interviews, questionnaires and model adaptations that add more credence to this work. A sample size of 509 was derived from a population of 745 amongst four (4) brewing companies using the Taro Yamani formula.

In the oral interview schedule, there are five open-ended questions containing the research questions with a focus group discussion. The answers to the questions from the two schedules were content-analyzed. The first hypothesis was tested using the Z test of population proportions while the second hypothesis was tested using the Spearman’s rank correlation coefficient.

12. Data Analysis
A five point Likert-scale was used with values assigned ranging from 5(SA) to 1(SD) for positive responses and vice versa for negative responses. Table 2 gives the analysis of the responses related to the two objectives.

Table 2.1. The analysis of the responses related to the five objectives

<table>
<thead>
<tr>
<th>STATESMENTS</th>
<th>RESPONSES</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>SA</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td>1. Capacity planning to a large extent enhances the performance in the brewing sector in South Eastern Nigeria</td>
<td>F 300 40.5</td>
</tr>
<tr>
<td>2. There is a significant positive relationship between capacity requirements planning and materials requirements planning</td>
<td>F 304 41.0</td>
</tr>
<tr>
<td>3. Capacity planning to a large extent sustains the organization’s competitive position</td>
<td>F 302 40.8</td>
</tr>
<tr>
<td>4. There is a significant positive relationship between capacity building and capacity planning.</td>
<td>F 308 41.6</td>
</tr>
<tr>
<td>5. The steps towards developing capacity plan positively affected profitability in the brewing industry in the area studied</td>
<td>F 315 42.4</td>
</tr>
</tbody>
</table>

Source: Field Analysis, 2016
Table 2, shows the statements and the responses namely Strongly Agree (SA), Agree (A), Undecided (U), Disagree (D) and Strongly Disagree (SD). For the statement that capacity planning to a large extent enhances the performance in the brewing sector in South Eastern Nigeria, the responses were Strongly Agree, Agree, Undecided, Disagree and Strongly Disagree. They had frequencies of 300, 367, 23, 25 and 25 out of 740 respectively. These gave percentages to 3 decimal places of 40.541, 49.595, 3.108, 3.378 and 3.378 respectively.

For the statement that there is a significant positive relationship between capacity requirements planning and materials requirements planning, the responses were Strongly Agree, Agree, Undecided, Disagree and Strongly Disagree. They had frequencies of 304, 370, 22, 23 and 21 out of 740 respectively. These gave percentages of 41.081, 50.000, 2.473, 3.108 and 2.838 respectively.

For the statement that capacity planning to a large extent sustains the organizations competitive position, the responses were Strongly Agree, Agree, Undecided, Disagree and Strongly Disagree. They had frequencies of 302, 380, 20, 19 and 19 out of 740 respectively. These gave percentages of 40.811, 51.351, 2.703, 2.568 and 2.568 respectively.

For the statement that there is a significant positive relationship between capacity building and capacity planning, the responses were Strongly Agree, Agree, Undecided, Disagree and Strongly Disagree. They had frequencies of 308, 381, 17, 18 and 16 out of 740 respectively. These gave percentages of 41.622, 51.486, 2.432 and 2.162 respectively.

For the statement that the steps towards developing a capacity plan positively affected profitability in the brewing industry in the area studied, the responses were Strongly Agree, Agree, Undecided, Disagree and Strongly Disagree. They had frequencies of 315, 381, 14, 15 and 15 out of 740 respectively. These gave percentages of 42.568, 51.486, 1.892, 2.027 and 2.027 respectively.

Table 2.3 gives the analysis of the 12 steps towards developing a capacity plan that have positively affected profitability in the brewing industry in the area studied.

<table>
<thead>
<tr>
<th>s/n</th>
<th>The 12 steps</th>
<th>Frequency</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>To determine service level requirements</td>
<td>69</td>
<td>9.624</td>
</tr>
<tr>
<td>2</td>
<td>To define workloads</td>
<td>66</td>
<td>8.919</td>
</tr>
<tr>
<td>3</td>
<td>To determine the unit of work</td>
<td>65</td>
<td>8.784</td>
</tr>
<tr>
<td>4</td>
<td>To determine the service levels of each workload</td>
<td>64</td>
<td>8.649</td>
</tr>
<tr>
<td>5</td>
<td>To analyse the current system capacity</td>
<td>63</td>
<td>8.514</td>
</tr>
<tr>
<td>6</td>
<td>To measure service levels</td>
<td>62</td>
<td>8.378</td>
</tr>
<tr>
<td>7</td>
<td>To measure the overall resource usage</td>
<td>61</td>
<td>8.243</td>
</tr>
<tr>
<td>8</td>
<td>To measure the resource usage by workload</td>
<td>60</td>
<td>8.108</td>
</tr>
<tr>
<td>9</td>
<td>To identify the components of response time.</td>
<td>59</td>
<td>7.973</td>
</tr>
<tr>
<td>10</td>
<td>To plan for the future</td>
<td>58</td>
<td>7.838</td>
</tr>
<tr>
<td>11</td>
<td>To determine the future processing requirements</td>
<td>57</td>
<td>7.703</td>
</tr>
<tr>
<td>12</td>
<td>To plan the future system configuration</td>
<td>56</td>
<td>7.568</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>740</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Source: Field Work Analysis 2016

From Table 2.2, the 12 steps were to determine service level requirements, to define workloads, to determine the unit of work, to determine the service levels of each workload, to analyse the current system capacity, to measure service levels, to measure the overall resource usage, to measure the resource usage by workload, to identify the components of the response time, to plan for the future, to determine the future processing requirements and to plan the future system configuration. They had frequencies of 69, 66, 65, 64, 63, 62, 61, 60, 59, 58, 57 and 56 out of 740 respectively. These gave percentages of 9.324, 8.919, 8.784, 8.649, 8.514, 8.378, 8.243, 8.108, 7.973, 7.838, 7.703 and 7.568 respectively.
2.4 Relative Frequency Analysis

Table 2.3 shows the analysis of the responses opposite in meaning to the objectives.

Table 2.3: The analysis of the responses opposite in meaning to the objectives

<table>
<thead>
<tr>
<th>STATEMENTS</th>
<th>RESPONSES</th>
<th>X</th>
<th>SA</th>
<th>A</th>
<th>U</th>
<th>D</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Capacity planning to a little extent enhances the performance in the brewing sector in South Eastern Nigeria</td>
<td>F R.F</td>
<td>25</td>
<td>0.034</td>
<td>25</td>
<td>0.034</td>
<td>23</td>
<td>0.031</td>
</tr>
<tr>
<td>2. There is a significant negative relationship between capacity requirements planning and materials requirements planning</td>
<td>F R.F</td>
<td>21</td>
<td>0.028</td>
<td>23</td>
<td>0.031</td>
<td>22</td>
<td>0.030</td>
</tr>
<tr>
<td>3. Capacity planning to a low extent sustains the organization’s competitive position</td>
<td>F R.F</td>
<td>19</td>
<td>0.026</td>
<td>19</td>
<td>0.026</td>
<td>20</td>
<td>0.027</td>
</tr>
<tr>
<td>4. There is a negative correlation between capacity building and capacity planning.</td>
<td>F R.F</td>
<td>16</td>
<td>0.022</td>
<td>18</td>
<td>0.024</td>
<td>17</td>
<td>0.023</td>
</tr>
<tr>
<td>5. There are no steps towards developing capacity plan to improve the profitability in the brewing industry in the area studied</td>
<td>F R.F</td>
<td>15</td>
<td>0.020</td>
<td>15</td>
<td>0.020</td>
<td>14</td>
<td>0.019</td>
</tr>
</tbody>
</table>

Source: Fieldwork Analysis 2016

Table 2.3 shows the statements, the responses and the numbers and the relative frequencies which summed up to 1. For the statement that capacity planning to an appreciable extent enhances the performance in the brewing sector in South Eastern Nigeria, the responses were Strongly Agree, Agree, Undecided, Disagree and Strongly Disagree. They had frequencies of 25, 25, 23, 367 and 300 out of 740 respectively. These gave relative frequencies of 0.034, 0.034, 0.031, 0.496 and 0.405 respectively.

For the statement that there is a significant negative relationship between capacity requirements planning and materials requirements planning, the responses were Strongly Agree, Agree, Undecided, Disagree and Strongly Disagree. They had frequencies of 21, 23, 22, 370 and 304 out of 740 respectively. These gave relative frequencies of 0.028, 0.031, 0.30, 0.500 and 0.411 respectively.

For the statement that capacity planning to a low extent sustains the organization’s competitive position, the responses were Strongly Agree, Agree, Undecided, Disagree and Strongly Disagree. They had frequencies of 19, 19, 20, 380 and 302 out of 740. These gave relative frequencies of 0.026, 0.026, 0.027, 0.514 and 0.408 respectively.

For the statement that there is a negative correlation between capacity building and capacity planning, the responses were Strongly Agree, Agree, Undecided, Disagree and Strongly Disagree. They had frequencies of 16, 18, 17, 381 and 308 out of 740 respectively. These gave relative frequencies of 0.022, 0.024, 0.023, 0.575 and 0.416 respectively.

For the statement that there are no steps towards developing a capacity plan to improve the profitability in the brewing industry in the area studied, the responses were Strongly Agree, Agree, Undecided, Disagree and Strongly Disagree. They had frequencies of 15, 15, 14, 381 and 308 out of 740. These gave relative frequencies of 0.020, 0.020, 0.019, 0.515 and 0.426 respectively.

2.4. Analysis using the Coefficient of Variation

Table 2.4 shows the analysis of the other responses related to the first four objectives.

Table 2.4: The analysis of the other responses related to the first four objectives

<table>
<thead>
<tr>
<th>s/n</th>
<th>Statements</th>
<th>X</th>
<th>SA</th>
<th>A</th>
<th>U</th>
<th>D</th>
<th>SD</th>
<th>( \bar{X} )</th>
<th>S</th>
<th>( \frac{\bar{X}}{S} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Adding capacity in anticipation of an increase in demand increases the performance in the brewing sector in South Eastern Nigeria.</td>
<td>F</td>
<td>298</td>
<td>366</td>
<td>24</td>
<td>26</td>
<td>26</td>
<td>4.195</td>
<td>0.925</td>
<td>4.535</td>
</tr>
<tr>
<td>2</td>
<td>Adding capacity only after the organization is running at full capacity due to increase in demand increases the performance</td>
<td>F</td>
<td>26</td>
<td>26</td>
<td>24</td>
<td>366</td>
<td>298</td>
<td>1.805</td>
<td>0.962</td>
<td>1.979</td>
</tr>
</tbody>
</table>
in the brewing sector in South Eastern Nigeria.

Source: Fieldwork Analysis 2016

Table 2.4 given the statements, responses, sample mean, sample standard deviation and the coefficient of determination. For the statement that adding capacity in anticipation of an increase in demand increases the performance in the brewing sector in South Eastern Nigeria, the responses were Strongly Agree, Agree, Undecided, Disagree and Strongly Disagree. They had frequencies of 298, 366, 24, 26 and 26 out of 740 respectively. These gave a sample mean of 4.195, sample standard deviation of 0.925 and coefficient of variation of 4.535.

For the statement that adding capacity only after the organization is running at full capacity due to increase in demand increases the performance in the brewing sector in South Eastern Nigeria, the responses were Strongly Agree, Agree, Undecided, Disagree and Strongly Disagree. They had frequencies of 26, 26, 24, 366 and 298 out of 740 respectively. These gave a sample mean of 1.805, a sample standard deviation of 0.962 and a coefficient of determination of 1.979.

Hypothesis Testing

1. Capacity planning to a non appreciable extent enhanced the performance in the brewing industry in South Eastern Nigeria.

\[
Z = \frac{\bar{x} - P_o}{\sqrt{\left( P_o(1-P_o) \right) / n}}
\]

\[
Z = \frac{667 - 0.8}{740 \sqrt{(0.8)(1-0.8)}}
\]

\[
Z = \frac{\sqrt{740}(0.101351351)}{0.4}
\]

\[
Z = 6.892637062
\]

\[
Z = 6.893 \text{ to 3 decimal places}
\]

Source: The number of respondents that strongly agree or agree with the statement \(x\) is got from the questionnaires administered, \(n = 740\), \(P_o\), the prescribed proportion is 0.8 and the rest are calculated. From the Table above, it is shown that the calculated Z value which is 6.893 is greater than the table Z value which is 1.645. So the null hypothesis is rejected and the alternative hypothesis is accepted. So capacity planning to a large extent enhanced the performance in the brewing industry in South Eastern Nigeria.

Table 2.4 shows the computational details of the second hypothesis.

### Table 2.4: The computational details of the second hypothesis

<table>
<thead>
<tr>
<th>Year</th>
<th>Increase in capacity requirements planning</th>
<th>Rank</th>
<th>Increase in materials requirements planning</th>
<th>Rank</th>
<th>d</th>
<th>d²</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5</td>
<td>10</td>
<td>4.5</td>
<td>9</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>7.5</td>
<td>4</td>
<td>7.5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>5.5</td>
<td>3</td>
<td>5.5</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
4 2 2.5 2 2.5 0 0 
5 2 2.5 2 2.5 0 0 

\[ r_s = 1 - \frac{6 \sum d^2}{(n)(n-1)(n+1)} \]

\[ r_s = 1 - \frac{(6)(1)}{(5)(4)(6)} \]

\[ r_s = 1 - \frac{1}{20} = \frac{20}{20} - \frac{01}{20} = \frac{19}{20} \]

\[ r_s = 0.95 \]

Source: The increases in the capacity requirements planning and materials requirements planning are got from the questionnaires administered.

From Table 2.4, the Spearman’s rank correlation coefficient is 0.95 which is very close to 1, so the null hypothesis is rejected and the alternative hypothesis is accepted. So there is a significant positive relationship between capacity requirements planning and materials requirements planning.

Discussion of findings relating the indigenous capacity building to the first objective

It was found that there is a positive relationship between the indigenous capacity theory and the extent to which capacity planning enhances the performance in the brewing industry in South Eastern Nigeria. The sample mean is 4.508 which is greater than three. So the sample mean lies in the strongly agree part of the Likert scale continuum. The calculated Z value is 7.444 which is greater than the Table Z value at 95% confidence level. This shows that most of the respondents strongly agree with the statement.

Capacity Building

UNDP defined capacity building as the creation of an enabling environment with appropriate policy and legal framework, institutional development, including community participation (of women in particular), human resources development and strengthening of managerial systems, adding that, UNDP recognizes the capacity building is a long-term, continuing process, in which all stakeholders participate (ministries, local authorities, non-governmental organizations and water user groups, professional associations, academics and others). Furthermore, capacity building is the process of developing and strengthening the skills, instincts, abilities, processes and resources that organizations and communities need to survive, adapt, and thrive in the fast-changing world.

For organizations, capacity building may relate to almost any aspect of its work: improved governance, leadership, mission and strategy, administration (including human resources, financial management, and legal matters), program development and implementation, fundraising and income generation, diversity, partnerships, and collaboration, evaluation, advocacy and policy change, marketing, positioning, planning, etc. For individuals, capacity building may relate to leadership development, advocacy skills, training/speaking abilities, technical skills, organizing skills, and other areas of personal and professional development. Thus, capacity building is the elements that give fluidity, flexibility and functionality of a program/organization to adapt to changing needs of the population that is served (Linnell, 2003).

Discussion of findings of the relationship between the indigenous capacity building theory and the second objective

It was found that the indigenous capacity building theory has a positive correlation with the nature of the relationship between capacity requirements planning and materials requirements planning. The sample mean is 4.668. This shows that this mean score is in the strongly agree Likert scale continuum. The calculated Z value is 7.812 which is greater than the table Z value at 95% confidence level which is 1.645. This shows that most of respondents strongly agree with the statement.
Materials Requirement Planning (MRP) systems do not perform capacity planning, but they can make it easier to plan and stay within the productive capacity. Using the MRP system, a manager can select key productive units, such as the component facility for KBC, and have the computer print out a “load projection” for that unit. This is done by examining orders that are currently in production or planned. The result is a summary of the future activity of the productive unit that allows the manager to look forward in planning the capacity. (Capacity is “planned” by scheduling overtime, extra shifts, or subcontracting, for example.) (McClain and Thomas, 2007).

Some industries plan for very long periods of time, and therefore the plan must also include expected orders, which are ones that may materialize. These can be listed as planned orders in developing a load projection, but expected orders should be removed from the system after the projection is made, to maintain the system’s validity. This information can help management to see when a capacity problem is coming. Then overtime can be scheduled, orders can be rescheduled, capacity can be expanded (by hiring, for example), or other actions can be taken. In this manner, the detailed scheduling tool (MPR) feeds into the higher-level problem of capacity planning (Bufer, 2007).

In the intermediate run, managers face the aggregate production work-force planning problem. The load projection feeds back to that plan to indicate how subunits are faring within the overall aggregate plan. Prior to that, the aggregate plan was used as input to the MRP system in two ways. First, the work-force decisions set the capacity level shown as “current capacity”. Second, seasonal inventory plans lead to large lot sizes to build up the required seasonal inventory. The MRP system responds to this in the same way it responds to any demand. This two-way interaction allows the coordination of the aggregate plan and the detailed MRP (McClain and Thomas, 2007).

The planning horizon for the MRP system is chosen considering the capacity planning problem. The horizon should be longer than the cumulative lead time (total lead time for the product and its predecessors) for any product, as stated before. It should also be long enough to allow meaningful information to pass from the MRP system to the aggregate planner, with time for appropriate action. In a company with seasonal inventory, this means that several months would be a minimal planning horizon and a year would be better.

Finally, there is an interaction between the capacity in a unit and the lead time required. If there is excess capacity, planned lead time can be set close to actual production time, in that waiting time will be small. However, during peak demand periods when capacity is fully utilized, actual lead time will frequently be much larger than production time. This makes the selection of planned lead times difficult. A low planned lead time will occasionally be insufficient, and a large planned lead time will cause excessive work-in-process inventories. A manager may choose to invest in some additional capacity in the long run to avoid this problem. In addition, capacity usage (load) projections can be used to predict and plan for production bottlenecks and the associated increase in lead times (Unyimadu, 2007).

It is possible to use linear or integer programming methods to plan lead times and stay within capacities, including the potential use of overtime. This approach is not in common use today. The use of mathematical model is explored in several problems.

13. Discussion of findings

Research Objective One: To determine the extent to which capacity planning enhances performance in the brewing industry in South Eastern Nigeria

In the hypothesis of this objective, it was found that capacity planning to a large extent enhanced the performance in the brewing industry in South Eastern Nigeria. This finding was consistent to that of Davis and Mabert (2000) that in many brewing organisations, many capacity planning decisions are made in production planning that enhance organizational performance.

The alternative hypothesis was that capacity planning to a large extent enhanced the performance in the brewing industry in South Eastern Nigeria. The hypothesis was tested. The calculated Z value was 6.893 to 3 decimal places which was greater than the Table value of 1.645. So the Null hypothesis was rejected and the alternative hypothesis was accepted. This showed that capacity planning to a large extent enhanced the performance in the brewing industry in South Eastern Nigeria. This means that to a large extent as capacity planning increased, the performance of the organizations studied increased.

Results related to the Second Objective

Objective two: To ascertain the nature of relationship between capacity requirements and materials requirements planning
In the hypothesis of this objective, it was found that there was a significant positive relationship between capacity requirements planning and materials requirements planning. This finding was consistent with that of Berry et al (2004) that capacity requirements planning utilized time-phased materials plan information produced by the materials requirements plan.

The alternative hypothesis was that there was a significant positive relationship between capacity requirements planning and materials requirements planning. The hypothesis was tested. The Spearman’s rank correlation between capacity requirements planning and materials requirements planning was 0.95 which is very close to 1, so the null hypothesis was rejected and the alternative hypothesis was accepted. This showed that there was a very high positive correlation between capacity requirements planning and materials requirements planning. This meant that as one increased, the other increased at the same rate.

In the results related to the contingency theory and multi period capacity problem, it was found that contingency theory related to the nature of the positive relationship between capacity requirements planning and materials requirements planning.

14. Conclusion

The finding that capacity planning enhanced the performance in the brewing industry in South Eastern Nigeria implied that it made the brewing companies studied to achieve their organizational goals and objectives. It also made them to fulfill the promises the companies made to their numerous stakeholders. It positively affected the behaviour of the factory senior and junior staff towards striving to achieve the organizational goals and objectives.

The finding that there was a significant positive relationship between capacity requirements planning and materials requirements planning implied that there was a positive correlation between them. This meant that materials requirements planning which was a method of coordinating the detailed production plans could lead to an enhancement of capacity requirements planning which meant taking future decisions on the items needed for the production capability of the brewing facility. Both processes were multi stage ones which began with a master capacity schedule and master materials schedule. Both of them worked backwards to determine when and how the component would be needed.

15. Recommendations

It is recommended that the strategic and production managers of the brewing companies studied should be backed by these policies:
- That the use of capacity planning as a technique to improve all performance factors.
- Sustain the organizational distinctive competence standing using capacity planning.
- Exploit the advantages of the positive synergy between capacity planning and capacity building.
- Going through the 12 steps of capacity planning for proper functioning and a balanced score card.

16. Acknowledgements

The authors would like to thank, Edo University Management, especially, the Acting Vice Chancellor, Engr Prof. Emmanuel Aluyor, Deputy Vice Chancellor and Dean FAMAS. Also Management of Enugu State University of Science and Technology, Dean of Faculty and Head Department of Business Administration. We cannot also fail to acknowledge the Management and Staff of the Brewing industries visited. The various contributions of you all made towards completing this article was amazing. We are indeed grateful and glad to be part of this body.

17. References


