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PRODUCTION METHODS AND PRODUCT DEVELOPMENT IN BEVERAGE ORGANIZATIONS IN SOUTH-EAST NIGERIA

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Abstract

The study investigated production methods and product development in beverage organizations in South East Nigeria. It was conducted to find out the relationship between each of job-shop production, mass production, batch production and continuous production and product development. The study adopted the survey research design. Data were obtained from both primary and secondary sources. The purposive sampling technique was adopted in the study. The Cronbach Alpha statistic was used to obtain a value of 0.77 as the instrument reliability ratio. Data analysis was committed to descriptive statistics and correlation analysis. The analysis was enabled by the use of SPSS software. The results showed that Job-shop production improved product development, mass production enhanced product development; batch production significantly enhanced product development and continuous production significantly improved product development. It was concluded that production methods were great drivers of sound product development in beverage firms in South East Nigeria. The study recommends that management should always use job-shop production method and mass production method more effectively in the beverage firms. Also, management of beverage entities should increase their use of batch production method and continuous production methods for efficient product development in the enterprises.

Key Words: *Production methods, product development, beverage organizations.*

Introduction

Background of the Study

Production is definitely the primary assignment of any manufacturing concern. It is a fact that various production methods aid product development competence in manufacturing enterprises. Production is about creating goods and services. Managers have to decide on the

most efficient way of organizing production for their particular production. Therefore production method involves the way to manage how a firm's products or suppliers' products are produced. Each method is made up of a set of production steps. Production steps are the series of steps involved in producing a product.

Adam and Margaret (2020) opine that production methods involve the following: job production, where items are made individually and each item is finished before the next one starts. Designer dresses are made using job production method; batch production, where groups of items are made together. Each batch is finished before starting the next block of goods; for example, a baker first produces a batch of 50 white loaves. It is only after the production is completed that the baker starts 50 loaves of brown bread; flow production where identical, standardized items are produced on an assembly line. Most cars are mass produced in large factories. Using conveyor belts and expensive machinery such as robot arms, workers have specialized jobs, for instance fitting wheels.

Phillip (2019) opines that when considering a firm's manufacturing options, there are a number of production methods, with each offering its own unique set of benefits depending on product type and market size. Each business follows its own set of operation. So, it is essential to know the difference between various production methods to ensure that the organization is selecting the most suitable and most effective production method. It is also important to understand that while one production method may work the best for the firm's production needs today, a different method may be required to keep costs low and to reach a larger customer base. The most successful manufacturers realize the importance of flexibility with how their operating processes are designed as well as how easily their facility can adapt to potential failure changes.

Job-shop production is a very important type of production method examined in this study. Rachana (2017) opines that a job-shop is a type of manufacturing process structure where small batches of a variety of customs products are made. In the job-shop process flow, most of the products produced require a unique set-up and sequencing of processing steps. General purpose machines are suitable in job-shop because they are capable of performing many different types of operations and thus capable of producing a wide variety of products with small sizes. Machines which perform similar functions are grouped together. The jobs which are done in the shop are usually not in bulk but for small orders. The quantity of the product is good as compared to batch shop (Rehman, 2021). Mahmoud (2015) maintains that the quantity of product is high and there are some chances that some products may not be of good quality, but in the case of job-shop each product is made carefully and the quality of the product is high.

A very popular type of production is batch production. Pearson (2021) opines that batch production is a method whereby a group of identical products are produced simultaneously (rather than one at a time). It is up to manufacturer to decide how big the batch will be made. He maintained that each batch goes through the separate stages of the manufacturing process together, i.e. batch can't begin a stage, if the previous one is still within the part of the cycle. Each batch can be different, as manufacturers can decide to change the specifications from one group of products to the next. Perhaps, when it is necessary to change the colour or size of that particular group (depending on the preferences specified in a particular order).

Mass production is a critical type of production method covered in this study. Sharma (2019) asserts that mass production is the manufacturing of large quantities of standardized products, often using assembly lines or automation technology.

Mass production is also referred to as flow production, repetitive flow production, series production or serial production. He maintained that it is used to produce a large quantity of same product at a time that is stocked for sale. All machines and required equipment are arranged according to sequence of operations, termed as line arrangement/flow. This ensures very high rate of production. One line arrangement can produce one type of products, therefore a different line arrangement is needed for a different product.

Continuous production is yet another production method to be investigated in this study. Marique (2020) opines that continuous production system involves a continuous or almost physical flow of materials. He maintains that it makes use of special purpose machine and procedures standardized items in large quantities. The examples are petrochemical, cement, steel, sugar and fertilizer industries etc. The aim of the continuous manufacturing flow is to produce, or process materials uninterrupted.

Product method can be a strategic tool to boost product development. Product development is a concept that has attracted the attention of many research experts in business. New product development, according to Njoku (2017), is a series of steps that includes the conceptualization, design, development and marketing of newly created or newly rebranded goods or services. The objective of product development is to cultivate, maintain and increase a company‘s market share by satisfying consumer‘s demand.

In business therefore, new product development is the complete process of bringing a new product to market. Product development is described in the literature as the transformation of a market opportunity into a product available for sale, and it can be tangible (that is, something physical one can touch) or intangible (like a service, experience, or belief). A good understanding of customer needs and wants, the competitive environment and the nature of the market represent the top required factors for the success of a new product (Grembler and Hair, 2010). Cost, time and quality are the main variables; companies develop continuous practices and strategies to better satisfy the customer requirements and increase their market share by a regular development of new products. This study on production methods and product development in beverage firms in South East Nigeria is conducted to investigate how various production methods may add value to product development efforts of manufacturing entities. This is with a view to bridging research gaps while contributing to knowledge.

Statement of Problem

It is a contradiction that despite the roles production methods should play for the growth of product development in enterprises in South East Nigeria, there is still dearth of empirical studies in the area of production methods and product development. Most empirical studies accessed by the researcher in reputable journals and in the area of internal business environment did not investigate the link between production method and product development in beverage firms in South East Nigeria. For example, Nkemdilim, Immanuel and Olayinka (2020) investigated the impact of product development practices on the performance of new financial products and services through the analysis of ten in-depth case studies. They did not evaluate the relationships which this present study examines. Mbithi, Muturi and Rambo (2015) examined empirically the

effects of new product development strategy on company performance. They did not evaluate the relationships which this present study investigates.

Nwokah, Ugoji and Ofoegbu (2009) examined product development and corporate performance in the Nigerian brewing industry. They did not investigate the relationships which this present study examines. Madu (2016) determined the influence of production techniques and technological orientation on the performance of manufacturing industries in Nigeria. He did not examine the relationships which this present study investigates. None of them examined the relationships that are examined in this present study. They did not show how product development was enhanced by production method in manufacturing firms. It is based on the identified research gaps that the researcher is faced with the major problem of investigating production methods and product development in beverage firms in South East Nigeria. The major objective of this study is to assess production methods and product development in beverage firms in South East Nigeria. The specific objectives include to;

i. find the relationship between job-shop production and product development.
ii. examine the relationship between mass production and product development.
iii. assess the relationship between batch production and product development.
iv. investigate the relationship between continuous production and product development.

Research Questions

Based on the objectives of the study, the researcher developed the following research questions:

i. What is the relationship between job-shop production and product development?
ii. How does mass production affect product development?
iii. What is the relationship between batch production and product development?
iv. How does continuous production affect product development?

Hypotheses

Based on the research questions, the researcher developed the following hypotheses:

H01: There is no significant relationship between job-shop production and product development.
H02: Mass production does not significantly influence product development.
H03: There is no significant relationship between batches
H04: Continuous production does not significantly influence production and product development.

Scope of the Study

This section consists of geographical scope, content scope and unit scope.

Geographical Scope: The study will concentrate on Nigerian Bottling Company Plc, Owerri; the Nigerian Breweries Plc, Enugu and Golden Guinea Plc, Umuahia and Guiness Plc, Aba. Enugu is the capital city of Enugu State, the Headquarters of the defunct Eastern Region. Owerri is the capital of Imo State, the Eastern Heartland while Umuahia is a capital city in Abia State. Aba is the commercial hub of Abia State. The geographical scope includes Owerri, Enugu, Aba and Nnewi

Content Scope: For the content scope, the researcher will examine the relationship between each of job-shop production, mass production, batch production, continuous production method and product development.

Unit scope: The unit scope will include all the functional units of the study firms. They include Accounts/Finance, Human Resources, Marketing, Production, etc. The study will not include cleaners, security men and labourers because the nature of their jobs does not suggest that they are the right people to respond to the research questions that will guide this proposed study.

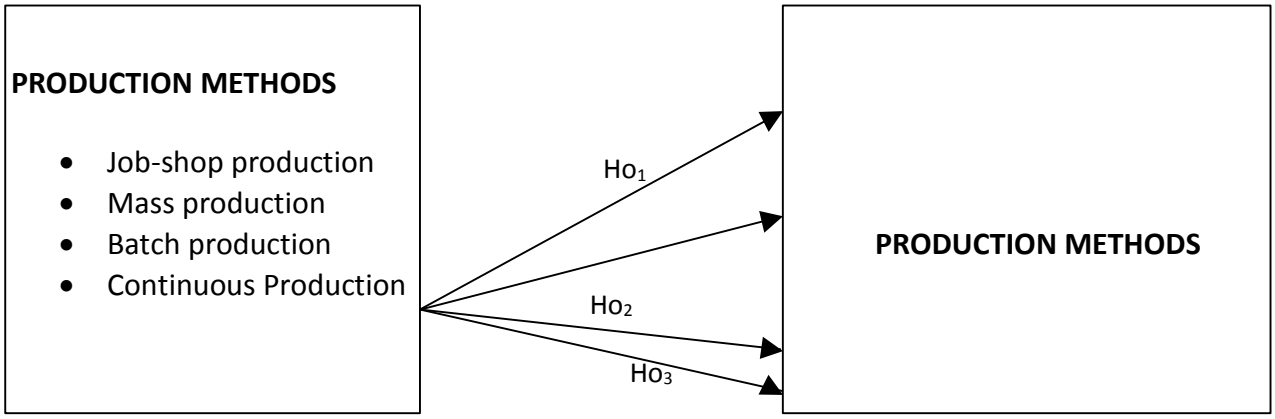
Review of Related Literature

Related literatures were reviewed on production methods and product development. This section comprises conceptual, theoretical and empirical reviews.

Conceptual Review

The study adopts the following operational conceptual model that shows the variables and measures used in this study:

Fig 2: Operational Conceptual Model



Source: From The Researcher's Desk (2023).

The above operational conceptual model shows that each of job-shop production, mass production, batch production and continuous production may influence product development in beverage firms in South East Nigeria.

Classifications of Production Systems

According to Mahmoud (2015), job-shop production is characterized by manufacturing one quantity of products designed and produced as per the specification of customers within prefixed time and cost. The distinguishing feature of this is low volume and high variety of products. A job-shop comprises of general-purpose machines arranged into different departments. Each job demands unique technological requirements, demands processing on machines in a certain sequence.

Rachana (2017) opines that a job-shop is a type of manufacturing process structure where small batches of a variety of customs products are made. In the job-shop process flow, most of the products produced require a unique set-up and sequencing of processing steps. General purpose machines are suitable in job-shop because they are capable of performing many different types of operations and thus capable of producing a wide variety of products with small

sizes. Machines which perform similar functions are grouped together. The jobs which are done in the shop are usually not in bulk but for small orders. The quantity of the product is good as compared to batch shop (Rehman, 2021). Mahmoud (2015) maintains that the quantity of product is high and there are some chances that some products may not be of good quality, but in the case of job-shop each product is made carefully and the quality of the product is high.

According to a professional organization known as Knowledge-gate Team (2017) job production involves the manufacturing of a single complete unit with the use of a group or operators and processes as per the customers 'order. He maintained that it is a "special order "type of production. Each job or product is different from the others and no repetition is involved. The whole job is one operation and work is completed separately on each job. The product is usually costly and non-standardized. There is absence of identical jobs and long runs on a single job. Jobs are carried out to the customers'specifications. Thus the job consist of the bringing together of materials, parts and components in order to assemble and commission a single piece of equipment or product.

He opined that under job production, goods are produced to specific customer orders. Customers do not make demand for exactly the same product on a continuing basis and therefore, production becomes intermittent. Each product is a class itself and constitutes a separate job for production purposes. Ship buildings, electric power plant, jobbing function, machine shop, printing press are common examples of job production forms engaged in sub contract. Work such as tool making, machining, sheet-metal work and sub-assembly, use job production system. According to Mahamed (2013), job shop typically uses a process layout in arranging the equipment. This is also known as functional layout because the equipment is arranged according to functions. For example turning machines may form one department, milling a second, and grinding process a third.

The main reason to group the similar equipment together is because no similar product contributes enough sales volume to justify the formation of a product specific array of equipment. Normally a job shop has a diverse array of facilities and capabilities to choose from with possibly different efficiency as manufactured (Gao, 2007). The responsibility of making the product is normally given to the highly skilled operators. Kher (2000) noted in Gao (2007) that the operators themselves decide the best way to make it, choose the equipment and then complete all or most of the operation involved manly checking the quality at each stage.

Sharma (2019) posits that job production involves productions as per customer's specifications. This ensures the simultaneous production of large number of batches/orders. Each batch/order comprises of a small lot of identical products and is different from other batches. It requires comparatively smaller investment in machines and equipment. It is flexible and can be adapted to changes in product design and other sizes without many inconveniences.

This system is most suitable where production of heterogeneous products is produced against specific orders. In this system, products are made to satisfy a specific order. However, that order may be produced- only once or at a regular time intervals as at when new orders arrive or at regular time intervals to satisfy a continuous demand.

Job-Shop Production Characteristics

Sharma (2019) writes on characteristics, merits, and demerits of job production. He maintains that the main characteristics of job production are as follows: machines and methods employed should be general purpose as products changes are quite frequent; manpower should be skilled enough to deal with changing work conditions; schedules are actually nonexistent in this system as no definite data is available on the product. In process, inventory will usually be high as accurate plans and schedules do not exist; product cost is normally high because of high material and labour costs; and grouping of machines is done on functional basis (i.e as lather section, milling sections etc). This system is very flexible as management has to manufacture varying product types. Material handling systems are also flexible to meet changing product requirements.

Mahamoud (2015) writes on the merits and demerits of job production. He maintains that the merits of job production include the facts that general purpose machines and facilities variety of products can be produced, that operators become more skilled and competent. Hence, each job gives them learning opportunities. Also, the potential of the operator can be utilized; and opportunity exists for creative methods and innovative ideas. He opined that the demerits of job production are as follows: higher cost due to frequent set up changes; higher level of inventory at all levels and hence higher inventory cost; production is complicated; and higher space requirement.

Batch production

Batch production is defined by American production and inventory control society (APICS) as "a form of manufacturing in which the job passes through the function departments in lots or batches and each lot may have a different routing". It is characterized by the manufacture of limited number of products produced at regular intervals and stock awaiting sales. Sharma (2019) posit that batch production is concerned with the production of different types of products in small quantities usually termed as batches. A batch contains the similar products but in small quantity. This is used to meet a specific order or meet a continuous demand. Under this system the goods may be produced partly for inventory and partly for customer's order. For example, components are made for inventory but are combined differently for different customers. e.g automobile plants, printing presses, electrical goods plant are examples of this manufacturing.

Mohamed (2013) agrees with (Kalpakjian and Schmid, 2006) that batch production is used when there are varieties of different products being manufactured but in smaller quantity. He agrees with Floudas and Lin (2004) that once a batch of a product is finished, the manufacturing system is changed over to produce another batch of products. However by sharing the machines, production time cost is high due to set up time, the changeover process, and the nature of scheduling in batch production. He agrees with Drira (2007) that the layout in batch production groups the equipment by function rather than by products which is suitable for a wide variety of product factory. The product is moving throughout the process of completion from department to department within the factory. The batch flow depends on job order such as routings process steps and time spent on certain department.

Pearson (2021) opines that batch production is a method whereby a group of identical products are produced simultaneously (rather than one at a time). It is up to manufacturer to decide how big the batch will be made. He maintained that each batch goes through the separate stages of the manufacturing process together, i.e. batch can't begin a stage, if the previous one is still within the part of the cycle. Each batch can be different, as manufacturers can decide to

change the specifications from one group of products to the next. Perhaps, when it is necessary to change the colour or size of that particular group (depending on the preferences specified in a particular order). Chan (2021) writes that batch production provides manufacturers with greater control over any number of elements that occur during the production of items. Goods can be produced in large numbers but the assembly line allows for changes along the way.

These changes create variations of an identical or similar commodity- the key difference over continuous and mass production. It also allows for quality control at various stages of the process, minimizing the risk of waste. He maintained that batch production offers a number of solutions for manufacturers, with the main one being the ability to produce lines of smaller quantities, making their overall process a lot more agile and efficient. It may be that a product does not need to be continually made (for a variety of reasons) or a business is able to scale up the production of something that had previously been assembled through manual labour.

Chan (2021) writes on characteristics, advantages, and disadvantages of batch production. He maintained that the advantages include the following: batch production provides the opportunity for businesses to make a smaller quantity so there can be more varieties of goods available. It also means that items can be manufactured on request and decrease lead time in production; there‘s no doubt that being able to produce variants of items on the same assembly line is one of the key benefit of batch production. Equipment is used efficiently and is rarely underutilized as it could potentially accommodate any number of production processes. It also minimizes the risk of concentrating on just one product, so businesses can be more agile in responding to supply and demand; more products can be manufactured on the same production line, it spreads the manufacturing cost across the various commodities; it allow for greater control over any issues or problems that may occur; and producing the correct number of goods required also helps to minimize waste overall.

Chan (2021), writing on the disadvantages of batch production, opines that due to the variables required for batch production, it can be more challenging to automate the system. That‘s because the equipment and process method has to consider the different attributes of each product; batch production can be more expensive because there are usually more stages to the manufacturing process; and when goods are being produced in a series of steps, and they are not able to move onto the next stage until every item in the batch is ready.

Mass Production

Sharma (2019) asserts that mass production is the manufacturing of large quantities of standardized products, often using assembly lines or automation technology. Mass production is also referred to as flow production, repetitive flow production, series production or serial production. He maintained that it is used to produce a large quantity of same product at a time that is stocked for sale. All machines and required equipment are arranged according to sequence of operations, termed as line arrangement/flow. This ensures very high rate of production. One line arrangement can produce one type of products; therefore a different line arrangement is needed for a different product.

Mohamed (2021) agrees with Quadt and Kuhn (2007) that flow line production is concentrated on multiple equipment or workstations that are arranged in the process sequence. According to Mohamed (2019), Drira (2007) opines that mass production is characterized by high

volume, repetitive and short cycle work. The work piece is physically moved through this sequence in order to complete the process and finally becomes the product. Allen (2019) asserts that mass production means setting up a production process to make a lot of the same thing and often with significant variation rather than the assumed uniformity. Allen (2019) maintains that organization runs the mass production process as fast business with acceptable quality and safety.

According to Caroline and Charles (2020), in mass production, mechanization is used to achieve high volume, detailed organization of material flow, careful control quality standards, and division of labour. They maintain that an early example of demand for standardized products in large quantities came from military organizations and their need for uniforms and other supplies. Precision machining equipment has led to large scale demand for mass produced products created cheaply with small workplaces. Gemma (2018) posits that the aim of mass production is to ensure that the whole process of manufacturing remains the lowest cost possible while turning out the highest volumes possible. He maintains that producing products in bulk results in their individual cost being, decreased, and allows for higher profit margin for businesses when all products are sold. Since the industrial revolution, the term “mass production“ has gained significant coverage, as it made specific industries, such as food manufacturing noticeably easier.

For Paul (2021), mass production involves making the same product over and over again according to the same specification. He maintain that it was originally designed by Henry Ford in the late 1910s and 1920s – used to manufacture his vehicles for the Ford Motor Company. Through the use of the division of labour, Henry Ford set up an assembly line to produce the Ford Model T.

Paul (2021) agrees with Henry (1920) that each employee had a specific task. One would fix on the doors; another would fix on the wheels, and another to fix on the windows. As each individual only had one set and specific task, he became extremely proficient at it. By working together as a collective, rather than individuals, Ford was able to rapidly expand its productive output. Instead of focusing on manufacturing the whole car – employees were more effectively deployed in specific asks.

The issue with mass production was that it became very repetitive and mundane, as employees were asked to do the same thing over and over again. Ford identified this as an issue and rewarded his employees with wages that far exceeded the industry average. This was only achievable due to the vast efficiencies that mass production achieved. Whilst efficiency and output increased, there was one catch – adaptability. With the assembly line running at speeds never seen before, it had to standardize production. Henry Ford demonstrated this succinctly by stating that consumers could ‘have any color as long as it was black‘. This is because mass production requires standardization in order to benefit from increased efficiency. In turn, this makes the product more affordable and therefore available to the masses.

Paul (2021) defines five characteristics of mass production. He maintains that mass production has become a staple for businesses across the world today and is used in industries ranging from manufacturing to canned foods to gaming. According to him, the characteristics are as follows:

a. Division of Labor: Mass production commonly uses machinery in its production process – each with a specific function. For example, canned soup requires one machine to fill the can up,

and another to close it. Yet some industries still require human labor – such as manufacturing. Motor vehicles are often produced by mass production and require hundreds of workers who each have a specific task. One may fix the window, another to fix the wheels, and another the steering. Each takes a time to master and by assigning one person for each job, they are able to produce a car at a far faster rate than one individual doing a car at a time.

b. Smooth Production Flow: Mass production has to have a smooth production process. This means that as the product is developed, it is moved on to the next station in good time. For example, the canned foods go through a number of stages. First, the food needs to be manufactured. Second of all, the cans need to be supplied. These are then put onto an assembly line which flows them along onto a hopper which would dispense the food. The can would then be moved along onto another machine which would enclose the can. This then moves onto another section which labs the can. Finally, the finished can is then moved onto a pallet or crate where it will be dispensed to its final location.

c. Standardized: Mass production is a very standardized process. In order to produce in such large quantities, the goods have to be the same. If a firm would want to change the goods output, it would require significant levels of alterations and complicate the process. This would add time and cost money – particularly from the amount of lost potential output. Such a large output can only be achieved when the process does not deviate. That way, employees and the machines they use are able to consistently produce the same goods. By altering the process, employees may slow down and it will take time to alter the machines. This costs both time and money, which is not practical for mass products.

d. Undefined Demand: It is easy to get confused between batch production and mass production. Whilst batch production is set to meet a specific level of demand, mass production produces to a level by which it is most efficient. By stop starting the process in mass production – additional costs are created and can significantly affect the quality of output. Instead, under mass production, goods are produced in a quantity by which the factory or firm is able to. If the goods are unable to sell, then the firm may reduce the price to the cost of production. However, by producing on mass, the final price is made cheaper in the first place.

e. High Startup Costs: Mass production requires a high number of resources to get started. A firm will require all the components to set up a streamlined process. It will most likely need a factory and machinery, as well as trained personnel – all of which takes up significant levels of capital.

Paul (2021) writes on advantages and disadvantages of mass production. He opines that mass production is widely used across the world and through a large number of industries. According to him, the advantages and disadvantages are as follows:

Advantages

a. Efficiency- Mass production is the most efficient form of production. This is because the process is segmented into its components. That way the process never stops. It can continuously flow down an assembly line with each stage being completed by a different

machine or worker. This comes at the cost of flexibility, but is a price worth paying for its significant cost reductions

b. Fewer Workers- Depending on the type of goods being produced, fewer employees are needed. This leads into the previous efficiency described. By needing fewer employees, the firm has fewer overhead costs. That means it can produce at a lower unit cost and therefore provide it to the mass population at a lower price.

c. Lower Costs- Lower costs are achieved through a number of reasons. First of all, fewer workers are needed. Second of all, there is an increased efficiency of production. And third of all, there is reduced waste. As the production process is streamlined and to a certain extent, automated, there is a reduced level of waste. For example, other forms of production may require an individual to produce the whole final good. If the individual is not highly proficient, they may make the odd mistake and damage the good. However, with mass production, the employee is more skilled as they can focus on one specific task – which can reduce waste and sunk costs through damaged goods.

d. Precision- With mass production, everything is standardized – from the product to the machines. Everything is repeated over and over again in the exact same way. This fine-tuned machine means that each product has the same quality as the last. As it runs through the assembly line, each relay point has a specific task to do. And because the task is so specific, the individual or machine is able to produce with great precision.

e. Fast Production- Perhaps one of the biggest advantages to a manufacturer is the fast production rate of mass production. It is the fastest of all production processes, with conveying systems advancing beyond imagination. They are now able to identify products and re-direct them to the next stage without any need for human intervention.

Disadvantages

Whilst mass production is an extremely popular process among manufacturers, it is not always the best for different industries. There are a number of disadvantages that mass production presents which makes it inappropriate for some types of businesses. Such examples include:

a. High Start-up Costs- Starting a mass production business requires huge start-up costs such as that for the factory, land, and machinery. These costs alone will require millions just to get going. Small startup businesses will find it difficult to amass this capital and compete. In turn they must use different production processes at a higher cost – which makes it difficult to compete.

b. Disengaged Workforce-Many industries that adopt mass production mainly use machines. However, there are industries that require the use of high levels of labor. For example, the iPhone requires hundreds of workers to assemble it together. The issue with such is that such work can become mundane. As each worker has a very specific task, they are assigned to repeat it over and over again. Whilst this can increase efficiency in the short-term, it can lead to de-motivated employees in the long-term.

c. Inflexible- Consumer demand can change over time and when the market changes, firms that engage in mass production will find it expensive and time consuming to change. This is particularly noticeable in fashion which relies on constantly changing styles. Another example can be seen in the food industry whereby food can go to waste if too much is produced. There can be seasonal fluctuations which can make it difficult to determine demand. So when food

is perishable, the cost benefits achieved by mass production may not be worth the sunk costs of perished goods (Paul, 2020).

Continuous Production

Continuous production is a type of production system in which materials being processed are continuously in motion. Vikash (2020) posits that continuous means something that operates constantly without irregularities or frequent stops. In continuous production system, goods are constantly produced according to demand forecast. The goods are produced on large scale for storage and sale, they are not produced at the customer's request. Marique (2020) opines that continuous production system involves a continuous or almost physical flow of materials. He maintains that it makes use of special purpose machine and procedures standardized items in large quantities. The examples are petrochemical, cement, steel, sugar and fertilizer industries etc. The aim of the continuous manufacturing flow is to produce, or process materials uninterrupted.

According to Kobus (2018), continuous production process consists of multiple functional units, each with specific objectives. He maintain that each of functional unit may consist of multiple pieces of equipment, and it is at functional unit level that operational personnel apply their decision making and also the level where performance is affected, strategic objectives are implemented, and operational risk is managed. Mahmoud (2015) opine that continuous production is characterized by dedicated plant and equipment with zero flexibility; material handling is fully automated; process follows a predetermined sequence of operations; component cannot be readily identified with final product and planning; also scheduling is a routine action. William (2021) posits that in the continuous system, items to be processed flow through a series of steps, or operations, that are common to most others products being processed. He maintains that large volume throughputs are expected; specifically designed equipment and methods are often used so that lower production cost can be achieved. William (2021) maintains that the tasks handled by workers are divided into relatively small segments that can be quickly mastered and efficiently performed examples include system for assembling automobile engines and automobiles themselves, as well as other consumer products such as television, washing machines, and personal computer.

Continuous productions are often referred to as assembly system or assembly line system. According to a professional organization known as Knowledgebase Team (2017) opines that continuous flow production situations are those where the facilities are standardized as to routings and flow since inputs are standardized. They maintain that a standard set of process and sequences of process can be adapted.

According to Knowledegiate Team (2017) the advantages of continuous production include that: the quality of output is kept uniform because each stage develops skill through repetition of work; any delay at any stage is automatically detected since there is automatic control of time and direct labour content is reduced; work in progress is minimum on account of sequence balancing; handling of material is reduced due to the set of pattern of production time; control over materials cost and output is simplified and repetitive nature of process make production control easier; overhead cost per unit is reduced due to spreading of large fixed cost

of specialized equipment over a large volume of output, and there is quick return of capital employed.

Knowledgiate Team (2017) maintains that the disadvantage of continuous system however, is very rigid and if there is a fault in one operation, the entire process is disturbed. Due to continuous flow, it becomes necessary to avoid piling up of work or any blockage on the line. Unless the fault is cleared immediately it will force the preceding as well as the subsequent stages to be stopped. Continuous manufacturing is gaining ever- increasing attention within the pharmaceutical industry because of the expanding profitability gap experienced by most pharmaceutical companies (Gerogiorgis and Banton, 2009). Today, it is becoming more difficult for pharmaceutical companies to meet profit expectation, due to increasing research and development operating costs and completion from generic manufacturers.

Theoretical Framework

The researcher used the following theory to beef up the study:

SWOT Analysis Model

The use of SWOT Analysis in this study is very relevant. It is a great strength to any organization that adopts sound production methods. It is however a weakness to any ongoing concern which relegates modern methods to the background. Also, it is a great opportunity for further product development if an organization continues to update and sustain its viable production methods. This kind of attitude to production in any enterprise is a threat to competitors.

SWOT Analysis is a useful technique for understanding business strengths and weaknesses, and for identifying both the opportunities open to the business and the threats it faces (Everton, 2011). Originated by Albert S. Humphrey in the 1960s, the tool is as useful now as it was then. A firm can use it in two ways – as a simple icebreaker helping people get together to 'kick off' strategy formulation, or in a more sophisticated way as a serious strategy tool. Strengths and weaknesses are often internal to the organization while opportunities and threats generally relate to external factors.

For this reason, SWOT is sometimes called Internal-External Analysis and the SWOT Matrix is sometimes called an IE matrix Benson and White (2015) maintain that SWOT Analysis is a basic, analytical framework that assesses what an entity – usually a business, though it can be a place, industry or product, can and cannot do, for factors both internal and external. Using environmental data to evaluate the position of a company, a SWOT analysis determines what assists the firm in accomplishing its objective, and what obstacles it must overcome or minimize to achieve desired results where the organization is today, and where it may go.

Fig 2.4 SWOT Analysis Visual Overview

Strengths	Weaknesses

Opportunities	Threats

Source: Benson and White (2015).

Analysts present a SWOT analysis as a square with each of the four areas making up one quadrant. This visual arrangement provides a quick overview of the company's position. Although all the points under a particular heading may not be of equal importance, there is insight in seeing how the number of opportunities measures up to the number of threats, and so forth.
For the elements of a SWOT analysis, companies must use them as a guide and not a prescription. They are discussed as follows:

a. Strengths: They descriptive what an organization excel at, and separates it from the competition: a strong brand, loyal customer base, a strong balance sheet, unique technology and so on. For example, a hedge fund may have developed a proprietary trade strategy that returns market-beating results. It must then decide how to use those results to attract new investors.
b. Weaknesses: They stop an organization from performing at its optimum level. They are areas where the business needs to improve to remain competitive higher than-industry-average turnover, high levels of debt, an inadequate supply chain, or lack of capital.
c. Opportunities: They refer to favorable external factors that an organization can use to give it a competitive advantage. For example, a car manufacturer can export its cars into a new market, increasing sales and market share, if a country cuts tariffs.
d. Threats: They refer to factors that have the potential to harm an organization. For example, a drought is a threat to a wheat-producing company, as it may destroy or reduce the crop yield. Other common threats include things like costs for inputs, increasing competition, tight labour supply and so on.

A SWOT analysis is a great way to guide business-strategy meetings. It is powerful to have everyone in the room to discuss the company's core strengths and weaknesses and then move from there to defining the opportunities and threats and finally to brainstorming ideas. A company can use a SWOT for overall business strategy sessions or for a specific segment like marketing, production or sales.

Empirical Review

The researcher used the following empirical studies to boost the study:

1. Nkemdilim, Immanuel and Olayinka (2020) investigated the impact of product development practices on the performance of new financial products and services through the analysis of ten in-depth case studies. We argue that weak product development practices negatively affect product performance. This study finds that in Nigeria, new financial product performance is suboptimal because of poor product development practices. This study further shows that when poor execution follows inadequate product development practices, the likelihood of product failure increases, as evidenced by poor product performance and

low adoption. The processes adopted in the development of financial services affect the adoption, use, and overall penetration of the product in the target market. Therefore, this study suggests that the management team of various financial service providers invest in developing sound product development practices in the actualization of their goals of increasing the adoption and use of their products.

2. Mbithi, Muturi and Rambo (2015) examined empirically the effects of new product development strategy on company performance. To do so, two indicators of product development strategy which include development of new product and improvement of existing products were considered as independent variable indicators while performance measures were total output turnover, profitability, sales quantities and capacity utilization. The sugar industry in Kenya was chosen as the empirical context for the present study's analysis largely because of its crucial role in agriculture subsector. Consistent with the study's hypothesis, this study's results show that introduction of other new products other than sugar has largely been minimal while improvement of existing products has adopted through packaging and branding. Resultant performance was positive in total output turnover, sugar sales quantities, capacity utilization was moderate while profitability after tax gave fluctuating results. Performance was fairly responsive to improvement of product processes procedures but poor in introduction of new products since actualization is yet to be realized. Implication aspect of this study's results depicts the crucial need of actualization of new products to the consumer and to exhaustively factory capacities. Introduction of current technologies though been effected by some companies is promising to be a key in investment both for high, diverse production and cheaper with minimum wastage. Present day's managers in effect should take care to build reasonable and realistic expectations about potential new products that are compatible with the current sugar production processes.

3. Nwokah, Ugoji and Ofoegbu (2009) examined product development and corporate performance in the Nigerian brewing industry. Data were gathered from 32 officials drawn from marketing, R&D and production departments in four breweries in the south-south and south east geographical regions of Nigeria through the use of questionnaire. The data were analyzed using appropriate statistical tool (spearman rank order correlation co-efficient). The data revealed among other things that product development facets of product quality and product lines/ product mix were positively and significantly correlated with the corporate performance facets of profitability, sales volume and customer loyalty. The study also revealed that the relationship between product size, product design and profitability, sales volume and customer loyalty was not significant. The study concludes that a positive and significant relationship exists between product quality product lines/product mix and profitability, sales volume and customer loyalty. To this end, it was recommended among other things that high product quality should be maintained and that the breweries should continuously develop new market segments and develop appropriate product accordingly.

4. Azigbo (2019) believes that some organizational leaders in emerging markets lack strategies for successful development of new products. By 2025, emerging markets will account for 50% of global consumption and represent significant opportunities for organizational leaders to steer their organizations toward market dominance. The purpose of this multiple case study was to explore the strategies that organizational leaders used to successfully develop new

products. The target population comprised leaders of 3 organizations in Nigeria who have successfully developed new products. The conceptual framework for this study was the disruptive innovation theory. Data were gathered from semi structured interviews with the organizational leaders and review of company documents. Data analysis involved the compilation of data, coding to organize the data, identification of themes that emerged, and linking those themes with the research. Triangulation and member checking were used to help ensure the trustworthiness of interpretations. Four themes emerged from data analyses relating to strategies used by organizational leaders to successfully develop new products: leadership and business models, organizational structure and culture, target population and market needs, and affordability. The implications of this study for positive social change include the potential to improve the standard of living in Nigerian communities, which might enhance the participation of the rural people and local businesses in the global economy. Furthermore, the findings of the study may provide knowledge for organizations to become more profitable in emerging markets.

5. Madu (2016) determined the influence of production techniques and technological orientation on the performance of manufacturing industries in Nigeria. The study employed a descriptive survey design of ten (10) manufacturing industries which cut across Kaduna, Kano and Jigawa State of Nigeria. Regression analysis was used in determining the relationship between production techniques and organizational performance. The result shows that, correlation coefficient ® is 0.741, implying that there is a strong positive relationship between performance (Y) and production technique (X) on first hypothesis while the second hypothesis of Regression result on technological orientation and the performance of manufacturing industries in Nigeria shows that computed correlation coefficient ® is 0.888, this implying that there is also a strong positive relationship between Performance (Y) and technological orientation (X). The findings and recommendations called upon organizational owners and managers to go for deep environmental scanning and be creative and innovative to transit into technological trend of meeting up with today's global challenge.

Gap in Literature

Based on the empirical studies accessed by the researchers, there are no empirical studies on the link between each of job-shop production, mass production, batch production, continuous production and product development. This study fills this enormous research gap.

Methodology

The study adopts the survey research design. The questionnaire is the major instrument for data collection. The population of the study consists of the staff of Nigerian Bottling Company Plc, Owerri; the Nigerian Breweries Plc, Enugu and Golden Guinea Plc, Umuahia and Innoson Vehicle Manufacturing Company Ltd, Nnewi. The total population of the study is 433. The Taro Yame's formula was adopted to obtain a sample size of 315. The data sources consist of primary and secondary sources; the primary sources are the survey tools (questionnaire and observations) while the secondary sources include journals, texts and other materials. Validity of the questionnaire was done by showing the instrument to the supervisors and to other experts

for their corrections and inputs (face validity). It was also ensured that all the items in the questionnaire were strictly based on the research questions (content validity). The reliability was

$$\alpha = \frac{N * \overline{c}}{\overline{v} + (N-1) * \overline{c}}$$

Where:

N = number of items

$\overline{c}$ = the average inter-item covariance among the items.

$\overline{v}$ = the average variance.

Hence, a reliability ratio of 0.77 (77%) was obtained. Data analysis was committed to descriptive statistics of mean, percentages and standard deviation. Correlation analytical technique was used to test hypotheses. The computations were aided by Statistical Package for Social Sciences (SPSS) version 23. The formula for correlation is:

$$r = \frac{n(\Sigma xy) - (\Sigma x)(\Sigma y)}{\sqrt{[\, n\Sigma x^2 - (\Sigma x)^2 \,][\, n\Sigma y^2 - (\Sigma y)^2 \,]}}$$

The decision rule: The rejection of the null hypothesis was based on the P-Value as the null hypothesis is rejected if P- value < 0.05.

Questionnaire Analysis

Out of the 315 copies of the questionnaire distributed, only 250 copies were properly filled and returned. The return rate was 79.4%.

Research Question 1:

What is the relationship between job-shop production and product development?

Table 1: Respondents' responses on the relationship between job-shop production and product development

Q/No	Item	SA	A	UN	D	SD	N	Mean	Std. Dev.
1	Job-shop production helps to boost product development.	120	72	30	23	5	250	4.12	0.771
2	Many business enterprises do not take job-shop production seriously for product development	107	81	25	18	19	250	3.96	1.332

Field Survey (2023)

The table 1 above presents data from responses by the respondents under study. The result also disclosed a strong agreement by the respondents on their opinion on the relationship between job-shop production and product development. The results further shows that the respondents agreed to the facts that: job-shop production helps to boost product development with a x ±S.D of 4.12 ±0.771; many business enterprises do not take job-shop production seriously for product development (with a x±S.D of 3.96 ±1.332).

Research Question 2:

How does mass production affect product development?

Table 2: Respondents' responses on the relationship between mass production and product development

Q/No.	Item	SA	A	UN	D	SD	N	Mean	Std. Dev.
3	Mass production is a wonderful driver of product development.	131	90	16	7	6	250	4.33	0.952
4	Management invests heavily on equipment acquisition for improved product development	128	78	20	11	13	250	4.19	0.965

Field Survey (2023)

The table 2 above presents data from responses by respondents on the relationship between mass production and product development in manufacturing organizations. The results show that majority of the respondents affirmed to the statements. There is a high level agreement by the respondents on the opinion that mass production is a wonderful driver of product development as the result accounted for a mean of 4.33 and a standard deviation of 0.952. The result has indicated that the majority of the respondents agreed to the item statement that: management invests heavily on equipment acquisition for improved product development (with a $x \pm S.D$ of 4.19 ± 0.965).

Research Question 3:

What is the relationship between batch production and product development?

Report on Research Question 3 is presented on Table 3

Table 3: Respondents' responses on the relationship between batch production and product development

Q/No.	Item	SA	A	UN	D	SD	N	Mean	Std. Dev.
5	Batch production is an aid to product development in beverage firms.	111	63	42	21	13	388	3.95	1.085
6	Management encourages workers to obtain batch production skills for improved product development.	117	71	28	18	16	388	4.02	0.934

Field Survey (2023)

The table 3 above presents data from responses by the respondents under study. The result also disclosed a good agreement by the respondents on their opinion on the relationship between batch production and product development. The results further shows that the respondents agreed to the facts that: batch production is an aid to product development in

beverage firms with a x ±S.D of 3.95 ±1.085; management encourages workers to obtain batch production skills for improved product development (with a x ±S.D of 4.02 ±0.934).

Research Question 4

How does continuous production affect product development?

Table 4: Respondents' responses on the relationship between continuous production and product development

Q/No.	Item	SA	A	UN	D	SD	N	Mean	Std. Dev.
7	Continuous production method encourages product development efforts in beverage enterprises.	130	51	31	24	14	250	4.04	1.033
8	In future, management will use continuous production method to out-do its competitors in product development competence.	140	41	41	14	14	250	4.12	0.881

Field Survey (2023)

The table 4 above presents data from responses by respondents on the relationship between continuous production and product development. The results show that majority of the respondents affirmed to the statements. There is a high level agreement by the respondents on the opinion that continuous production method encourages product development efforts in beverage enterprises as the result accounted for a mean of 4.04 and a standard deviation of 1.033. The result has indicated that the majority of the respondents agreed to the item statement that: in future, management will use continuous production method to out-do its competitors in product development competence (with a x ±S.D of 4.12 ±0.881).

Testing of Hypotheses

Here the hypotheses associated with the study were tested. The hypotheses were tested in order to find out whether the difference in opinion was significant to draw conclusion.

Test of Hypothesis One

Ho1: There is no significant relationship between job-shop production and product development.

Table 5: Correlation analysis between job-shop production and product development

Item	Mean	Standard Deviation	Correlation Coefficient	P-value
Job-shop production	4.12	0.771	0.921	0.001
Product development	3.96	1.332		

The result on table 5 presents the correlation analysis between job-shop production and product development. The result shows a p-value of 0.001 and correlation coefficient of 0.921.

The result shows a p-value less than 0.05 being the level of significance; therefore rejecting the null hypothesis and accepting the alternative hypothesis. Therefore, the correlation coefficient between job-shop production and product development is statistically significant. Therefore, there is a significant relationship between job-shop production and product development.

Ho2: Mass production does not significantly influence product development.

Table 6: Correlation analysis between mass production and product development

Item	Mean	Standard Deviation	Correlation Coefficient	P-value
Mass production	4.33	0.952	0.887	0.001
Product development	4.19	0.965		

SPSS Correlation Analysis Output (2023)

The result on table 6 presents the correlation analysis between mass production and product development. The result shows a p-value of 0.001 and correlation coefficient of 0.887. The result shows a p - value ≤ 0.05 level of significance, thereby rejecting the null hypothesis and accepting the alternative which states that mass production significantly influences product development.

Ho3: There is no significant relationship between batch production and product development

Table 7: Correlation analysis between batch production and product development

Item	Mean	Standard Deviation	Correlation Coefficient	P-value
Batch production	3.95	1.085	0.905	0.001
Product development	4.02	0.934		

SPSS Correlation Analysis Output (2023).

The result on table 7 presents the correlation analysis batch production and product development. The result shows a p-value of 0.001 and correlation coefficient of 0.905. The result shows a p-value less ≤ 0.05 level of significance; therefore rejecting the null hypothesis and accepting the alternative which states that there is a significant relationship between batch production and product development.

Ho4: Continuous production does not significantly influence product development

Table 8: Correlation analysis between continuous production and product development

Item	Mean	Standard Deviation	Correlation Coefficient	P-value
Continuous production	4.04	1.033	0.969	0.001
Product development	4.12	0.881		

SPSS Correlation Analysis Output (2023).

The result on table 8 presents the correlation between production and product development. The result shows a p- value of 0.001 and a correlation coefficient of 0.969. The result shows a p - value < 0.05 level of significance; thereby rejecting the null hypothesis and accepting the alternative. Therefore, the correlation coefficient between production and product development is statistically significant. This means a positive and a strong relationship existing between production and product development.

Conclusion and Recommendations

The researcher concluded that production methods are essential for product development in beverage firms. Job-shop production helps to boost product development. Mass production is a wonderful driver of product development. Also, continuous production method encourages product development efforts in beverage enterprises. The researcher therefore concludes that any management that encourages workers to obtain batch production skills for improved product development stands to consistently develop high quality products.

The study recommends that management should always train their workers on job-shop production skill. Mass production should be sustained in beverage organizations. Workers should improve on their attitudes to batch production so as to help management increase its product development abilities. Also, management should determine factors that impede its abilities to fly high in continuous production method so as to always do well in product development.

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