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The Effect of Production Planning and Control on Organisational Performance in the Nigerian Cement Manufacturing Industry

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Abstract

The study examined the effect of production planning and control on organisational performance in the Nigerian cement manufacturing industry. Production planning and control were proxied by material requirement planning, quality control, just-in-time production, and inventory management; while organisational performance was measured by productivity, quality delivery, profitability, and cost minimisation. The study's population includes 768 employees in the production, quality, procurement, and sales/marketing departments of Dangote Cement Plc and Lafarge Cement Nigeria Plc, in which two hundred and sixty-three (263) employees were selected as sample using judgmental sampling technique. A structured questionnaire was administered on the respondents. A pool confirmatory factor analysis was employed to assess the validity and reliability of the research instrument. The study employed descriptive (mean, frequency distribution, and percentage) and inferential statistical techniques to analyse and test the data collected. On the other hand, structural equation modeling technique was used to test the hypotheses formulated for the study. The outcome of the path analysis revealed a positive coefficient value of the causal effect of production planning and control constructs (material requirement planning, quality control, just-in-time production, and inventory management) on organisational performance. The study recommends that manufacturing firms should embrace effective material requirement planning to ensure manufacturing effectiveness in their operations.

Keywords: *Industry, Organisation, Performance, Production Planning, Production Control.*

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1. Introduction

The massive increase in the demand for cement in Nigeria led to the establishment of several cement's manufacturing plants. For instance, Association of Portland Cement Manufacturing (APCM) established its second cement's manufacturing plant in Nigeria in 1978, West African Portland Cement Company's (WAPCO) plant was also established in the same year in Shagamu, with a 900,000 metric ton production capacity. It is interesting to know that APCM adopted a new name "Blue Circle" in the same year. Ashaka Cement's plant was also established in Gombe in 1979 with a 700,000 metric tons capacity. In 1980, Benue Cement Company (BCC) was established with a 900,000 metric tons capacity. These companies were controlled by the federal government of Nigeria, being the major investor in all of them. The level of investment in the 1970s was different from that of the 1950s and 1960s. Due to the establishment of new cement's manufacturing firms in Nigeria in the 1970s, there was no possibility of foreign business interests acquiring larger shares in the sector. This was accounted for by the indigenisation decree of 1972 and 1977, which repelled every possibility of foreign dominance in the sector by way of adding cement manufacturing to the class of businesses to be controlled by the Nigerian government. This led the Nigerian government to acquire and have a controlling interest in WAPCO (Shagamu and Ewekoro), BCC, and Ashaka cement's companies.

As a consequence of the increase in customer demand and the present level of competitiveness in the Nigerian business environment, the majority of manufacturing enterprises in Nigeria designed essential strategies to fulfill the demands of consumers. The efficacy and workability of their production planning and control in the manufacturing process determine how well these strategies were implemented. Production planning and control are one of the most crucial aspects of production management; in fact, they are the manufacturing company's nervous system. It is critical in a manufacturing company that production is carried out in the best possible way at the lowest possible cost, and that the items produced are of the correct quality and delivered on time. Only careful production planning can achieve this. However, just planning production will not fix the problem production management, since production plans are not self-acting and do not result in instantaneous implementation. To achieve this, the production manager must make conscious efforts; such as regulating work assignments, reviewing work progress, and devising techniques to create consistency between real and planned performance, so that the plans are carefully followed and the standards established during the planning stage are maintained. This is where the role of production control comes to play.

Production planning is simply the determination of resources to allocate and how to use them to deliver product (good or service) in the future; whereas production control is the regulation of the production system to achieve objectives as quickly as feasible. Material forecasting, scheduled order processing, long-term management, and infrastructure development are also embedded in production planning (Guo, Zhang, Chen, et al., 2019). Production control entails keeping a watch on the production line and interfering when things are not going according to plans. A longer temporal view of production preparation is necessary to maximise production runs. Production control uses several control methodologies to achieve output goals and ensure that the production system performs at its best. Production planning and control in industrial companies is an approach that comprises the conversion of raw materials or components into finished products, as well as the optimal combination of these components to minimise defects and maximise profit.

It is quite easy to assure a cost-effective production process, stimulate timely delivery of products, decrease total time, please consumers, coordinate production with other units, and ensure that the right man is allocated the best jobs when a company has efficient production planning and control operating systems (Bashir, 2020). Production planning and controlling (PPC) not only provides an overall approach to the production unit but also oversees and regulates every stage of the working environment; receiving input from the product/process design and engineering subdivisions (Wickramasinghe, 2016).

The importance of production planning and control in the manufacturing business cannot be overstated, yet, several militating variables limit its optimal performance. After-sales service, seasonal fluctuations, order wastage and production, lack of current automation equipment for correct computation, market, and losses due to unexpected variables are examples of such issues (Oleghe & Salonitis, 2014). Failure to properly integrate and execute plans and control may drive up operating costs, perhaps leading to a business's closure. It also seems that if production plans and control are done poorly, the firm's profitability would suffer. PPC is used to reduce costs and help businesses to expand. Changes connected with company expansion, particularly in a developing nation like Nigeria, affect production costs and planning.

Previous studies such as Ovunda, Isaac, and Ndor (2019); Ikon and Nwankwo (2016); Millicent (2017); paid less attention to the key measures of PPC effect on performance, such as; quality control, inventory management, material

requirement planning, while the study of Wen-Hsien and Yin-Hwa (2018) did not consider the measures of PPC to know the impact of these measures on performance. Also, the sample size used by the study of Yazan (2017); Millicent (2017); Ovunda, (2019); Sambil, Matimba, Sihle, Xolani, and Sine (2019) were not adequate to draw inference from a study of this nature. The studies of Millicent (2017) and Sambil *et al.* (2019) were based on case analysis, regression, and correlation analysis, and only relatively few studies used structural equation modeling (SEM) for data analysis. Furthermore, studies on production planning and control in Nigeria are scanty. To contribute to the existing studies in production planning and control, this study examines the effect of production planning and control on organisational performance.

The major objective of the study was to examine the effect of production planning and control on organisational performance in the Nigerian cement manufacturing industry. However, the Specific objectives are to- investigate the effect of material requirement planning on organisational performance; assess the effect of quality control on organisational performance; evaluate the effect of inventory management on organisational performance; and determine the effect of just-in-time production on organisational performance.

2. Literature Review

2.1 Conceptual Review

Production Planning and control

Production has to do with the process of converting inputs into output, while planning is all about the determination of what and how to produce goods and services in an organisation. Every production activity needs input resources such as money, man, machines, materials information and energy. The production of goods and services must be associated with market demand, through continuous flow and increases in customers (Jain & Aggarwal, 2008). Therefore, to achieve effectiveness and efficiency, production and distribution of goods and services must be carried out in a manner that ensures customers' satisfaction, and cost-effectiveness. The process involved in developing effective relationship between production capability and market demands is the primary role of production planning (PP). Production planning is the process of predetermining production requirements; such as components and basic materials, production runs, detailed equipment, order priority, man, money, and production process within the terrain of the firm to ensure that goods manufactured match demands. Firms can have robust production planning in place via effective management of inventories, workflow, backlogs, and changing operation levels (Jain & Aggarwal, 2008).

Material Requirement Planning

Material Requirement Planning **(**MRP) can be described as a computerised system of scheduling production and controlling inventory. MRP is a system of controlling materials to maintain adequate levels of inventory to facilitate the availability of required components and materials for planned production. It is a technique of time-phased-priority planning that estimate materials required for production and schedule supply intending to meet market demand for a particular product. Material requirement planning is a technique used to determine the quantity and when to place and receive dependent demand items required to meet the requirements of the master production schedule (MPS). MPS is computed by converting the bill of material, inventory status into time-phased requirements for raw materials, parts, and sub-assemblies using lead times and other information to work backward from the due date to know the time and the quantity to order (Oladokun & Olaitan, 2012). The benefits of this technique cannot be overemphasised; improvement of labour and facilities' utilisation, swift response to the change in demand, minimises the cost of inventory, quick delivery of products to customers as a result of strict compliance to production schedules (Heizer & Render, 2011). The application of MRP system enables firms to minimise waste, achieve efficiency in production, quick respond to market demand, and prevent inventory pile-ups.

Quality Control

The major priority of every industrial system is quality. Quality assurance is critical for assuring process and product reliability. In a production system, quality must be guaranteed from the start of each phase. It is vital to verify that only high-quality goods with no faults or rejections are moved on to the next workstation and that they fulfill the standard requirements. This is in sharp contrast to the previous quality control method, which involved work being passed from one workstation to the next without quality assurance and inspection being done in large batches at the end of the production process. One of the fundamental steps in the production system to ensure quality is quality at the source (both processes and products). The importance of this action was stressed by Ringen, Aschehoug, Holtskog, and Ingvaldsen (2014), who noted that if an abnormality arises, the equipment or process can be quickly terminated.

Quality at the source may be successfully implemented provided that production is carried out in small batches. High quality may be ensured if small batch size rules are followed (Sangwan, Bhamu, & Mehta, 2014). With precise accuracy, the cause of the problem may be identified. At the same time, it guards against the occurrence of flaws. As a consequence, each phase ensures that no defective units are given to subsequent procedures.

Inventory Management

Prempeh (2016) posits that an inventory system is a set of policies and controls put in place in a manufacturing setup for monitoring as well as determining the volume/levels of inventory and replenishment that a firm should keep. To achieve optimal results, the managers of manufacturing firms must bear in mind the goal of minimising costs of inventory and satisfying the needs of customers. A robust Inventory Management (IM) system must be in place at various locations/branches within a manufacturing facility and/or various locations of a distribution network to ensure that regular, as well as planned courses of production are prevented from random disturbance of stockout components/materials. Additionally, IM encompasses asset management, cost of keeping an inventory, physical inventory, sale forecasting, products replenishment, the physical space available, lead time management, defective products, quality management, price forecasting, inventory valuation, and visibility. Ogbo, Onekanma, and Wilfred (2014) add that an optimal inventory level can be attained by achieving effective management of the above-mentioned scope, which every firm both in the service and manufacturing set-up should incorporating into their business process to respond to changes in the business environment.

Just-In-Time Production

The most essential technique for production cost reduction, quality production of goods and services, improved productivity, and waste reduction in the manufacturing processes has been traced to Just-In-Time (JIT) production system. JIT production system started in Japan and has been adopted by Toyota and other Japanese manufacturing companies; allowing them to increase production, while reducing waste to the absolute minimum. JIT aids in the reduction of unnecessary inventories during operations, resulting in more effective resource utilisation (Adeniran, Agbaje, & Adeosun, 2019). JIT is a production technique aimed at improving overall efficiency and productivity via waste elimination and results in quality enhancement. In the assembly/production process, JIT helps to minimise the cost of production and ensure the delivery of only materials required for production in the right quality/quantity, and at the appropriate time/place, while utilising minimum of equipment, facilities, human and materials resources.

Organisational Performance

Performance according to Dahmash (2015) in Adoke and Adulaziz (2021) is the ability of an organisation to be effective in its resource usage so as to achieve stated goals and objectives. Corporate performance is seen from the level of visible, financial and non-financial variables that are pivotal to a firm survival in a dynamic environment. At the financial level are profitability, return on asset, return on capital, return on equity and the likes; while at the non-financial are lean inventory, on-time-delivery, product quality, customer satisfaction and so forth. An organisation is able to fight competition, through improved performance (Ekpudu, 2016 & 2021)

2.2 Theory of Constraints

Application of the Theory of Constraints (TOC) which originated from the works of Eli Goldratt in 1984 has become a critical subject matter within the operations management research. Collier and Evans (2006) state that TOC is a collection of axioms and principles that ensure related activities capable of creating bottlenecks in the production areas and process are resolved by increasing total process throughput. A number of researches have applied TOC to explain the effect of production planning and control on performance of organisations (Ekpudu, 2016; Cardoso, 2021; Stevenson, 2007; Jacob, Berry, Whybark & Vollmann, 2011). The theory is connected to effective planning and controlling of production processes, resource consumption and other activities to minimise or avoid constraints that hinder performance of organisation. TOC applies to production process, as well as addresses how bottlenecks are identified and managed in the production process.

A vigorous application of TOC improves operations, minimises lead time, reduce inventory level, and optimise performance of organisation. Jacob et al (2011) opine that manufacturing goals could be deterred by constraints and that operations performance could be enhanced through TOC scheduling of activities. This study adopts the theory of constraint because it enables managers to effectively plan and control resources by avoiding constraints that could limit organisational performance.

2.3 Empirical Review

Agorzie, Ekpudu and Adewumi (2020) carried out a study on material management practices effect on operational performance of selected quoted food, beverages and breweries firms in south western Nigeria and found that material management practices have significant effect on operational performance of firms in the sector. Ghasemi, Lehoux and Ronnqvist (2022) conducted a study through a review of 118 articles on coordination, cooperation and collaboration in the production and inventory systems. The result showed that 'production planning and control decisions are not separate and that supply chain members can significantly reduce costs through effective planning and coordination of production and inventory decisions in organisation'.

Based on 13 manufacturing pharmaceutical companies in Egypt in the Great Cairo survey, Habib (2016) found that the degree of the MRP positive implementation of pharmaceutical manufacturer's production and operations' performance, ensures the availability of materials, components, and products. This led to Enhanced production and operations planning and controlling, improved on-time delivery to customers, maintenance of optimal inventory level and plans manufacturing activities, and accomplishment of purchasing schedules. MRP creates synergy and attains better production and operations performance which resulted in wide acceptance in the Egyptian pharmaceutical manufacturing field. Using correlation and regression analysis, Millicent (2017) studied the effect of manufacturing planning/control on operational performance within the context of the pharmaceutical industry of Nairobi.

The study was based on a descriptive research design and the data were collected from respondents via questionnaire. The study's findings established that enterprise resource planning, manufacturing resource planning, Just-in-time systems, and materials requirement planning significantly influence operational performance. Therefore, it is highly required for pharmaceutical companies to deploy the necessary strategies to deal with the challenges of the application/implementation of manufacturing planning and control systems.

Adopting a survey research design, Osuolale, Tijani and Bakare (2018) assessed the relationship of quality control with the performance of SMEs in Nigeria. The primary data for the study were generated via a structured questionnaire copies administered on two hundred respondents in manufacturing and service SMEs. The regression analysis deployed revealed that quality control has a significant influence on SMEs' performance in Nigeria. Hence, firms must be committed to total quality planning and control and ensure that it is backed by action and laws. Also, Ofila and Rahmat (2018) assessed how effective the implementation of a quality control circle (QCS) is in influencing a firm's performance in the construction industry. The study deployed a regression analysis to test the collaborative influence of QCS on the performance of firm. It results revealed that quality control circle is a robust and powerful tool adopted by firms to proffer possible solutions to quality problems as well as optimise performance of firms.

The impact of various practices of inventory management on operational performance was examined by Opoku, Fiati, Kaku, Ankomah, and Agyemang (2020) in the Ghanaian manufacturing companies. A descriptive survey was employed and one hundred and fifty-two participants were sampled from the study firms. A primary tool (questionnaire) was used to generate the primary data. Regression analysis (ordinary least square) was deployed and results revealed that 'strategic supplier partnership, vendor-managed inventory, activity-based costing, material resource planning, economic order quantity, and just-in-time had significant impact on operational performance'. Based on the outcomes, the study concluded

that the practices of IM, particularly strategic supplier partnerships, play significant roles in optimising the level of operational performance of manufacturing companies.

In the same vein, Tekalign (2020) carried out a study in Hawassa City to find out how effective the practices of inventory management were in manufacturing companies. A descriptive research design was adopted and a self-administered questionnaire was used for data collection. It was indicated that a lot of procedures of inventory management were experienced by the studied firms in an attempt to maintain a reasonable level of stock and prevent stockout to satisfy both current and future customers' demand. The results of the study also revealed that a robust practice of IM was in place in the studied firms. Nevertheless, the study's result showed that severe long lead time challenges were encountered by some of the firms as a result of bureaucratic processes involved in receiving materials or parts ordered which led to cancellation of purchase orders and results in loss of customers.

A double-fixed panel-data regression model was deployed in the study of Xian, Mengwei, Lu, and Ziyang (2020) to analyse the database of 9051 observations to assess the effect of JIT application on firms' innovation. The patents were divided into three forms to ascertain how JIT impacts the various types of innovation. The study revealed that the adoption of JIT enhances innovation, output and investment in corporate innovation. It further showed that the adoption of JIT optimised innovation performance of firms. Adopting Linear regression analysis, Yazan (2017) in his work on JIT and firm performance revealed that the JIT system positively and significantly influences operational excellence of firms. Above studies inferred that it is necessary for firms' managers to pay adequate attention to JIT systems such as Setup time reduction, supplier quality, pull production, and equipment layout to build and sustain competitive advantage and operational excellence.

Within the context of the South African environment, Sambil, Matimba, Sihle, Xolani, and Sine (2019) conducted a study in selected South Africans' organisations to ascertain the influence of JIT on SMEs' performance and assess if the philosophy of JIT can be applied in South African SMEs. The study was based on an explanatory research design and deployed the correlation technique of data analysis. It was revealed that firms in South Africa (SA) are test running the JIT application and eventually exhibiting a high level of improvements in monetary terms, employee morale, and customer loyalty. Indeed, the level of productivity in SA SMEs has been greatly influenced positively by JIT production system. Hence, JIT is a robust and applicable principle to adopt by firms in that there are a lot of benefits to derive from it. Ovunda, Isaac, and Ndor (2019) ascertained the degree to which production planning/control has been applied and implemented in the beverage industry of Nigeria as well as how PPC application has enabled the studied firms to reduce cost of operations as well as other operating expenses. Three firms were studied within the industry and a sample of 97 participants were selected from the studied firms. The findings showed that PPC is used by the firms for decision making and there was an effective application of PPC in the studied firms. Furthermore, it was revealed that PPC is significantly instrumental in minimising cost of operations.

Wen-Hsien and Yin-Hwa (2018) conducted a study in the tire manufacturing industry and proposed a production planning/control framework in a carbon tax Industry. The study adopted a mathematical programming model (Activity Based Costing) and theory of constraints for production planning for achieving optimal solution under various production/sale constraints to obtain the optimal product mix that maximises profit. The application of the model was demonstrated using an illustrative example. It was revealed based on the sensitivity analyses and optimal solution that by increasing carbon taxes and the prices of raw materials, profitability was affected. Using a survey research design, Okah, Nduka, and Ugwuegbu (2018) evaluated production planning effect on firms' effectiveness in the Nigerian food and beverage industry. The firms' effectiveness was proxied by Sales volume, inventory cost minimisation, and customer satisfaction. Primary data were collected with the aid of self-administered questionnaire's copies. The study adopted Chi-square for data analysis and production planning was revealed to have had a positive and significant influence on sales volume, inventory cost reduction, customer satisfaction. It implies that a firm's effectiveness is greatly affected by production planning. Therefore, demand forecasting and material requirements planning must be carried out by manufacturing firms in a bid to identify and meet the needs of customers.

Research hypotheses and conceptual Framework

The following hypotheses were stated and tested in the course of the study:

H_1: Material requirement planning has a significant effect on organisational performance.

H_2: Quality control has a significant effect on organisational performance.

H_3: Inventory management has a significant effect on organisational performance.

H_4: Just-in-time production has a significant effect on organisational performance.

Based on the hypotheses formulated, and the method of data analysis deployed (structural equation modeling) a research conceptual framework is developed:

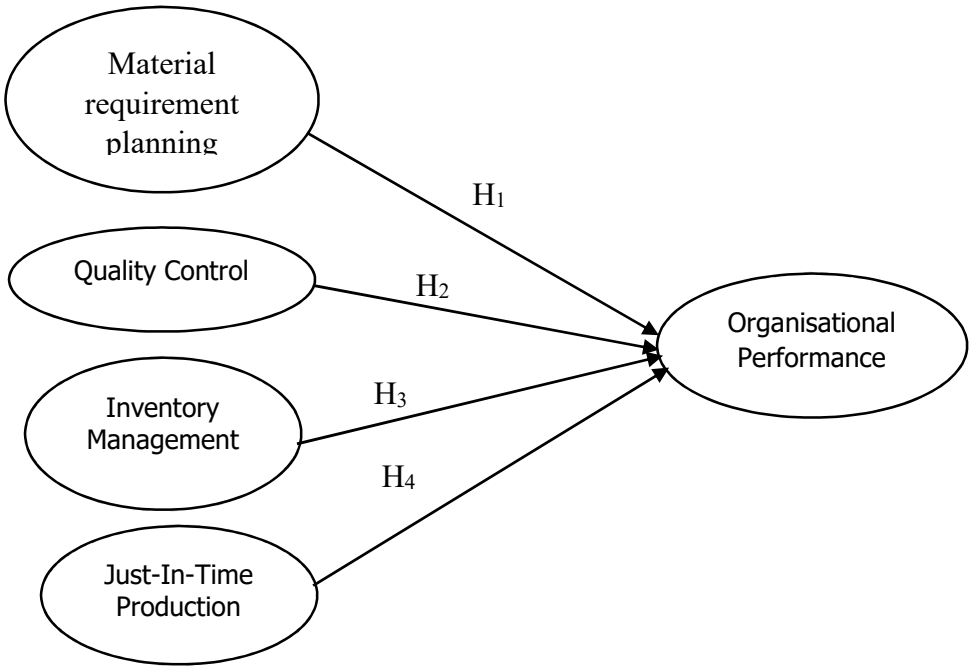


Figure 1: Authors' Conceptual framework of production planning and control on organisational Performance.

Source: Field Survey, 2022

3. Methodology

The research adopted descriptive survey research design to assessed production planning and control effect on organisational performance in the cement manufacturing industry in Nigeria. The design was adopted because it helps in utilising data collection techniques that yields results concerning the measure of central tendency, variation and correlation, and structuring investigations aim at identifying variables and their relationship. The population of the study included 768 employees in the production, quality, procurement, and sales/marketing departments of Dangote Cement Plc, and Lafarge Cement Nigeria Plc. The firms were purposively selected and used for the study because of their viability and active role in the industry. The total number of employees in the selected departments in both firms are seven hundred and sixty-eight (768). To determine the sample size, Taro Yamane's formula (1967) was used thus:

$$n = \frac{N}{1 + N(e)^2}$$

Were

n = Sample size

N = Population size = 768

e = Margin of errors = 5% = 0.05

$$n = \frac{768}{1 + 768(0.05)^2}$$

$$n = 263$$

Hence, the sample size used by the study is 263.

The instrument of data collection was questionnaire. It was used because it facilitates data collection for inferential and descriptive statistical analysis, for effective decision making in organisation. It also assures confidentiality of respondents

and elicited more truthful responses. The questionnaire was segmented into two parts. The first part was based on the demographic characteristics of those to respond, such as gender, age, qualification, years of service, department, and position. The second part deals with questions associated with PPC and performance variables. In the second section also, five-points Likert's Scale was adopted: (5) strongly agree, (4) agree, (3) undecided, (2) disagree, (1) strongly disagree.

Table 1: Items adapted from Ngugi, Kimutai, and Kibet (2019); Alfred et al. (2018); Faraz and Danish (2019).

Constructs	Items
Material Requirement Planning	My firm has efficient and effective budgeting and planning for raw materials required for production.
	There is production efficiency in my company through the effective workflow.
	The production rate in my company has been optimised through on-time delivery of raw materials.
	My company has increased its sales level through on-time delivery of finished products to customers.
Quality Control	My firm facilitates the quality of its products through effective process management.
	My firm enhances quality performance through a robust quality inspection technique.
	There is a low rate of product defects in my firm through effective quality improvement.
	Production efficiency is facilitated in my firm through skilled employees.
Inventory Management	My firm has minimised cost of holding inventory through effective **i**nventory control system
	My firm has enhanced sales revenue through efficient demand management**.**
	There is a low cost of operations in my firm through effective capacity utilisation.
	My firm has improved its profit performance via inventory accuracy
Just-In-Time Production	My company has an efficient work method that eliminates errors in the production process.
	My company purchases quality materials for production through a network of reliable suppliers.
	My company ensures smooth production run through an effective layout plan.
	My company minimises the rate of products defects through effective productive maintenance.
Firm Performance	The productivity rate in my firm is excellent.
	The delivery time of my firm's products is satisfactory.
	The profit performance of my firm is good.
	There is a relatively low cost of inventory in my firm.

Source: Field Survey, 2022

Prior to the testing of the hypotheses, a pilot study was carried out to assess the viability of utilising a questionnaire before the main data analysis on the effect of production planning and control on organisational performance. The goal of pilot trials is to give sufficient certainty to permit the conduct of a bigger and final experiment (Lee, Whitehead, Jacques & Julious, 2014). The study conducted a pilot study to ensure that its instrument was valid and reliable. To test the validity and reliability of the research instrument, respondents who were not part of the sample size in the target population received and completed fifty (50) copies of the questionnaire. First-order Confirmatory Factor Analysis (CFA) was deployed to assess the Composite Reliability (CR) and construct validity (convergent and discriminant validity) of the research instrument. Descriptive and inferential statistical tools were used with the aid of the Statistical Package for Social Sciences, (SPSS) version 23 and Analysis of Moments Structures (AMOS) Graphics.

Descriptive statistics was deployed to achieve the frequency distribution, percentage, mean, and standard deviation results of respondents' responses. Inferential statistics (Covariance-Based Structural Equation Modelling) was deployed with AMOS Graphics to model and analyse the relationships that existed among the latent constructs (material requirements planning, quality control, JIT production, inventory management, and organisational performance). As such, the hypotheses developed were tested using covariance-based structural equation modelling analysis to achieve the objectives of the study.

A linear regression model was developed by this study to estimate the coefficients of the predictor variables (material requirement planning, quality control, just-in-time production, inventory management) The model is as stated below:

DY = f (MRP, QC, IM, JIT) ……..eqn (i)

Written in a linear mathematical form as:
$DY = \beta_0 + \beta_1 MRP + \beta_2 QC + \beta_3 IM + \beta_4 JIT + E$…… eqn (ii)
Where:
DY: Organisational Performance
MRP: Material Requirement Planning
QC: Quality Control
IM: Inventory Management
JITP: Just-in-time Production
E: Error terms
$\beta_1, \beta_2, \beta_3, \beta_4$ = Coefficient

4. Result

The demographic characteristics of respondents, first order factor analysis for assessing the validity and reliability of instrument; and structural equation modelling test's results are discussed in this section.

Table 2: Respondents' Profiles

Responses	Frequency	Percent (%)
Gender		
Male	143	63.3
Female	83	36.7
Total	**226**	**100.0**
Age		
22-31yrs	66	29.2
32-41yrs	96	42.5
42-51yrs	45	19.9
52yrs and above	19	8.4
Total	**226**	**100.0**
Marital Status		
Single	103	45.6
Married	123	54.4
Total	**226**	**100.0**
Qualification		
ND/Equivalent	50	22.1
HND/B.Sc	131	58.0
PGD/M.Sc	45	19.9
Total	**226**	**100.0**
Years of Service		
1-5yrs	66	20.6
6-10yrs	122	44.5
11 yrs and above	38	34.9
Total	**226**	**100.0**
Position		
Top-level Manager	53	23.5
Middle-level Manager	118	52.2
Lower-level Manager	55	24.3
Total	**226**	**100.0**
Department		
Production	46	20.4
Quality	83	36.7
Procurement	67	29.6
Sales//Marketing	30	13.3
Total	**226**	**100.0**

Source: Field Survey, 2022

First order Factor Analysis

In order to evaluate the measurement model of the constructs, the study carried out first order confirmatory test. The factor loading of each item was significant. This implies that the factor loading was fit for use to evaluate the study's

instrument validity and reliability. The Average Variance Extracted (AVE), Cronbach's Alpha, and composite reliability were computed in order to evaluate internal validity and reliability of the model. The convergent validity was supported by calculating the AVE of the latent constructs adopted individually in the study and the threshold for convergent validity's value of AVE of the latent constructs should be ≥ 0.5 (Hair, Black, Babin, &. Anderson, 2010). Moreover, the reliability of the research's instrument was tested to evaluate its internal accuracy and consistency by implementing the Cronbach's Alpha and composite reliability test to demonstration the common variance among the predictor variables of the hidden constructs. According to Nunnally and Bernstein (1994), the threshold for Cronbach's Alpha and CR is that the value of the Cronbach's Alpha and composite reliability of a hidden construct should be ≥ 0.7. As revealed in Table 3, the Cronbach's Alpha and composite reliability (CR) of the study's instrument is > 0.7; the average variance extracted (AVE) is > 0.5, thus, confirmed the internal accuracy and convergent validity of the constructs.

Table 3: Measurement model evaluation

Latent Variable	No of Item	Factor Loading (min-max)	CR	Cronbach's Alpha	AVE
Material Requirement Planning	4	0.69 – 0.894	0.890	0.883	0.671
Quality Control	4	0.611 – 0.765	0.806	0.806	0.512
Inventory Management	4	0.727– 0.911	0.897	0.902	0.689
Just-In-Time Production	4	0.60 – 0.939	0.885	0.875	0.664
Firm Performance	4	0.661 – 0.963	0.851	0.844	0.594

Source: Authors' Computation, 2022

The study applied the confirmatory factor analysis (CFA) to establish and ensure unidimensionality. The fit indices for the unidimensionality are presented in Table 3.6.2

Table 4: 'Measurement model of fit indices'

'Fit indices'	Value	Recommended Value
Absolute fit measure		
χ2/df	1.87	< 3
GFI	0.843	> 0.90
NFI	.0.903	> 0.90
TLI	0.921	> 0.90
CFI	0.944	> 0.9
RMSEA	0.061	< 0.08

Source: Authors' Computation, 2022

The measurement model results showed the acceptable fit's indices and proved unidimensionality. This showed that the research instrument has content validity. For discriminant validity, the study used the benchmark suggested that the square root of the AVE of the construct should be greater than the correlation shared between the construct and other constructs in the model (Lin & Chen, 2008). Table 3 also showed the correlations among the constructs with the square root of the AVE on the diagonal. It is observed that the constructs fulfilled the cut-off mark of discriminant validity, as the values of the square root of AVE of the diagonal values (in bold) for the individual construct is greater than the inter-correlation's values of the hidden constructs.

Arising from the validity and reliability test's results, the constructs scale was considered to have had decent measurement properties, thus, the research instrument was employed to collect the data required for the study.

Table 5: Discriminant Validity

Latent Variables	MRP	QC	IM	JIT	FP
Material Requirement Planning	0.819				
Quality Control	0.711	0.716			
Inventory Management	0.430	0.701	0.830		
Just-In-Time Production	0.229	0.430	0.218	0.815	
Firm Performance	0.045	0.030	0.050	0.186	0.771

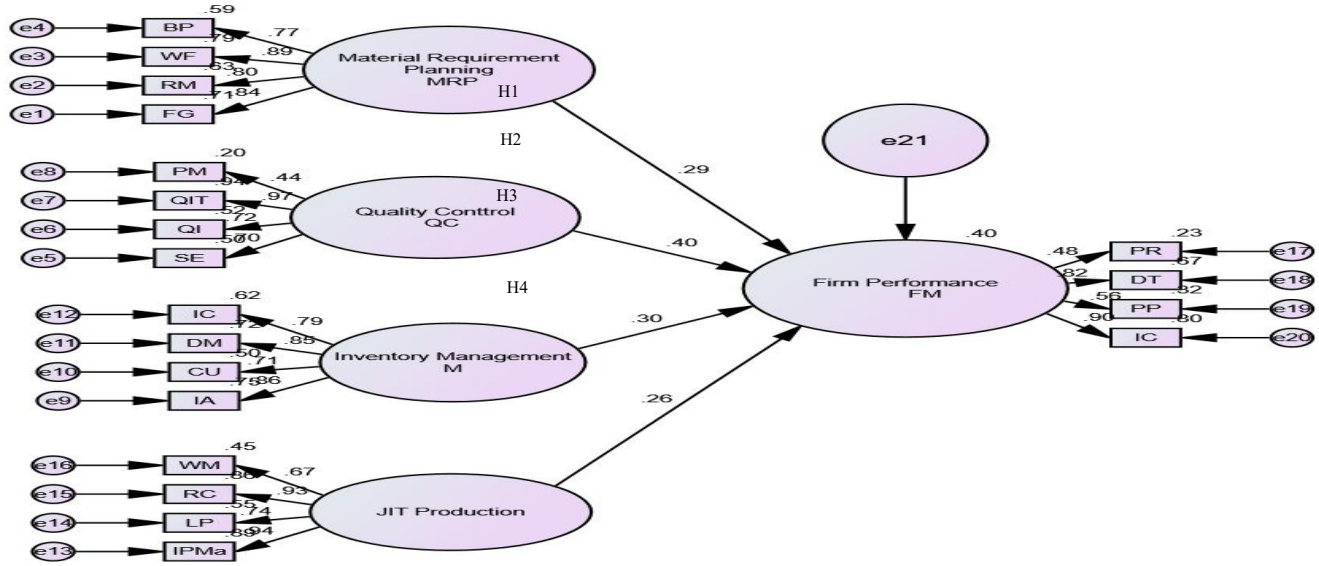
'Off-diagonal elements are correlations between constructs, while the diagonal and bold elements are the square root of AVE between the latent constructs and their measures'

Source: Authors' Computation, 2022

Testing the research hypotheses

The study deployed the structural equation modeling technique via analysis of moments structures graphics version 22 to test the hypotheses formulated. Also, path analysis was conducted to examine the hidden exogenous variables (material requirement planning, quality control, just-in-time production, inventory management) effect on the hidden endogenous variables (firm performance). The condition for testing and accepting and rejecting hypothesis was that 'when the t-statistic is ≥ 1.96 and P-value is less than 0.05 ($p < 0.05$) level of significance, the null hypothesis is rejected and when the t-statistic is ≤ 1.96 and P-value is greater than 0.05 ($p > 0.05$) level of significance, the null hypothesis is accepted'. Below is the structural model for the study:

Figure 2: Structural Model for Production Planning and Control and Firm Performance.



Source: Authors' Computation, 2022

Figure 2 above shows the path diagram results of the structural modeling analysis via AMOS Graphics. In terms of variance accounted, the structural model illustrates the effect of external latent constructs on internal latent constructs (Hulland, 1998). A single-headed arrow (path) was used to signify the contributing effect in the structural equation model. The path is drawn from the hidden independent variables directing to the hidden dependent variable and the location of the arrow confirmations that 'material requirement planning, quality control, just-in-time production, inventory management are hypothesised to have had a significant effect on firm performance'. Two values are used to determine the explanatory power of the model: squared multiple correlations (R^2) and path coefficient. The path coefficient shows the strength of the

associations between independent and dependent constructs, while R^2 tells the amount of variance an endogenous variable denotes in the model. Endogenous R^2 is defined as strong if it is = 0.26, moderate if it is = 0.13, and weak if it is = 0.02 (Chin, 1998). The structural model's R^2 score of this study is 0.40, indicating that PPC has significant explanatory effect on firm performance.

Table 6: The fitness of the Structural Model

Goodness of fit Statistic	Structural Model Values	Recommended * values for good fit
χ2 /df	2.441	< 3.00
NFI	0.900	> 0.9
TLI	0.904	> 0.9
CFI	0.934	> 0.90
RMSEA	0.073	< 0.08

Source: Authors' Computation, 2022

The indices adopted for achieving the fitness of the structural model show satisfactory fit with their corresponding values greater than the recommended values. Therefore, the structural model has a good fit.

Table 7: Construct Structural Model (PPC Techniques and Firm Performance)

Link in the model	Hypothesis	Path Coefficient	t-stat	p-value	Result
MRP ----> P	H_1	0.29	2.617	0.009	Accepted
QC ----> P	H_2	0.40	3.141	0.002	Accepted
IM ----> P	H_3	0.30	2.681	0.007	Accepted
JIT ----> P	H_4	0.26	2.445	0.014	Accepted

Source: Authors' Computation, 2022

Table 5 shows the condensed path coefficients of the hidden independent constructs (material requirement planning, quality control, just-in-time production, inventory management) on the hidden dependent constructs (firm performance), pulled-out of the structural model in figure 1. The result showed that the four hypotheses were accepted with t values > 1.96 and p-values < 0.05 level of significance.

Discussion of Findings

The study investigated the effect of production planning and control on firm performance in the cement manufacturing industry in Nigeria. The findings are in line with most previous studies. All the null hypotheses tested were rejected with p-value less than the significant level of 0.05. Findings reveal that material requirement planning has a significant and positive effect on firm performance. By implication, the successful implementation of MRP has aided robust budgeting and planning for on-time delivery of raw materials required to facilitate production. This in turn enhances the sales revenue through on-time delivery of finished products to customers. This finding is in line with Ngugi, Kimutai, and Kibet (2019), study's finding that MRP had a significant effect on Kenya's manufacturing company performance. The study found that using MRP in the production sector helps to track inventories such as spare parts, work in progress, raw materials, and among other things allows production to run smoothly.

The findings also corroborate with the study of Roumiantseva and Netessinet (2017) which revealed that using an MRP system enhances production speed, material flow efficiency, and information execution across the manufacturing process. In a similar vein, it agrees with Millicent (2017) findings that materials requirement planning has a significant impact on the pharmaceutical company's operations in terms of cost reduction in Kenya.

The findings also revealed that quality control has a significant and positive effect on firm performance. This finding is an indication that a robust quality inspection technique optimises the quality performance of products based on investigation in the studied firms. Achieving quality performance would be difficult without effective process management and having the skilled personnel in place to man production to minimise product defect rate. This finding supports the finding of Osuolale, Tijani, and Bakare (2018), who found a link between quality control and SMEs' success. This is also consistent with Al-Mubarak (2016), Monday, Olusegun, and Bajomo (2015), who identified the following components as

indicators of a firm's performance; continuous improvement, process management, leadership, customer focus, training, employee relations, product/service design, and supplier relationship.

Furthermore, the study revealed that inventory management has significant and positive effect on firm performance. This result is consistent with that of Etale and Bingilar (2016), who looked at the impact of inventory cost and reorder point management on the profitability of Nigerian listed brewing firms whose results indicated that effective inventory management has favorable impact on the profitability of Nigerian brewery firms. The study also revealed that costs of raw material, work in progress, and finished goods had a strong positive connection with brewery profitability in Nigeria. As a result, it has been established that effective inventory management has a beneficial impact on profit. Similarly, the finding supports the study of Torky, (2020), which revealed that a company's profitability has a strong link with inventory management, implying that efficient inventory management assures higher profitability, whereas poor inventory management correlates to poor financial performance.

Finally, the finding revealed that just-in-time production has a significant and positive effect on firm performance. This implied that the studied firm was able to minimise the cost of inventory and production through quality raw materials for production, smooth production run, and effective productive maintenance. This finding supports the finding of Ngugi *et al.* (2019), who found that the Just-in-time system had an impact on manufacturing company performance in Eldoret Town, Kenya. According to Mulandi and Ismail (2019), JIT system has a favorable and substantial association with company performance. They concluded that most businesses have adopted the JIT approach to managing their production and inventory because of its potential to minimise waste. This finding is consistent with the findings of Tewari, Singh, and Tewari (2016) that highlighted three essential and fundamental concepts that JIT is founded on: waste elimination, continual quality improvement, and promoting worker engagement in both planning and execution. According to John, Etim, and Ime (2015), the JIT method necessitates strong coordination and communication between the company and its suppliers to ensure that necessary products arrive on time. JIT, according to Folinas, Fotiadis, and Coudounaris (2017), necessitates continual development, waste removal, and people participation.

5. Conclusions

From the results of the study, the paper concludes that production planning and control has substantial effect on organisational performance in the Nigerian cement manufacturing firms. The specific conclusions include: material requirement planning has substantial effect on organisational performance because an effective material requirement planning is mandatory to ensure efficient manufacturing system. Quality control has a significant and positive effect on organisational performance. Strategic control of quality would enhance the quality delivery and satisfy the delivery time required by the customers. Inventory management has a significant and positive effect on organisational performance. Effective inventory management via stock availability, inventory accuracy, and capacity utilisation would optimise the profit earnings of firms. Just-in-time production has a significant and positive effect on organisational performance. Quick conversion of raw material into finished goods minimises cost of holding stock of raw materials, which by implication will minimise the cost of production.

5.1 Implication and Contribution to Knowledge

The study makes some vital contributions by closing the gap in the existing literature. The study's findings would assist production managers to develop production planning system that would facilitate smooth production runs to ensure quick production and delivery of products to customers. By implication, firms' competitiveness would be solidified and a satisfactory level of profitability would be achieved. The study also contributes to knowledge for future academics and researchers by improving on existing literature on production planning and control in both manufacturing and service sectors.

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