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Working Capital Management and the Financial Performance of Manufacturing Firms in Nigeria

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Abstract
This study explored the influence of working capital components on the financial performance of manufacturing firms in Nigeria. The study adopted secondary data using panel data of ten-selected manufacturing companies (10 cross-sections) for a period of nine (9) years from 2012 to 2020 making up ninety (90) data points. This study uses the account receivables period, cash conversion cycle, inventory conversion period and accounts payable period as working capital indicators and returns on assets as a financial performance indicator. In order to test the cause-effect relationship between the dependent and independent variables, three widely used panel data regression models (fixed effect, random effect, and pooled OLS technique) were adopted. However, the fixed effect outperformed the other models and hence was used to analyze data generated from the statement of financial position and income statement of selected manufacturing companies. The results from the study shows that account receivables period (ARP) have a negative ($\beta_1 = -0.000834757$) and significant ($p < 0.05$) effect on return on asset (ROA), cash conversion cycle (CCC) have a negative ($\beta_2 = -5.56027e\text{-}08$) and insignificant ($p > 0.05$) effect on return on asset (ROA), inventory conversion period (ICP) have a negative ($\beta_3 = -0.000666007$) and significant ($p < 0.05$) and accounts payable period (APP) have a negative ($\beta_4 = -3.57208e\text{-}05$) and insignificant ($p > 0.05$) effect on return on asset (ROA). The findings from the fixed effect regression revealed that the account receivables period, cash conversion cycle, inventory conversion period, and accounts payable period has a negative impact on return on assets. This study recommends that the managers of manufacturing firms in Nigeria should enhance firm profitability by reducing the cash conversion cycle to an optimal level, trying as much as possible to collect receivables so that they can have available cash to reinvest and can prevent cash from getting eroded by inflation. The study further recommends that managers should shorten inventory conversion and accounts payable period to a reasonable extent by processing and selling goods more quickly and speeding up payments to suppliers.

Keywords: *Account Receivables Period, Accounts Payable Period, Inventory Conversion Period, Cash Conversion Cycle, Returns on Assets*

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I. Introduction

Every organization, either profit-oriented or otherwise, requires funds to finance its operations. The needed fund may be for capital investment or working capital. This fund is referred to as capital. While capital investment refers to the firm's investment in long term assets, working capital refers to the firm's investment in short- term assets. Working capital is described as an investment of the firm's capital in current assets and the

use of current liabilities to fund part of the investments. It could also be described as money utilized by business firms in their daily activities or operations, represented by their net current assets (Adeniji, 2008).

Management of these current assets and current liabilities in any organization is essential as it affects the liquidity and profitability of the firm (Christopher and Kamalavalli, 2009). If a firm can minimize its investment tied up in current assets, the resulting funds can be invested in value-creating projects, thereby increasing its growth opportunities and shareholders' return. Large inventory and a generous trade credit policy may lead to higher sales. A larger inventory reduces the risk of a stock-out. Trade credit may stimulate sales because it allows customers to assess product quality before paying (Adeniji, 2008). However, underinvestment in working capital could be disastrous. If capital invested in cash, trade receivables, or inventories is not sufficient, the firm may have difficulty carrying out its daily business operations. This may result in declining sales and, by extension, a reduction in profitability. Decisions relating to working capital and short term financing are referred to as working capital management. In other word, it is the management of current assets and current liabilities in an organization.

According to Pouragha and Emamgholipourarchi (2012), working capital management is one of the crucial components of financial management which directly impacts corporate performance. Working capital management involves the ability of a company to manage its current assets and current liabilities in a more efficient manner that provides maximum return on assets (Jagongo and Makori, 2013). Sound working capital management policies improve firms' profitability and market value, and their negligence may lead to operational challenges (Christopher and Kamalavalli, 2009). Working capital management aims to ensure that firms can manage their operational expenses and meet their short term debt obligations by maintaining adequate cash flows. Therefore finance managers must adopt suitable approaches to working capital management to increase firms' profitability and create value for their investors. Though profitability is a significant goal of firms, insolvency problems may occur when firms concentrate too much on profitability at the expense of liquidity. Therefore, working capital management seeks to maintain a balance between the components of working capital (Gitmen, 2009). The lack of understanding about the impact of working capital on profitability and the inability of management to plan and control its components may lead to insolvency and bankruptcy (Gill, 2011).

The contemporary competitive business environment demands efficient use of resources, underscoring the importance of working capital management. It has been widely accepted that the profitability of a business concern largely depends upon how its working capital is managed (Brigham and Houston, 2003). The inefficient management of working capital reduces profitability and may ultimately lead to distress and financial crises in an organization. Egbide (2009) noted that many business failures in the past had been blamed on the inability of the financial managers to plan and control the working capital of their respective firms. These reported inadequacies among financial managers are still being practiced today in many manufacturing firms in Nigeria in the form of high bad debts, high inventory costs, and others, which adversely affect their operating performance. Inefficient working capital management may reduce profitability and lead to financial crises and their associated effects. This has led to the desire to establish the effect of each of the components of working capital on the performance of manufacturing firms in Nigeria. Therefore, the main objective of this study is to examine the relationship between working capital components and the profitability of manufacturing firms in Nigeria. Specifically, the study seeks to:

i. evaluate the influence of account receivables period on the profitability of manufacturing firms in Nigeria;
ii. examine the influence of the account payable period on the profitability of manufacturing firms in Nigeria;
iii. evaluate the relationship between inventory conversion period and the profitability of manufacturing firms in Nigeria; and
iv. investigate the impact of the cash conversion cycle on the profitability of manufacturing firms in Nigeria.

The relationship between working capital components and corporate profitability, when established, would, in addition to extending the frontiers of knowledge, assists managers of companies, especially those of manufacturing firms, to establish an optimal working capital mix that maximizes the firm's value, while at the same time optimizing the balance between liquidity and profitability in their companies. Policy formulators and regulatory agencies such as the Securities and Exchange Commission (SEC) and the Nigerian Stock Exchange (NSE) may also use the outcome of the study as a platform to formulate policies on liquidity issues, where necessary, especially for listed firms in Nigeria.

Following the introduction in section one, the structure of the remaining part of the paper is as follows: section two reviews the relevant literature and develops the study's hypotheses. Section three discusses the research methodology, highlighting the data of the study and model specification, while section four presents the

analysis of data and research findings. Section five concludes the research by summarizing the findings' salient aspects, highlighting the policy implication of the findings, and providing valuable recommendations.

II. Literature Review and Hypotheses Development

Working capital, according to Khan and Jain (2005), is the funds locked up in materials, work in progress, finished goods, receivables, and cash and cash equivalent. Thus, they defined working capital as capital invested in current assets, which are those assets that can be converted into cash within a short period of time and the cash received is again invested into the assets. Working capital management is therefore, the managerial accounting strategy that focuses on maintaining efficient levels of both components of working capital - current assets and current liabilities (Adeniji 2008). An efficient management of working capital components is aimed at increasing the profitability of a company, as well as ensuring that the company has sufficient liquidity to meet short-term obligations as they fall due and so continue in business. The basic working capital components which should be managed efficiently includes the account receivables or debtors collection period, accounts payables or creditors payment period, inventory management, cash and cash equivalents and the operating cycle of a firm. Studies have examined the relationship between these working capital components and firm profitability. However, despite the intuition that effective working capital management leads to increased profitability by firms, there has been lack of conclusive evidence on this linkage, as evidenced by the review below.

Accounts receivables period is the average time taken by credit customers to settle their accounts. In working capital management, account receivables are a very important component of current assets and the management of this component, to a greater extent, defines the managerial efficiency of a firm. Generally, credit facilities are offered to customers to increase turnover and maximize profits. Hence, longer credit terms will increase turnover, and by extension profitability. However, if a firm takes more time in collecting receivables, the profitability of the firm will decline, as longer credit terms will also increase the risk of bad debts and the costs of debt collection. These costs will negatively affects profitability. Studies on account receivable period have demonstrated conflicting correlation with profitability. For instance, Napompech (2012) on Thailand listed firms found a strong negative relationship between account receivable period and its profitability. The study suggested that one possible way to increase profitability and create shareholder value is to reduce firm's account receivable period. This view is supported by several other studies, including Amarjit, Nahum and Neil (2010), and Falope and Ajilore, (2009). On the other hand, Olufisayo (2012), in a study on Nigerian firms found that account receivables period has a positive relationship with profitability. Thus, the first hypothesis of the study is that "account receivable period do not have significant influence on the profitability of manufacturing firms in Nigeria".

Account payable period is the average time taken by a firm to pay its suppliers. Extant literature shows mixed results regarding account payable period and profitability. In a study of companies listed on the Karachi Stock Exchange, Raheman and Nasr (2007) use a sample of 94 firms for a period of 6 years (1999-2004) and investigated the effects of account payable period on profitability. The results of the study found a strong negative relationship between accoun payable period and companies' profitability. An empirical study from Ghana by Samuel and Benjamin (2011) focused on the working capital management practices and profitability of banks also found that creditors' payment period exhibits a significantly opposite relationship with profitability. Uremadu, *et al.* (2012) also discovered a negative relationship between profitability and creditors' payment period. Nevertheless, a study by Khan *et al.* (2012) on the effect of working capital management on firms' profitability in Pakistan between the period of 2004 and 2009 using textile, chemical, engineering and sugar and allied sectors showed that average payment period have a positive significant relationship Net Operating Profit. This position is supported by Lazaridis and Tryfonidis (2006), who argued that the longer a firm delays its payment the higher the working capital levels it reserves and is used in order to increase profitability. In view of the mixed conclusions, the second hypothesis of the study is that "account payable period do not have significant influence on the profitability of manufacturing firms in Nigeria".

Inventory conversion period, otherwise called inventory turnover, is the average time required to convert materials into finished goods and then to sell those goods. This working capital component helps in evaluating the efficiency in inventory management policy of the firm. A higher inventory conversion period implies that the firm is holding excessive inventory. Excessive inventory increases the stock holding costs, the cost of obsolescence, and the opportunity cost of excess working capital tied up on excess inventory. These costs will reduce the firm's profitability. At the same time, excessive inventory may reduce stock-out costs and lost goodwill of the firm, resulting into increase in profitability. Hence, the association between inventory conversion period and firm's profitability is controversial. Raheman and Nasr (2007) studied the relationship between working capital management and corporate profitability for firms listed on Karachi Stock Exchange using static measure of liquidity and ongoing operating measure of working capital management during 1999-2004. They found a negative relationship between inventory conversion period and profitability. Similarly,

Hayajneh and Yassine (2011) and Deloof (2003) also found negative relationship between inventory conversion period and firm profitability. On the contrary, Sharma and Kumar (2011), on Indian companies, found a significant positive relationship between inventory conversion period and corporate profitability. David (2010), reasoning in line with Sharma and Kumar (2011), argued that high inventory levels reduce costs of possible interruptions in the production process and loss of business due to scarcity of products. This is supported by Taleb *et al.* (2010), resulting into the development of the third hypothesis that "inventory conversion period do not have significant influence on the profitability of manufacturing firms in Nigeria".

Cash management is one of the most critical tasks of financial management. It is concerned with optimizing the amount of cash available, maximizing the interest earned by spare funds not required for immediate use and reducing losses caused by delays in the transmission of funds (Uyar, 2009). Cash conversion cycle is the period of time between when cash is expended on the purchase of raw materials and when cash is received from the sale of finished goods. A firm with longer cash conversion cycle will require a larger working capital for its operations than a firm with a shorter cash conversion cycle. Companies hold cash for a number of reasons, ranging from transactions, precautionary to speculative reasons. The length of the cash conversion cycle could positively or negatively affects profitability. Holding sufficient cash to meet short-term financial obligations incurs an opportunity cost equal to the returns which the idle cash could have earned if invested. However, holding small amount of cash will reduce this opportunity cost, but will increase the risk of being unable to meet financial obligations as they fall due. Therefore, the influence of cash conversion cycle on profitability is mixed. Lyroudi and Lazaridis (2000) examined food industry in Greek to assess the influence of cash conversion cycle (CCC) on profitability. Their study found a significant positive relationship between the cash conversion cycle and return on assets and the net profit margin. Lazaridis and Tryfonidis (2006) investigated the relationship of corporate profitability and working capital management for firms listed at Athens Stock Exchange. Their results showed a statistically significant positive relationship between profitability measured by gross operating profit and the cash conversion cycle (CCC). They conclude that, managers can create profit by correctly handling the cash conversion cycle and by keeping each component of the cash conversion cycle at an optimal level. Several other researchers also argue in favour of a direct and positive relationship between a longer cash conversion cycle and profitability. Shin and Soenen (1998) argues that a firm could have larger sales volume with a generous credit policy that extends cash cycle. In that case, the longer cash conversion cycle may result in higher profitability. Additionally, Similarly, Deloof (2003) opine that a longer cash conversion cycle might increase profitability because it leads to higher sales. Quayyum (2012) also concur to this line of reasoning. However, a study by Alipour (2011) on the Tehran Stock Exchange, to examine the relationship between cash conversion cycle and corporate profitability, found a significant negative relationship between cash conversion cycle and corporate profitability in Iran. A study by Garcia *et al.* (2011) on European companies using a sample of 2, 974 non-financial companies listed in 11 European stock exchanges for a period of 12 years (1998-2009), also found a significant negative relationship between gross operating profit and cash conversion cycle. They concluded that, managers can create positive value for shareholders by reducing the cash conversion cycle. In view of the contradictory relationship between cash conversion cycle and profitability, the fourth hypothesis of the study is that "cash conversion cycle do not have significant influence on the profitability of manufacturing firms in Nigeria".

III. Methodology

An *ex-post facto* research design is adopted for the study. The design is considered most appropriate because it allows for the use of previously gathered data for the measurement of the statistical association between working capital components and the profitability of manufacturing firms in Nigeria. The study population covers 48 manufacturing firms that are listed on the Nigerian Stock Exchange as at December 31, 2020. Convenience sampling technique is used to select ten (10) companies out of the population of the study, based on availability and accessibility to their annual reports for the study period, covering 2012 to 2020. The list of the sampled manufacturing firms is as attached in Table 3.1

Table 3.1 Sample Firms

S/N	Company
1	NESTLE NIGERIA PLC
2	DANGOTE GROUP
3	UNILEVER NIGERIA PLC
4	NIGERIAN BREWERIES PLC
5	PZ CUSSONS NIGERIA PLC
6	LAFARGE AFRICA PLC
7	GUINNESS NIGERIA

8	UNITED AFRICA COMPANY OF NIGERIA-UACN
9	MAY & BAKER NIGERIA PLC
10	CADBURY NIGERIA PLC

Source: Researchers' Compilation (2022)

The study is based on secondary data, sourced from annual reports and accounts of the sampled manufacturing firms. The variables of interest examined in this study are grouped into two main categories: dependent variable and independent variables. The dependent variable is profitability of the manufacturing firms in Nigeria, proxied by return on assets (ROA), while account payables period (APP), account receivables period (ARP), inventory conversion period (ICP) and cash conversion cycle (CCC) constituted the independent variables. All the variables of the study, their measurements and their codes are summarized in Table 3.2

Table 3.2 Variables of the Study

Variables	Measurement	Code
Dependent Variable		
Return on Assets	Profit for the year divided by total assets	ROA
Independent Variables		
Account Payable Period	(Account Payable/Cost of goods sold) x 365	APP
Account Receivable Period	(Account Receivable/Turnover) x 365	ARP
Inventory Conversion Period	(Inventory/Cost of goods sold) x 365	1CP
Cash Conversion Cycle	ARP + ICP – APP	CCC

Source: Researchers' compilation (2022)

To test the stated hypotheses, a functional relationships based on the multiple regression analysis is developed as follows:

$$ROA_{it} = \beta_0 + \beta_1 ARP_{it} + \beta_2 APP_{it} + \beta_3 ICP_{it+} \beta_4 CCC_{it} + e_{it} \quad \text{Equation (3.1)}$$

Where:
ROA = Return on Assets
ARP = Account Payable Period
APP = Account Receivable Period
ICP = Inventory Conversion Period
CCC = Cash Conversion Cycle
i,*t* = Firm *i* in year *t*;
e = Error component which assumed to capture the influence of other exogenous factors that are capable of influencing the dependent variable.
β_0 - Constant coefficient, $\beta_1 - \beta_4$ = Regression coefficients
The study adopts an econometric analysis using the panel linear regression methodology consisting of periodic and cross sectional data in the estimation of the regression equation. In this model, account receivables period, cash conversion cycle, inventory conversion period and accounts payable period are used as working capital indicators while returns on assets is used as a financial performance indicator. A stationary test is performed to avoid spurious regression problems normally associated with time series econometric modeling using the Levin, Lin and Chu t*, ADF - Fisher Chi-square and PP - Fisher Chi-square techniques for estimating unit roots. This is to establish whether the panel time series data is stationary or not. In order to test the cause effect relationship between the dependent and independent variables, three widely used panel data regression models (fixed effect, random effect technique and pooled OLS) are adopted. To decide among fixed or random effects and pooled OLS, the study firstly compared the random effects versus the alternative fixed effect. The summary of the selected model is given below.

Table 3.3: Selection of Panel regression Methodology

Fixed Effect	**Random Effect**	**Selection**
If no fixed effect	If no random effect	Choose the Pooled OLS
If there is a fixed effect	If no random effect	Select Fixed effect model
If no fixed effect	If there is a random effect	Choose the Random effect model
If there is a fixed effect	If there is a random effect	Use Hausman test to select the best model from fixed or random effect

Source: Park, 2011.

IV. Results and Discussion

This study uses a panel data of ten-selected manufacturing companies (Ten cross-sections) for a period of nine years from 2012 to 2020 making up ninety (90) data points. This includes data on account receivables period (ARP), cash conversion cycle (CCC), inventory conversion period (ICP), accounts payable period (APP) and return on assets (ROA) for each of the selected companies. The analysis includes the descriptive statistics, unit root test, co-integration test, Hausman test and regression analysis.

4.1 Data presentation

Table 4.1 shows data extracted from financial statement of top ten manufacturing firm in Nigeria from 2012 to 2020.

Table 4.1 Data for the Study

Company	Years	Account receivables period (ARP)	Cash conversion cycle (CCC)	Inventory conversion period (ICP)	Accounts payable period (APP)	Return on asset (ROA)
	2012	55.93203	7665	27.47187	59.4317	0.23754
	2013	36.90755	-5750	27.03958	79.71725	0.205698
	2014	56.86572	-3375	27.90062	93.36114	0.203875
	2015	58.98305	-499750	25.60798	1290.432	0.199102
Nestle	2016	48.22591	-19989	41.40987	129.7434	0.053984
	2017	46.98711	6285	35.74489	73.33607	0.198861
	2018	57.81216	4915	31.69765	82.77248	0.264935
	2019	84.58218	20698	42.76399	100.7481	0.236242
	2020	50.29042	-24735	66.39531	148.1339	0.159279
	2012	19.29356	-33046	17.54961	77.2574	0.225532
	2013	10.85803	-44283	26.14981	78.86246	0.086477
	2014	14.57618	-42602	39.78439	94.06481	0.20432
	2015	8.568936	-62935	39.42868	94.71332	0.163215
Dangote Group	2016	15.59387	-159784	49.19435	159.6035	0.118416
	2017	13.66289	-145972	42.85946	122.6606	0.122606
	2018	18.00997	-79504	43.33523	93.54509	0.230353
	2019	12.72773	-139932	46.99512	117.0031	0.11508
	2020	12.42106	-205924	38.21186	123.3099	0.136502
	2012	37.04013	-1915	47.50756	97.13095	0.153382
	2013	42.5075	11249	154.2144	128.295	0.10797
	2014	56.39255	20668	177.8388	98.92591	0.052737
	2015	62.5149	-6226	38.04639	138.9343	0.023758
Uniliver	2016	99.10558	-3652	51.67132	169.8803	0.042378
	2017	118.3391	5691	49.17622	143.1329	0.061528
	2018	118.5946	5506	54.71661	151.6807	0.080035
	2019	145.6174	1281	71.62294	209.5102	-0.07156
	2020	76.32959	-806	80.46507	161.5428	-0.04333
	2012	45.8312	-18994	49.77447	133.9562	0.099514
	2013	28.98664	-33000	41.65691	133.9374	0.170439
	2014	25.41018	-36261	39.02238	114.1197	0.121754
	2015	20.50498	-37491	38.80186	105.8668	0.106831
Nigerian Breweries	2016	23.2372	-62801	33.05025	129.3484	0.077392
	2017	21.24388	-64835	44.53045	133.3443	0.086461
	2018	35.07631	-46492	32.43509	113.902	0.050062
	2019	24.07705	-42955	43.52785	116.1443	0.019659
	2020	12.36391	-91791	38.97711	150.745	0.016525
	2012	74.24527	21005	114.5501	81.3311	0.035106
	2013	103.6715	19528	91.16147	96.04811	0.082617
	2014	103.5297	19074	101.5922	109.6277	0.071613
	2015	89.40568	21089	104.879	89.02135	0.0614
PZ Cussons	2016	81.82799	9149	101.2049	135.0028	0.031593
	2017	73.13533	4658	133.9741	185.3723	0.02139
	2018	68.20867	887	117.9888	182.1783	0.041595
	2019	65.21154	4681	140.4299	182.6571	-0.09988
	2020	43.67382	4932	143.0677	159.8704	0.024754
	2012	8.224066	-10028	53.6639	103.4979	0.096817
	2013	13.806	-9899	43.35756	93.73449	0.175484
	2014	25.77526	-16088	41.00255	87.68917	0.080645
	2015	32.06183	-20345	45.10974	104.9597	0.059597
Lafarge Cement	2016	16.22377	-59711	74.72305	190.1418	0.033703
	2017	41.70831	-29624	96.78121	187.6957	-0.05989
	2018	35.4974	-12198	79.02164	134.9598	-0.01628
	2019	14.03971	-29084	55.58993	119.4687	0.231527
	2020	7.959423	-42777	49.15593	124.8322	0.060807

	2012	31.24905	-7803	38.13066	91.93209	0.134083
	2013	46.2423	-5871	34.44077	96.98967	0.097993
	2014	70.45842	3826	45.01918	102.6895	0.112507
	2015	52.22955	-3776	33.11321	96.97397	0.097901
Guinness Nigeria	2016	94.88575	2001	46.60709	134.3305	-0.01472
	2017	66.57129	3008	66.94232	124.7944	0.013168
	2018	64.28187	13037	48.58668	79.58647	0.043836
	2019	72.21836	19277	69.89232	88.60336	0.0341
	2020	65.45633	13200	92.41099	111.7073	-0.08726
	2012	62.02673	16773	149.3034	123.4087	0.080894
	2013	63.96797	23159	123.4195	79.99822	0.056322
	2014	67.96822	29755	118.3201	59.49243	0.083952
United Africa	2015	72.82036	24935	126.1644	74.55691	0.040294
Company of Nigeria-	2016	67.13238	34073	162.6923	79.20887	0.04099
UACN	2017	66.95228	30511	124.3885	66.46112	0.007365
	2018	52.99966	25809	158.0978	77.42518	0.032351
	2019	23.11147	11345	75.07197	45.90036	0.049677
	2020	29.1616	16794	90.27982	44.09682	0.037519
	2012	80.26534	1695	88.55799	63.9276	0.00497
	2013	83.18125	1851	87.1368	64.20606	-0.01262
	2014	101.1057	2151	66.05158	55.28569	0.007783
	2015	79.4338	1681	76.34712	74.70732	0.008256
May and Baker Nigeria PLC	2016	64.30275	1330	74.43087	81.4128	-0.00476
	2017	34.56989	506	72.26601	83.91013	0.074524
	2018	57.36202	1445	66.36752	62.05683	0.042212
	2019	72.72896	1790	71.87067	63.73948	0.075424
	2020	53.09798	2462	94.80671	52.20394	0.067168
	2012	69.51863	-6309	22.22638	160.3824	0.083425
	2013	63.95666	-5395	19.18904	138.2121	0.139512
	2014	72.87322	-3257	28.60869	140.4361	0.074173
	2015	79.14334	-4002	29.6596	170.1137	0.040574
CADBURY NIGERIA	2016	60.48634	-2594	61.11945	153.1882	-0.01042
	2017	53.95719	2282	68.98576	97.76293	0.01052
	2018	38.2523	-450	59.50922	102.3274	0.029897
	2019	42.03542	974	56.26379	89.25914	0.037151
	2020	39.74002	-1811	54.0588	112.4679	0.028034

Source: Researcher's computation 2022

4.2 Descriptive Statistics of the Variables

The general characteristics of the variables used in the study is discussed in this section. The discussion focusses on data distribution, involving the mean, median, minimum, maximum, standard deviation, skewness and kurtosis of the variables. While the mean, median, minimum, maximum and standard deviation measured the central tendency of the variables, skewness and kurtosis explained the shape of the data distribution. Specifically, the skewness measures the symmetry of distribution while kurtosis measures the peakedness or flatness of the distribution (height), as compared to normal distribution (Hair *et al.*, 2010). Table 4.2 showed the summary of the descriptive analysis of the variables of the study.

Table 4.2 Descriptive Statistics of the Variables

Statistics	ARP	CCC	ICP	APP	ROA
Mean	52.54912	-19013.23	67.15741	124.0104	0.075633
Median	53.52758	-628.0000	53.86135	104.2288	0.061464
Maximum	145.6174	34073.00	177.8388	1290.432	0.264935
Minimum	7.959423	-499750.0	17.54961	44.09682	-0.099880
Std. Dev.	29.02015	65739.35	37.77340	129.6781	0.076652
Skewness	0.486619	-4.917686	1.072667	8.207791	0.423366
Kurtosis	3.075988	33.83554	3.329483	74.39145	3.010974
Jarque-Bera	3.573628	3928.369	17.66631	20123.29	2.689028
Probability	0.167493	0.000000	0.000146	0.000000	0.260666
Sum	4729.421	-1711191.	6044.167	11160.94	6.806958
Sum Sq. Dev.	74953.06	3.85E+11	126987.9	1496660.	0.522923
Observations	90	90	90	90	90

Source: Researchers' computation (2022)

Table 4.2 presents the descriptive statistics of the variables of the study. Account receivables period (ARP), cash conversion cycle (CCC), inventory conversion period (ICP), accounts payable period (APP) and

return on asset (ROA) cluster around 52.54912, -19013.23, 67.15741, 124.0104 and 0.075633 respectively. This implies that the mean of all the series display high level of consistency as their mean values are perpetually within the maximum and the minimum values of these series. The kurtosis show that cash conversion cycle (CCC), inventory conversion period (ICP) and accounts payable period (APP) has a leptokurtic distribution (Kurtosis > 3) while is account receivables period (ARP) and return on asset (ROA) are mesokurtic (Kurtosis = 3) in nature respectively. In addition, account receivables period (ARP), inventory conversion period (ICP), accounts payable period (APP) and return on asset (ROA) are positively skewed while cash conversion cycle (CCC) is negatively skewed. The positive skewness is an indication that the degree of departure from the mean of the distribution is positive revealing that there was an overall consistent increase from 2012-2020. The result also shows that cash conversion cycle (CCC), inventory conversion period (ICP), accounts payable period (APP) have a lower probability which indicates that the variables are not normally distributed; this is evident from the probability of Jarque-Bera statistics which reject the null hypothesis of the existence of normality of the series in the model.

4.3 Unit Root Test

The study adopts Levin, Lin and Chu t*, ADF - Fisher Chi-square and PP - Fisher Chi-square techniques to test and verify the unit root property of the series and stationarity of the model. The stationary test is performed to avoid spurious regression problems normally associated with time series econometric modeling. This is to establish whether the time series data is stationary and if not, establish the order of integration as well as check whether the variables are integrated of the same order or not.

Table 4.3: Summary of Unit Root Test Results

Method		Levin, Lin and Chu t*	ADF - Fisher Chi-square	PP - Fisher Chi-square	Order of integration
ARP	**Statistic**	-10.3424	94.5540	101.893	I(1)
	Prob.**	0.0000	0.0000	0.0000	
CCC	**Statistic**	-9.51057	91.0702	91.9401	I(1)
	Prob.**	0.0000	0.0000	0.0000	
ICP	**Statistic**	-11.1154	98.7619	93.1690	I(1)
	Prob.**	0.0000	0.0000	0.0000	
APP	**Statistic**	-10.4159	101.191	95.5257	I(1)
	Prob.**	0.0000	0.0000	0.0000	
ROA	**Statistic**	-3.095	34.4345	39.0746	I(0)
	Prob.**	0.0010	0.0233	0.0065	

SOURCE: Researchers' Computation (2022)

From Table 4.3, Account receivables period (ARP), Cash conversion cycle (CCC), Inventory conversion period (ICP), Accounts payable period (APP) are stationary in their first difference form, which are integrated at order one (1) but return on asset (ROA) is stationary in its level form. At this order of integration, their individual p value is less than 0.05. All variables are examined and found stationary at their level and first difference form. As a result, it can be concluded that there is possibility of no co-integration because all the variables are not the same in their conclusion and are not integrated of the same order.

4.4 Co- Integration Test

Co-integration is the statistical implication of long-run relationship between economic variables. The basic idea behind co-integration is that, if in the long-run two or more series move closely together, even if they are trended, the difference between them is constant. Lack of co-integration on the other hand, suggests that such variables have no long-run relationship, and in principle they can wander arbitrary far away from each other. The co-integration result is presented in Table 4.4.

Table 4.4: Co-integration test

Kao Residual Cointegration Test
Series: ROA ARP CCC ICP APP
Date: 01/04/22 Time: 01:10
Sample: 2012 2020
Included observations: 90
Null Hypothesis: No cointegration
Trend assumption: No deterministic trend
Automatic lag length selection based on SIC with a max lag of 1
Newey-West automatic bandwidth selection and Bartlett kernel

	t-Statistic	Prob.
ADF	-1.554197	0.0601
Residual variance	0.004119	
HAC variance	0.001517	

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RESID)
Method: Least Squares
Date: 01/04/22 Time: 01:10
Sample (adjusted): 2013 2020
Included observations: 80 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESID(-1)	-0.865082	0.117128	-7.385758	0.0000

R-squared	0.400220	Mean dependent var	-0.007783
Adjusted R-squared	0.400220	S.D. dependent var	0.066361
S.E. of regression	0.051393	Akaike info criterion	-3.086192
Sum squared resid	0.208661	Schwarz criterion	-3.056417
Log likelihood	124.4477	Hannan-Quinn criter.	-3.074254
Durbin-Watson stat	1.915126		

Source: Researchers' Computation 2022

Kao residual test of co-integration statistics accept the null hypothesis of no co-integration at the 0.05 level. Therefore it can be concluded that variables are not co-integrated, hence the model estimated reveals that there is no long-run relationship among the variables.

4.5 Regression Result for the Model

In order to test the cause effect relationship between the dependent and independent variables, three widely used panel data regression models (fixed effect, random effect and pooled OLS technique) are adopted.

4.5.1 Regression Analysis for the Model

To choose among fixed or random effects and pooled OLS, the study firstly compared the random effects with the fixed effects. The finding shows that the fixed effect and its alternative fit the model well. The goodness of fit for the fixed effect model is based on F-statistics and its probability value (0.0000) which is less than 0.05) as well as the effect random effect which is based on the Breusch-Pagan test (p-value = 0.0000 which is also less than 0.05). Since both the fixed and random effects are found to be significant and one of the models has to be selected, the Hausman test would assist to select between fixed effects model and a random-effects model. In the Hausman test, if the p-value is small i.e. the p-value is less than 0.05, the fixed effect is the most appropriate otherwise select the random effect model.

Table 4.5: Hausman Test for the Model

Correlated Random Effects - Hausman Test
Equation: $ROA_{it} = \beta_0 + \beta_1 ARP_{it} + \beta_2 CCC_{it} + \beta_3 ICP_{it} + \beta_4 APP_{it} + e_{it}$

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	17.673000	4	0.0014

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
ARP	-0.000868	-0.000769	0.000000	0.5815
CCC	0.000000	0.000000	0.000000	0.2041
ICP	-0.000893	-0.000836	0.000000	0.7428
APP	0.000118	0.000039	0.000000	0.3663

Source: Researchers' Computation (2022)

The Hausman test from Table 4.5 clearly shows that the estimated χ^2 value (17.673000) with 4 degree of freedom is significant (p-value < 0.05), indicating that fixed effect estimator is the most efficient regression model to use in this case.

Table 4.6: Fixed-effects Model
Model: Fixed-effects, using 90 observations
Included 10 cross-sectional units
Time-series length = 9
Dependent variable: ROA

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
Const	0.199412	0.0282883	7.049	<0.0001	***
ARP	−0.000834757	0.000333019	−2.507	0.0146	**
CCC	−5.56027e-08	3.06203e-07	−0.1816	0.8564	
ICP	−0.000666007	0.000260083	−2.561	0.0127	**
APP	−3.57208e-05	0.000135437	−0.2637	0.7928	
Year 2013	−0.000769927	0.0222067	−0.03467	0.9724	
Year 2014	0.000487884	0.0226530	0.02154	0.9829	
Year 2015	−0.0310875	0.0230214	−1.350	0.1814	
Year 2016	−0.0651200	0.0228362	−2.852	0.0058	***
Year 2017	−0.0486168	0.0227335	−2.139	0.0361	**
Year 2018	−0.0244794	0.0224422	−1.091	0.2792	
Year 2019	−0.0421346	0.0225751	−1.866	0.0663	*
Year 2020	−0.0745992	0.0235283	−3.171	0.0023	***

Mean dependent var	0.075633	S.D. dependent var	0.076652
Sum squared resid	0.166982	S.E. of regression	0.049554
LSDV R-squared	0.680675	Within R-squared	0.376901
LSDV F(21, 68)	6.902333	P-value(F)	4.92e-10
Log-likelihood	155.3310	Akaike criterion	−266.6619
Schwarz criterion	−211.6661	Hannan-Quinn	−244.4844
Rho	0.014112	Durbin-Watson	1.844458

Joint test on named regressors -Test statistic: F(4, 68) = 3.22665, with p-value = P(F(4, 68) > 3.22665) = 0.0174439, Test for differing group intercepts - Null hypothesis: The groups have a common intercept, Test statistic: F(9, 68) = 6.29036 with p-value = P(F(9, 68) > 6.29036) = 2.0025e-006, Wald joint test on time dummies - Null hypothesis: No time effects, Asymptotic test statistic: Chi-square(8) = 23.0999 with p-value = 0.00323834

Source: Researchers' Computation (2022) using Gretl.

From Table 4.6, the R-squared (0.680675) indicates that about 68% of the total variations in measures of Return of Asset (ROA) is explained by the variations in Account receivables period (ARP), Cash conversion cycle (CCC), Inventory conversion period (ICP), and Accounts payable period (APP). The Durbin-Watson result of 1.844458 indicates that there is no problem with autocorrelation in the model. The table 4.6 shows that account receivables period (ARP) has a negative ($\beta_1 = -0.000834757$) and significant ($p < 0.05$) effect on Return on Asset (ROA). Cash conversion cycle (CCC) has a negative ($\beta_2 = -5.56027e\text{-}08$) and insignificant ($p > 0.05$) effect on Return on Asset (ROA). Inventory conversion period (ICP) has a negative ($\beta_3 = -0.000666007$) and

significant ($p < 0.05$) effect on Return on Asset (ROA), while accounts payable period (APP) has a negative ($\beta_4 = -3.57208e-05$) and insignificant ($p > 0.05$) effect on Return on Asset (ROA).

However, the result also revealed that the year effect otherwise known as dummies for each of the years was introduced to capture the effect of the aggregate time-series trend. These year effects are the control variables to capture year specific effect on Return on Asset (ROA) that cannot be capture by the working capital variables. It can be seen that the year 2012 is omitted; this is because the year 2012 is considered the based (reference) year. The result shows that the Return on Asset (ROA) in the year 2013 is on average and ceteris paribus 0.077% lower than the year 2012. The Return on Asset (ROA) in the year 2014 is on average and ceteris paribus 0.049% higher than the year 2012. The Return on Asset (ROA) in the year 2015 is on average and ceteris paribus 3.11% lower than the year 2012. The Return on Asset (ROA) in the year 2016 is on average and ceteris paribus 6.51% lower than the year 2012. The Return on Asset (ROA) in the year 2017 is on average and ceteris paribus 4.86% lower than the year 2012. The Return on Asset (ROA) in the year 2018 is on average and ceteris paribus 2.48% lower than the year 2012; The Return on Asset (ROA) in the year 2019 is on average and ceteris paribus 4.21% lower than the year 2012. The Return on Asset (ROA) in the year 2020 is on average and ceteris paribus 7.46% lower than the year 2012. All the year captured excluding the year 2016, the year 2017, the year 2019) are not statistically significant because their p-value is more than 0.05 level of significance.

4.6 Discussion of findings

This study explored the impact of working capital management on the financial performance of manufacturing firms in Nigeria using a panel data of ten-selected manufacturing companies (10 cross-sections) for a period of nine (9) years from 2012 to 2020 making up ninety (90) data points. The researcher provided some background literature into working capital management and financial performance, allowing the researcher to understand the existing literature on the topic and make comparisons towards the findings in this study. In order to achieve the aim, a number of objectives and hypothesis were set out.

i. The findings show that account receivables period (ARP) have a negative ($\beta_1 = -0.000834757$) and significant ($p < 0.05$) effect on return on asset (ROA). This is an indication that for one unit increase in account receivables period, financial performance of manufacturing firms in Nigeria is expected to decrease by 0.000834757 units while keeping all other variables constant. The result is interpreted that slow collection of accounts receivable is correlated with low financial performance. It can be explained that the less the time it takes for customers to pay their bills, the more cash is available to reinvest, which attributes to higher sales that lead to higher corporate financial performance. This result is similar to the study of Padachi (2006), Hoang (2015), Alipour (2011) whose works show an inverse relationship between account receivables period and profitability of firms.

ii. The outcome of the study shows that cash conversion cycle (CCC) have a negative ($\beta_2 = -5.56027e-08$) and insignificant ($p > 0.05$) effect on return on asset (ROA). This is an indication that for one unit increase in cash conversion cycle, the financial performance of manufacturing firms in Nigeria is expected to decrease by −5.56027e-08 units while keeping all other variables constant. This result is consistent with the view that shortening the CCC will generate more profits for manufacturing firms in Nigeria. Hence, firms can create value for their shareholders by keep the CCC to a reasonable minimum. The outcome of this study is similar to Hoang (2015) who found out a negative relationship between cash conversion cycle and return on asset of manufacturing firms in Viet Nam.

iii. The findings show that inventory conversion period (ICP) have a negative ($\beta_3 = -0.000666007$) and significant ($p < 0.05$) effect on Return on Asset (ROA). This is an indication that for one unit increase in inventory conversion period, the financial performance of manufacturing firms in Nigeria is expected to decrease by 0.000666007 units while keeping all other variables constant. This finding is in line with the attitude that holding high inventories will incur costs to the firm because the funds which are tied up in inventories cannot make interest earnings. As well, storage and insurance costs have to be paid, furthermore, spoilage, damage and loss of goods may lead to the costs to the firm. This study is contrary to the findings of Makori and Jagongo (2013) who concluded that there is a positive impact of number of days' inventory on profitability.

iv. The findings show that accounts payable period (APP) have a negative ($\beta_4 = -3.57208e-05$) and insignificant ($p > 0.05$) effect on return on asset (ROA). This is an indication that for one unit increase in accounts payable period, the financial performance of manufacturing firms in Nigeria is expected to decrease by 3.57208e-05 units while keeping all other variables constant. In contrast to theoretical predictions, this finding is consistent with the view that decreasing the time a firm take to settle their creditors will lead it to a higher level of profitability. The result of this study is contrary to Wassie (2021) who found out a positive relationship between accounts payable period and firms' return on asset.

V. Conclusion and Recommendations

The study was carried out to explore the influence of working capital components on the financial performance of manufacturing firms in Nigeria using a panel data of ten-selected manufacturing companies (10 cross-sections) for a period of nine (9) years from 2012 to 2020. Findings of the study show that;

i. account receivables period have a negative and significant effect on the financial performance of manufacturing firms in Nigeria;
ii. cash conversion cycle have a negative and insignificant effect on the financial performance of manufacturing firms in Nigeria;
iii. inventory conversion period have a negative and significant ($p < 0.05$) effect the financial performance of manufacturing firms in Nigeria;
iv. accounts payable period have a negative and insignificant ($p > 0.05$) effect on the financial performance of manufacturing firms in Nigeria.

Conclusively, the study showed that the management of working capital components influence the profitability of manufacturing firms in Nigeria. Based on the key findings in this study, managers of the manufacturing industry should try to collect receivables as soon as possible because of a fact that by reducing account receivables period, firms will have available cash to reinvest and can prevent cash from getting eroded by inflation. Inventory conversion period should also be reduced to a realistic level through processing and selling goods more quickly as well as speeding up payments to suppliers. Managers can also enhance firm profitability which ultimately create more value for the shareholders by focusing on reducing cash conversion cycle to an optimal level.

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