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*Full Length Research Paper*

# Tackling poverty in era of Covid-19 pandemic: The contributory pension option

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In December 2019, news broke out that a novel coronavirus has hit the city of Wuhan, China. It was reported that the SARS-CoV2 virus is responsible for the Covid-19 pandemic. The coronavirus pandemic has impacted severely on the country. As expected, the pandemic has worsened the fate of the poor and most vulnerable households in Nigeria. To cushion the impact, the federal government of Nigeria (FGN) has instituted various palliative measures including cash grants of N5,000 (US\$14) monthly to approximately 1 million vulnerable households. However, a review of these measures shows that they are grossly inadequate and incapable of any meaningful impact on the suffering of the masses. The government is clearly hamstrung in this regard due to huge shortfalls in revenue as a result of the pandemic. To this end, the study reviewed the contributory pension scheme in Nigeria and recommended that government should leverage on the pension fund which is currently in excess of ₦7 trillion. The study argued that government should amend the extant regulatory framework for recovery of pension contribution to enable the contributors to access up to 30% of their contributions to help cushion the effect of the coronavirus pandemic. These withdrawals will be restored through increased accretion to the funds by government and private sector employers when normalcy returns to the country. This will help to alleviate the sufferings of over 9 million Nigerians who are currently enrolled on the pension scheme.

**Key words:** COVID-19, poverty alleviation, contributory pension, pension funds.

## INTRODUCTION

Early this year, news broke out that a novel coronavirus has hit the city of Wuhan, China. It was reported that the SARS-CoV2 virus is responsible for the Covid-19 pandemic. The virus later spreads to other parts of the world from early February, 2020 and currently over 213 countries are battling the scourge of the virus (Nigerian

Centre for Disease Control, 2020). As expected, the pandemic was worsened the fate of the poor in developing countries like Nigeria. The macroeconomic outlook for Nigeria and indeed the whole world has worsened since the outbreak of the pandemic (World Bank, 2020). According to the World Bank (2020), the

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coronavirus pandemic is impacting the world in a way that has not been seen since World War II. The pandemic has led to loss of lives and death tolls around the world are, in many cases, unacceptably high. International trade has been disrupted as countries have shut their borders and movement of people has been restricted in a bid to mitigate the spread of the virus across borders. International travels have been suspended with planes all grounded and cars parked. Schools have also been closed including factories and workplaces. Some employees are working from home and the level of unemployment has increased tremendously all over the world. For a country like Nigeria, the picture is grim.

Even before this pandemic, Nigeria was already battling with poverty and was home to the largest number of poor people in the world (World Economic Forum, 2019). Indeed, the pandemic has complicated the poverty situation in Nigeria because of loss of jobs and means of livelihood of the masses.

The immediate consequence of the pandemic in Nigeria is worsening poverty situation especially food shortage and malnutrition. Early in the year, the President of Nigeria, Muhammadu Buhari, had placed poverty alleviation in the front burner in the 2020 budget proposal (Budget Office of the Federation, 2020). This was the fifth year in succession that the federal government of Nigeria has placed poverty alleviation in the front burner of fiscal discourse and the president has pledged a substantial part of the national budget on poverty alleviation in line with Goals No. 1 and 2 of the Sustainable Development Goals (SDGs) of the United Nations (UN, 2015).

With the coronavirus pandemic and the substantial loss of revenue, it is difficult to see how the federal government of Nigeria (FGN) can fulfill its promise of fighting poverty in the country. Given the federal government tight fiscal position, it is clear that there is need for creative thinking on ways and means to rein in any revenue the government can muster. This is where the contributory pension funds may play a critical role.

There is currently dearth of peer-reviewed literature on the role of contributory pension funds on poverty alleviation in period of pandemic. Essentially, the paper reviews the state of the Covid-19 pandemic in Nigeria, identifies policy gaps in palliatives measures and highlights the role contributory pension funds could play in poverty alleviation in this period of the pandemic. Perhaps, through this approach, the pension contribution governance mechanism could be re-jigged and re-tooled for inclusive poverty alleviation and sustainability policy in Nigeria.

Going forward, this paper will first review the Federal Government of Nigeria (FGN) response to the Covid-19 pandemic, followed by interrogation of the palliative measures in place and identification of the policy gaps. Thereafter,, the theoretical framework that underpins the study together is briefly reviewed with empirical literature,

followed assessment of pension schemes in Nigeria with analytical spotlight on the contributory pension scheme. Finally, the paper makes a case for government to leverage on the funds to provide more palliatives for millions of Nigerians currently enrolled in the scheme.

The study used a mixed method design which comprised qualitative and quantitative analysis. The research methodology is largely descriptive with anecdotal evidences. The dataset comprised pension data collated from annual reports of Pension Commission of Nigeria (PenCom) for the period 2004 - 2019. The content analytical method was used to draw inferences from the data on pension and poverty alleviation in Nigeria.

## **REVIEW OF NIGERIA'S RESPONSE TO COVID-19 PANDEMIC**

The novel coronavirus case was first reported in Nigeria on 27th February, 2020 following the visit to Nigeria by an infected Italian contractor to Lafarge – a cement manufacturing company situated in Ogun State, Nigeria. Since that first case, the number of cases has continued to rise ever since. As of 25th June, 2020, Nigeria recorded 22,020 confirmed cases (7,613 recovered and 542 deaths) spread across 35 states and the Federal Capital Territory (FCT), Abuja (Nigeria Centre for Disease Control, 2020).

Like other countries in the world, Nigeria has mobilized a regime of strategies to combat the pandemic. These interventions largely followed the standard World Health Organization (WHO)-suggested approach namely: testing, contact tracing, isolation and treatment, as well as a boutique of containment measures such as strict enforcement of hygiene practices like hand washing, observation of social distancing, and travel restrictions (Nigeria Centre for Disease Control, 2020).

In addition, the Federal Government of Nigeria (FGN) imposed full lockdowns in areas that are considered epicenters of the pandemic. To this end, on 30 March, 2020, the FGN imposed full lockdown of Lagos, and Ogun States and the Federal Capital Territory (FCT) for 14 days in the first instance. The lockdown was further extended following the expiration of the initial lockdown and the increasing number of cases across many states. The state governments have also followed suit (Presidential Taskforce on Covid-19, 2020). Some state governors have implemented partial lockdown involving banning of, public gatherings, closure of open markets, and restriction of inter-state movements. Thus, businesses are being forced to shut down without alternative plans, rendering vulnerable informal sector workers who work daily to earn a living and are now stranded at home, unable to sustain themselves and their families.

To stem the tide in the spread of the COVID-19, the Federal Government of Nigeria announced an initial 6-week lock-down nationwide. The lock-down involved restriction in movements at certain period of the time, especially in the night; restrictions in inter-state movement except for those conveying essential goods and mandatory use of facemasks when going out (Nigeria Centre for Disease Control, 2020).

It must be remarked that governments around the world are responding in various ways to cushion the effect of the pandemic on the poor and other most vulnerable groups. Most of these interventions have come in form of palliatives – unemployment benefits, cash grants, waivers and host of other incentives (Department for International Development, 2020).

In Nigeria, government interventions could be grouped into three broad categories namely: fiscal interventions, macroeconomic intervention and monetary intervention, especially palliatives for the poor and most vulnerable groups (IMF, 2019).

In terms of fiscal intervention, the first thing the government did was the release of an initial contingency funds of N984 million (\$2.7 million) to the nation's apex agency for disease surveillance and control – the Nigerian Centre for Disease Control (NCDC). With these funds, the center quickly mobilized for action to contain the spread of the virus. Furthermore, an additional N6.5 billion (\$18 million) was disbursed to enable the centre purchase more testing kits, open more isolation centers and increase the training of medical personnel (Presidential Taskforce on Covid-19, 2020).

When confirmed cases of the virus began to increase in some states especially in Lagos - the country's commercial nerve centre, the NCDC released an initial grant of N10 billion (\$28 million) to Lagos State to increase its capacity to contain the outbreak. Other states have also been given financial grants, materials and personnel trainings along with capacity building to help them contain the spread of the pandemic (Presidential Taskforce on Covid-19, 2020).

Moreover, as a result of the precipitous fall in the price of the crude oil, the Federal Government of Nigeria (FGN) has reviewed the 2020 budget proposal and has downgraded the key assumptions in the budget, especially: the crude oil price benchmark, minimum production capacity and targets for non-oil revenues especially taxation. In consequence, the government has cut down on non-essential capital spending by N1.5 trillion – approximately 1% of GDP (Budget Office of the Federation, 2020).

In terms of monetary and macroeconomic interventions, the FGN through the Central Bank of Nigeria (CBN, 2020) announced a reduction in monetary policy rate by 100 basis points from 13.50 to 12.50 after its Monetary Policy Committee meeting in May, 2020. In addition, the CBN announced the following palliative

measures (CBN, 2020):

- a) Reduction in interest rates on all applicable CBN interventions from 9 to 5% and introduction of a one year moratorium on CBN intervention facilities;
- b) Creation of a N50 billion (\$139 million) targeted credit facility especially for micro, small and medium enterprises;
- c) Injection of liquidity of N3.6 trillion (approximately 2.4% of GDP) into the banking system, including N100 billion to support the health sector, N2 trillion to the manufacturing sector, and N1.5 trillion to the real sector.
- d) Introduction of regulatory forbearance. This involves the restructuring of loans in impacted sectors including extension of loan tenor, moratorium and rationalization of interest rate.
- e) The CBN also coordinated with the private sectors to create a private sector special intervention initiative targeting N120 billion (\$333 million) to fight COVID-19. As a result of this initiative, the sum of N42.6 billion has been mobilized, including \$50 million grant from the European Union on April 16, 2020.

Furthermore, to ensure the alignment of the foreign exchange regime to market realities, the Central Bank of Nigeria (CBN, 2020) adjusted the official exchange rate by 15%. The CBN initiated action to ensure unification of the various exchange rates under the investors and exporters (I&E) window, Bureau de Change, and retail and wholesale windows. To ensure a seamless foreign exchange allocation, the CBN committed itself to let the investors and export (I&E) rate move in line with market forces. This action has seen the (I&E) rate depreciate by about 4%. However, priority has been given to the manufacturing sectors especially pharmaceutical companies. To this end, some pharmaceutical companies have been identified to ensure they can receive FX and naira funding. While I&E window turnover has been low since April, the CBN has resumed FX supply in some of the other windows.

In terms of direct palliatives, the FGN initiated a fiscal stimulus package in the form of a COVID-19 intervention fund of N500 billion (\$1.4 billion), to support healthcare facilities, provide relief for taxpayers, and incentivize employers to retain and recruit staff during the downturn. There is also a case-by-case import duty waiver for pharmaceutical firms to enable them import essential inputs for drug manufacture, medical equipment and testing kits.

Moreover, the government has also reduced the regulated fuel prices and introduced an automatic fuel price formula to ensure fuel subsidies are eliminated. In addition, the government initiated cash grants of N5,000 (approximately US\$14) paid on monthly basis to most vulnerable households in Nigeria. This initiative has seen over 1 million households who are registered in the social

register benefit from this largesse since March, 2020. Following public outcry on the limited coverage of this initiative, the President approved an increase of the social register from 1 million households to 3.6 million by July to help cushion the effect of the lockdown (Ministry of Gender and Women Affairs, 2020).

### **EFFORTS NOT ENOUGH BUT GOVERNMENT HAMSTRUNG**

Despite the good intention of the government, the interventions especially the palliative measures in place are grossly inadequate to cushion the effect of the pandemic on the poor and most vulnerable groups in Nigeria. For instance, the cash grant of N5,000 (approximately US\$14) per household per month is simply an icing on the cake. For an average family of 5, it translates to average of US\$3 per person per month – far below the recommended US\$1.9 per day or US\$57 per month. Moreover, as at March, 2020, there were approximately 1 million households in the social register who were eligible for the cash grant. Although the president has promised to increase the number to 3.6 million by July, 2020; this is also grossly inadequate for a country with over 45 million people classified as poor and vulnerable groups. The government is therefore, merely scratching the surface with the current palliative measures.

Moreover, with the lockdown in place including the ban on public gatherings, closure of open markets, and restriction of inter-state movements; businesses are being forced to shut down without alternative plans, rendering vulnerable informal sector workers who work daily to earn a living and are now stranded at home, unable to sustain themselves and their families (WIEGO, 2020). The picture is indeed, grim for the poor and vulnerable groups in Nigeria.

A cursory look at the country's economic fundamentals shows that the various tiers of governments in Nigeria are clearly hamstrung and their efforts to provide palliatives will be at best grossly inadequate. For instance, apart from being the poverty capital of the world – a position the country recently retrieved from India, there is very limited fiscal capacity for economic maneuvering at a time like this. The country has very low ratio of public revenue to GDP which is estimated at 15% compared to Brazil at 30% or the United Kingdom at 37%. At 15% public revenue/GDP ratio, Nigeria is even below the African average of 19% (World Bank, 2019). With the crash in oil price and revenue retrenchment, it will be difficult for the country to muster the level of revenue required to make appreciable impact on the poor and most vulnerable groups in the country.

Again, the tax-to-GDP ratio for Nigeria has hovered around 5-7% for over a decade as against African

average of 22%. The situation is compounded by a high debt servicing ratio which is above 22% of public revenue as against for instance, Mexico, 17%; Brazil, 11% or India, 8% (IMF, 2019). In the 2020 budget proposal, a whopping sum of N2trillion has been earmarked for debt servicing, leaving the government with little or no room for economic maneuvering.

There is also the issue of high level of corruption and lack of transparency in public accountability. This factor may weigh heavily and could be particularly problematic in the management of public funds or large inflows from several quarters to tackle the pandemic. At the end, the funds meant to tackle the pandemic and provide cushion to the most vulnerable groups will end up in private pockets of government officials. Already, there has been accusation and claims that the funds meant for palliatives to the poorest in the country have largely been diverted to imaginary recipients (CLOs, 2020).

Moreover, the country is greatly disadvantaged in terms of key demographics. For instance, the country has large and unorganized informal sector. Micro, small and medium enterprises account for over 70% employment in Nigeria as against sub-Saharan African average of 55 or 40% in Latin America and India and 15% in OECD countries (World Bank, 2019). Many of these micro and small enterprises suffer from poor infrastructural facilities and lack of support from the government. This lack of facilities had made it difficult for their staff to work from home as is the case in other climes. Even those who manage to put up an appearance, perennial power outages, high cost of data, disruptions in supply chains and unmitigated lockdowns had made it difficult for them to hold their heads above the waters.

There is also the issue of the country's young and largely dependent populations. Nigeria has comparatively younger population with median age of approximately 19 years as against 27 years in India or 43 years in Europe. Many of these young populations have limited and in some cases, no life-long skills and live in inhospitable conditions. It is estimated that 50 to 70% of its urban dwellers live in slums and shanties as against 23% in Latin America or compared to India with 17% (IMF, 2019). There are also no job opportunities for these teeming youth population. It is estimated that there are over 45 million youths in vulnerable employment in Nigeria and majority of this number do not contribute anything to the economy (IMF, 2019).

Furthermore, the coronavirus pandemic has led to closure of schools in Nigeria as elsewhere but it is estimated that the impact of school closure in Nigeria is going to be disproportionately higher than in other climes due to lack of infrastructure to engage in on-line teaching and learning along with high cost of data for internet connectivity for the few schools who could afford to mount an online learning. In the medium to long term, this could increase the number of school drop-outs, which

currently is up to 38% as against 19% average in OECD countries (World Bank, 2019).

We must remark that the coronavirus pandemic is first and foremost, a public health issue. Nigeria has very fragile healthcare system with one of the poorest healthcare infrastructures even by developing countries' standard. The country has very low number of healthcare professionals estimated at less than 1 doctor to 1,000 people or 30 doctors to 100,000 and very limited hospital beds, testing and treatment capacity. In consequence, after the initial 6-week lockdown in key states in Nigeria, namely, Lagos, Ogun and the Federal Capital Territory, it was discovered that the Nigerian Centre for Disease Control (NCDC) has only managed to carry out about 13,689 tests as at 29 April, 2020. This shows that Nigeria is lagging behind in COVID-19 surveillance, contact tracing and testing when compared with its peers such as Ghana and South Africa that have conducted over 100,000 and close to 200,000 testing respectively as at 29 April, 2020 (Presidential Taskforce on Covid-19, 2020).

This situation reinforces the opinion of medical experts that Nigeria is way behind peer countries in Africa in terms of contact tracing and testing of citizens which could account for the exponential increase in the number of Covid-19 positive patients across the country especially in the northern parts of the country. Comparatively, statistics from Ghana Health Service stated that the situation updates on COVID-19 outbreak in Ghana as at 28 April, 2020 shows that Ghana has been able to test a total of 113,497 persons with a total of 2,074 confirmed cases. South Africa now has testing capacity of about 25,000 per day and as at 30<sup>th</sup> May, 2020 (BusinessDay, 2020).

How the current pandemic will pan out ultimately for the country may very well depend on appropriate government response based on evidence of not only those who are poor but those that have become vulnerable due to the pandemic. This requires a creative approach and an innovative thinking. This is where the contributory pension funds currently estimated at well over ₦6 trillion may come into play. The study makes a case for the government to leverage on the funds to provide financial succor to the contributors as a stop-gap measure pending the return to normalcy.

## REVIEW OF THEORETICAL AND EMPIRICAL LITERATURE

The link between pension funds and poverty alleviation has attracted a lot of theoretical modelling and empirical validations. Some of the theoretical frameworks that have performed excellently well in empirical studies include: utility and preference theory of Samuelson (1938, 1950), productivity theory of Clark and Wickstead (1921), life-

cycle theory of Modigliani and Brumberg (1953) and the graph theory of a cognitive map by Barrientos et al. (2003). This work is underpinned by the life-cycle theory because of its appropriateness to the issue of pension funds and poverty alleviation especially during periods of adversity and income disruption.

### Life-cycle theory

Essentially, the life-cycle theory is concerned with spending and saving habits of people (workers) over the course of a life-time. The theory posits that workers strive to save a part of their income during their active working years which they hope to fall back to during retirement when they are no longer active and/or incapable of generating incomes. The theory can be stretched to accommodate the potential for workers to fall back to their savings not only during retirement but in adverse events which threatens their means of livelihood like the current coronavirus pandemic. The overarching objective of retirement savings is to smoothen consumption in periods of scarcity and thus, maintain a socially acceptable standard of living. According to Modigliani and Brumberg (1953), the life-cycle theory provides the framework for explaining the variations in rates of savings between the younger and older populations and in shaping pension plans. The basic assumption underlying the theory is that household members choose their current expenditures rationally by taking into account their spending needs and future income over the envisaged remainder of their life-time. It is also assumed that consumption and income are unequal at various points in the life-cycle trajectory and therefore, savings must be built up to account for the periods when consumption exceeds income. By so doing, consumption is smoothened and certain acceptable minimum standard of living is maintained.

Several studies have been carried out examining the link between pension schemes, pension savings and poverty alleviations in various contexts and jurisdictions with nearly similar outcomes. For instance, Bello et al. (2007) investigated the causation between non-contributory old age pension scheme and poverty reduction in Lesotho, South Africa. The study found that non-contributory old age pension scheme reduced poverty incidence and severity in the sample of respondents used in the study. The study found that there was significant difference in poverty head count ratios in the periods with the programme and periods without the programme up to 200 basis points difference.

Long and Pau (2008) examined the link between pension schemes and poverty alleviation among the elderly in Vietnam. The study found that social pension schemes if appropriately implemented could reduce significantly the incidence of poverty among the elderly.

Again, Faye (2010) examined the link between pension funds and poverty alleviation in Sub-Saharan Africa. The study simulated various scenarios with basic pension schemes and found that basic pension schemes have salutary effect on poverty reduction among households with elder members.

More recently, Grech (2018) evaluated the impact of pension reforms on poverty alleviation among the elder in Europe. The study was unique in that it focused on all potential pension payments within a large spectrum rather than just the pension payment at the point of retirement. The study found that pension reforms have improved pension payments and this has in turn, reduced relative poverty threshold among the elder in Europe.

In Nigeria, few studies have been carried out on pension schemes and poverty alleviation. For instance, Gunu and Tsado (2012) investigated the role of contributory pension scheme on economic growth. Edogbanya (2013) carried out an assessment of impact of contribution scheme on Nigerian economic development. Dagauda and Adeyinka (2013) investigated the impact of the 2004 pension policy on the welfare of Nigerian civil servants. More recently, Jeff-Anyene et al. (2017) assessed the role of pension scheme on poverty reduction in Nigeria. The study found that pension scheme had significant impact on national, urban and rural poverty in Nigeria.

From the foregoing, there is near consensus in empirical literature that pension funds could help to alleviate poverty through consumption smoothing and consistency in income streams during periods of adversity.

The rest of the paper reviews the contributory pension scheme in Nigeria and how it can be innovatively adapted to serve as cushion in this time of coronavirus pandemic.

## **PENSION SCHEMES IN NIGERIA**

Pension is the amount paid by government or company to an employee after working for some specific period of time, considered too old or ill to work or have reached the statutory age of retirement (Odia and Okoye, 2012). It is the monthly sum paid to a retired officer until death because the officer has worked with the organization or government institution paying the sum.

A pension is a contract for a fixed sum to be paid regularly to a pensioner, typically following retirement from service. It is different from severance pay because the former is paid in regular installments while the latter is paid in one lump sum. Pension consists of lump sum payment paid to an employee upon his disengagement from active service. Payment is usually in monthly installments and pension plans may be contributory or non-contributory; fixed or variable benefits; group or individual; insured or trustee; private or public, and

single or multi-employer (Yusuf, 2014).

### **The old pensions reform – Defined benefit scheme**

The National Provident Fund (NPF) scheme established in 1961 was the first legislation to address pension matters of private organizations in Nigeria. This was the first social protection scheme for the non-pensionable private sector employees in Nigeria. It was mainly a savings scheme where both employee and employer contributed the sum of N4 each on monthly basis. The scheme provided for only one-off lump sum benefit (Ahmad, 2006). The NPF was followed by Armed Forces Pension Acts No. 103 also of 1972 and by the Pension Acts No. 102 of 1979, 18 years later. The Pension Acts No. 102 of 1976 which commenced on 1st April, 1974 encompassed the recommendation of Udoji Commission which included all consolidated enactments and circulars on pension as well as repealing existing 113 pension laws hitherto in force (Balogun, 2006).

### **The New Pensions Reform Act of 2004**

The Pensions Reform Act (PRA) of 2004 is the most recent legislation of the Federal Government of Nigeria which is aimed at reforming the pensions system in the country. It encompasses employees in both the public and private sectors. The PRA of 2004 came into being with a view to reducing the difficulties encountered by retirees in Nigeria under the old pension scheme. It is believed that the new scheme will: guarantee the prompt payment of pensions to retirees, eliminate queues of aged pensioners standing hours and days in the sun to collect their pensions and also increase their standard of living.

#### ***Objectives of the new pension scheme***

The objectives of the Scheme according to Section 2, Part 1 of the PRA of 2004 (PRA, 2004) include to:

- 1) Ensure that every person who worked in either the public service of the federation, federal capital territory or private sector receives his retirement benefits as and where due.
- 2) Assist improvident individuals by ensuring that they save in order to cater for their livelihood during the old age.
- 3) Establish a uniform set of rules, regulations and standards for the administration and payment of retirement benefits for the public service of the federation, federal capital territory or private sector.
- 4) Stem the growth of outstanding pension liabilities.
- 5) Secure compliance and promote wider coverage.

### **The 2014 Pension Reform Act**

The 2014 Pension Reform Act was signed into law on July 1, 2014 by the then President of Nigeria, Ebele Goodluck Jonathan. The 2014 Pension Reform Act provided the legal framework for the administration of contributory pension scheme in Nigeria.

The major contribution of the 2014 Pension Reform Act was its recognition that the 2004 Pension Act did not provide enough deterrent for offenders. The new Pension Act not only provides enough deterrent for pension offenders, it also excluded the personnel of the Nigerian Military and Department of State Security from the contributory pension scheme. The 2014 Act also incorporates subsequent reviews to the 2004 Act such as the Universities (Miscellaneous) Provisions Act 2012 (which revised the retirement age and benefits of university professors) and the Third Alteration Act (which places responsibility for pension matters with the National Industrial Courts).

The following are the major highlights of the Pension Reform Act 2014 (PRA, 2014).

#### ***Upward review of rate of pension contribution***

There was an increase in the rate of contributions, Under the Act, employers are to contribute 12% of the monthly emolument which was previously 7.5%, and the employees on the other hand, are to contribute 8% which was previously 7.5%. For an employer that bears the total pension contributions of its employees, they will be expected to make 20% contribution. These contributions are applicable on monthly emoluments only. The scope of participation of the contributory pension scheme for employers in the private sector has been decreased from minimum of five employees to three employees, which enables wider participation for the informal private sector, is a wonderful development for employees in small scale employment, and are not left out of the contributory benefit to secure their future.

#### ***Access to benefits in event of loss of job***

The Pension Reform Act 2014 has reduced the waiting period for accessing benefits in the event of loss of job by employees from six (6) months to four (4) months. This is done in order to identify with the yearning of contributors and labour. Opening of Temporary RSA for employees that failed to do so:

#### ***Enhanced coverage of the CPS and informal sector participation***

i) The Pension Reform Act 2014 makes provision that

would compel an employer to open a Temporary Retirement Savings Account (TRSA) on behalf of an employee that failed to open an RSA within three (3) months of assumption of duty. This was not required under 2004 Act.

ii) It is important to note that the scope of the monthly emolument has been given a wider definition than before i.e. Monthly emoluments under the Act is defined as the total emoluments as may be defined in the employees contract of employment but shall not be less than a total of basic salary, housing allowance and transport allowance.

#### ***Sanctions and punishments***

The Pension Reform Act 2004 only allowed PenCom to revoke the license of erring pension operators but does not provide for other interim remedial measures that may be taken by PenCom to resolve identified challenges in licensed operators. Accordingly, the Pension Reform Act 2014 now empowers PenCom to take proactive corrective measures on licensed operators whose situations, actions or inactions jeopardize the safety of pension assets. This provision further fortifies the pension assets against mismanagement and/or systemic risks. The new pension law prescribes among others, upward review of penalties and sanctions to pension defaulters and employers which fail to remit deducted monies of their employees.

#### ***Power to institute criminal proceedings against employers for persistent refusal to remit pension contributions***

The Act now empowers the National Pension Commission to institute criminal proceedings against employers for persistent refusal to remit pension contributions subject to the fiat of the Attorney General of the Federation, which will be to the delight of employees right now. The pension reform Act of 2004 only allowed PENCOM to revoke the license of erring pension operators but does not provide for other interim remedial measures that may be taken by PENCOM to resolve identified challenges in licensed operators.

#### ***Upward review of the penalties and sanctions***

The sanctions provided under the Pension Reform Act 2004 were no longer sufficient deterrents against infractions of the law. Furthermore, there are currently more sophisticated mode of diversion of pension assets, such as diversion and/or non-disclosure of interests and commissions accruable to pension fund assets, which

**Table 1.** Public Sector Pension Contributions as at December 2019.

Year	Amount (N' Billion)	Percentage of Total
2004	15.61	0.68
2005	34.68	1.51
2006	37.38	1.63
2007	80.63	3.51
2008	99.28	4.3
2009	371.11	5.9
2010	162.46	7.07
2011	228.92	9.9
2012	302.24	13.15
2013	278.50	12.12
2014	237.49	10.35
2015	200.05	8.71
2016	225.86	9.83
2017	257.11	11.19
2018	266.84	10.04
2019	375.22	13.08
<b>Total</b>	<b>4,173.37</b>	<b>100.0</b>

Source: Author Computation from National Pension Commission (PenCom, 2019).

were not addressed by the PRA 2004. Consequently, the Pension Reform Act 2014 has created new offences and provided for stiffer penalties that will serve as deterrence against mismanagement or diversion of pension funds assets under any guise. Thus, operators who mismanage pension fund will be liable on conviction to not less than 10 years imprisonment or fine of an amount equal to three-times the amount so misappropriated or diverted or both imprisonment and fine. As it is clear that the benefit of pension is on the high side, some adamant employees still refuse to join this scheme, the Pension Act 2014 takes good care of these category of staff by compelling an employer to open a Temporary Retirement Savings Account (TRSA) on behalf of an employee that failed to open an RSA within three (3) months of assumption of duty.

### **Recovery of pension**

i) The employees who have been involved actively in the contributory pension scheme often complain about recovery of pension after loss of job. With the worry bordering around the stipulated waiting period after a job loss. the new Act has now given us a reason to smile as the Act has reduced the waiting period for accessing benefits in the event of loss of job by employees from six (6) months (2004 Pension Reform) to four (4) months (2014 Act). So in a sad case where one loses his job, the

individual can quickly smile to the bank to access his benefits after 4 months.

ii) Finally, It is clear that the new Pension Act 2014 is quite advantageous to the employees as some keys issues have been addressed such as upward review of the penalties and sanctions, enhanced coverage of the contributory pension scheme and informal sector participation, upward review of rate of pension contribution, opening of temporary retirement savings account for adamant employees and access to benefits in the event of loss of job.

### **TREND AND PATTERN OF PENSION REFORMS IN NIGERIA**

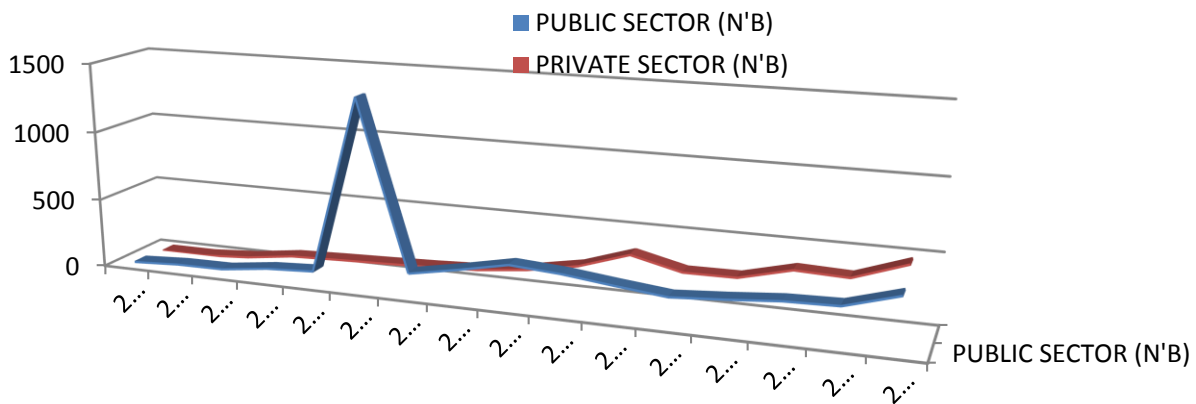
During the year under review, the total pension contributions into the retirement savings account (RSA) of employees in both the private and public sectors amounted to ₦610.84 billion as shown in Tables 1 and 2. The public sector accounted for ₦257.11 billion, which represents 42.09% of total pension contributions in the year. Accordingly, total pension contributions had cumulatively amounted to ₦4,487.40 billion as at 31 December, 2017. This was made up of ₦2,297.57 billion contributions from the public sector, which represents 51.20% of total contributions and ₦2,189.83 billion from the private sector, which represents the remaining balance of 48.80%.



**Table 2.** Private sector pension contributions as at December 2019.

Year	Amount (N' Billion)	Percentage of Total
2004	0	-
2005	0	-
2006	23.03	1.05
2007	68.34	3.12
2008	80.81	3.69
2009	91.21	4.17
2010	103.03	4.70
2011	119.53	5.46
2012	159.52	7.28
2013	225.42	10.29
2014	343.89	15.71
2015	258.91	16.39
2016	262.33	11.98
2017	353.73	16.15
2018	340.72	12.99
2019	470.52	13.8
<b>Total</b>	<b>2,900.99</b>	<b>100.0</b>

Source: Author Computation from National Pension Commission (PenCom, 2019).



**Figure 1.** Line trend of both the private and public sectors fund contribution in N' billion. Source: Author Computation from National Pension Commission (PenCom, 2019).

As at December end, 2019, the total contributions of the public sector included N2,939.63 billion from participating State, Local Governments employees and self-funding State and FGN agencies. The accumulated contributions from the public sector increased from N2,040.19 billion in 2016 to N4,173.37 in 2019, representing an increase of over 100%.

Similarly, the accumulated private sector pension contribution recorded an increase of 29.27% in 2017 as it moved from N1,836.02 billion in 2016 to N2,900.99 billion

in 2019. Figure 1 shows the line trend of both the private and public sectors fund contribution in N' billion.

It could be observed that public sector fund contribution is higher than private sector fund contribution up to 2013 before the private sector fund contribution take over from that of public. Also, the private sector fund contributions follow the pattern of that of public sector. There was an upward trend in the graph indicating that a lot of workers are now contributing toward their retirement for a better welfare.

**Table 3.** Scheme membership as at Third Quarter, 2019.

<b>Scheme Type</b>	<b>Q3:2018</b>	<b>Q4:2018</b>	<b>Q3:2019</b>	<b>Change between Q4:2018 and Q1:2019</b>	<b>% Change</b>
Retirement savings account	8,271,948	8,410,184	8,876,123	158,853	1.89
Closed pension fund administration	23,403	23,332	23,316	(16)	(0.07)
Approved existing scheme	40,951	40,951	40,951	0	0
<b>Total</b>	<b>8,336,302</b>	<b>8,474,467</b>	<b>8,940,390</b>	<b>158,837</b>	<b>1.87</b>

Source: National Pension Commission (Pencom) Third Quarter 2019 Report.

It is also clear that the upward review of penalties and sanctions in the 2014 reform has galvanized private sector contributions and served as a deterrent to pension crimes. This is evident in the upward trajectory in private sector pension contributions which overtook the public sector contributions from 2014. Overall, both the public sector and private sector pension contributions have maintained an upward trajectory till date.

The 2014 Pension Reform Act was unique in many respects especially the increase in the contribution base of pension, the establishment of Pension Protection Fund and availability of recourse to three superior courts of record in case of dispute.

To this end, given the scourging effect of the COVID-19 pandemic on the livelihood of Nigerian workers, there is need for government to leverage these funds now to provide more palliatives to workers.

### **Scheme memberships**

The pension industry recorded a 3.87% growth in the scheme membership during the third quarter of 2019, moving from 8.47 million contributors at the end of the preceding quarter to 8.94 million. The growth in the industry membership was driven by the Retirement Savings Account (RSA) Scheme, which had an increase of 158,853 contributors representing 1.89%. However, membership of the Closed Pension Fund Administration (CPFA) Scheme declined by 16 members (23,316) while the Approved Existing Scheme (AES) membership remained unchanged at 40,951 as shown in Table 3.

### **Contributory pension funds and Covid-19 palliatives**

We have argued elsewhere in this study that current government palliatives are grossly inadequate to cushion the effect of the coronavirus pandemic on the poor and most vulnerable Nigerians. It is also clear that the various tiers of government in Nigeria are hamstrung to provide the needed palliatives and interventions. This is where

the contributory pension funds could be leveraged to provide succor to millions of Nigerian workers in the public and private sectors of the economy.

There are over 8 million participants in the contributory pension scheme in Nigeria as at year end 2019 with over N7 trillion in the contribution pension funds within the same period. The government should approve immediate release of 25 – 30% of the pension funds to the participants as a stop-gap measure pending when normalcy returns to the country. This will amount to approximately N2 trillion to approximately 9 million Nigerians who are registered in the scheme as at third quarter, 2019. This amount and the number of the direct beneficiaries will be more than 500% of the current number of beneficiaries in government cash grants and other palliatives.

To achieve this, there may be need to amend the regulatory framework for recovery of pension contributions. In the extant pension regulatory framework, that is the 2014 Pension Reform Act, an employee who has been involved actively in the contributory pension scheme is empowered to access benefits in the event of loss of job after four months. Currently, no public or private sector employee can access his/her pension contribution within the contemplation of the law as majority of the workers who have been forced to stay at home for the last four months have not, technically speaking, lost their jobs. They are still in employment except that salaries are not being paid especially for private sector employees.

To this end, there may be need to amend the conditions for the recovery of pension benefits (Parts 3 and 4 of PRA, 2014) to allow participants access up to 30% of their contributions to cushion the hardship occasioned by the coronavirus pandemic. A bill for the amendment of that section of the 2014 Pension Reform Act should be brought before the National Assembly and given accelerated hearing.

Alternatively, the president could issue an Executive Order to bring this into effect. The essence of contributory pension or any pension scheme for that matter is to enable the contributors fall back on their savings in adverse situations like the current pandemic. It will make

no sense to allow millions of workers to languish in poverty and penury when they could be allowed to access their savings in the contributory pension funds.

## RECOMMENDATIONS

Based on the foregoing, it is recommended thus:

(a) A bill be sent to the National Assembly to amend Part 3 (1) (a)-(c) of the PRA 2014 on recovery of pension benefits under the 2014 Pension Reform Act to allow contributors in the pension funds to access up to 25 – 30% of their pension contributions to cushion the effect of the pandemic. Alternatively, the president could issue an Executive Order to that effect.

(b) Government in collaboration with the private sector employers should work out the modalities to restore this 25% withdrawal, perhaps by an increase in their counterpart contribution in the pension scheme from the current 12 to 15% when normalcy returns to the country.

(c) Government should act quickly in this direction as time is of the essence to ameliorate the suffering of millions of Nigerian workers who have been forced to stay at home with no salary and no government interventions or palliatives.

## CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

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*Review*

# **A review of the Management Science theory and its application in contemporary businesses**

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**The Management Science theory is one of the theories of management that attributes management effectiveness to the application of scientific methods. It goes a step beyond the famous scientific management theory by applying operations research tools and techniques to solving practical problems. Its origin can be traced to the Second World War in Britain. Its method of expressing business factors in form of variables allows for the accurate prediction of business phenomena and overall optimization of profits. The management science approach uses computer applications and operations research tools to solve business problems around quantitative management, operations research, total quality management and management information systems. Its major limitation is its inability to accurately predict business phenomena that contain behavioral elements. The theory ignores the importance of people, relationships and other non-quantifiable factors. Overall, the management science theory provides a new and proactive way of solving business problems by identifying relationships among different business variables that were previously considered unrelated and so, have provided modern businesses with a better way of doing things.**

**Key words:** Management Science theory, scientific management theory, operations research, total quality management, linear programming.

## **INTRODUCTION**

Several theories of management have evolved since the nineteenth century. The view of management both as an art and a science has led several management scholars to attribute management effectiveness to certain factors and circumstances. Some theories have been developed that try to apply scientific methods into addressing management issues (Jones and George, 2014). The first of these theories was the theory of scientific management propounded by Frederick Winslow Taylor. However, other

theories have adopted this scientific approach to solving specific management problems. The Management Science theory is one of these theories that apply operations research and other quantitative analysis tools to maximize the utilization of the organization's resources in the production of goods and services.

The Management Science theory is often confused with the scientific management theory. The confusion may be as a result of the similar nomenclature. However both

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theories, even though they have some similarities, are not one and the same. Also, contemporary businesses use many techniques that have their origin in the Management Science theory; however there is scarcity of studies in existing literature that identify this linkage. As a result of this, the 'Management Science' concept is slowly creeping away from the minds of scholars as a theory of management. Instead, it is often simply regarded as a group of disciplines or fields of study. To address this problem, the study tried to situate the Management Science theory by discussing the following; the history of the Management Science theory and its different branches, its contribution to the body of management theories, its relevance for contemporary management practices and the limitations of its application in decision-making.

## **HISTORY AND OVERVIEW OF THE MANAGEMENT SCIENCE APPROACH**

Management Science theory is a school of management theories that is characterized by the use of operations research techniques and other quantitative tools to maximize the utilization of organizations' resources in the production of goods and services (Schutts, 2011). It uses such techniques as economic order quantity (EOQ), linear programming, queuing theory, and game theory to solve problems in business operations. It specializes in solving technical problems rather than behavioral ones. Management Science theory focuses on achieving precision by expressing the relationship between variables using quantitative models (Hussain et al., 2019). It is a contemporary approach to management, an extension of the scientific management theory that applies scientific procedures (e.g. division of labor and specialization) in managing the worker-to-task fit so as to improve organizational efficiency (Taylor, 1911). The Management Science theory shares some characteristics with the scientific management theory in that it makes use of scientific methods, assumptions and procedures in uncovering and learning better ways of doing things. Management Science simply applies this method to business problems like decision-making, design processes and strategic planning (Sridhar, 2017). It identifies an operational problem, comes up with possible explanations for the cause of the problem and then suggests possible solutions. This process is similar to the way scientists create models to test their theories and then obtain information from the results. Analysis of such information then leads to possible solutions for solving problems. Although, the scientific management theory was propounded in the nineteenth century, the Management Science theory, which builds on some of the premises of this theory, came later in the mid-twentieth century (Figure 1).

The first practical application of the Management

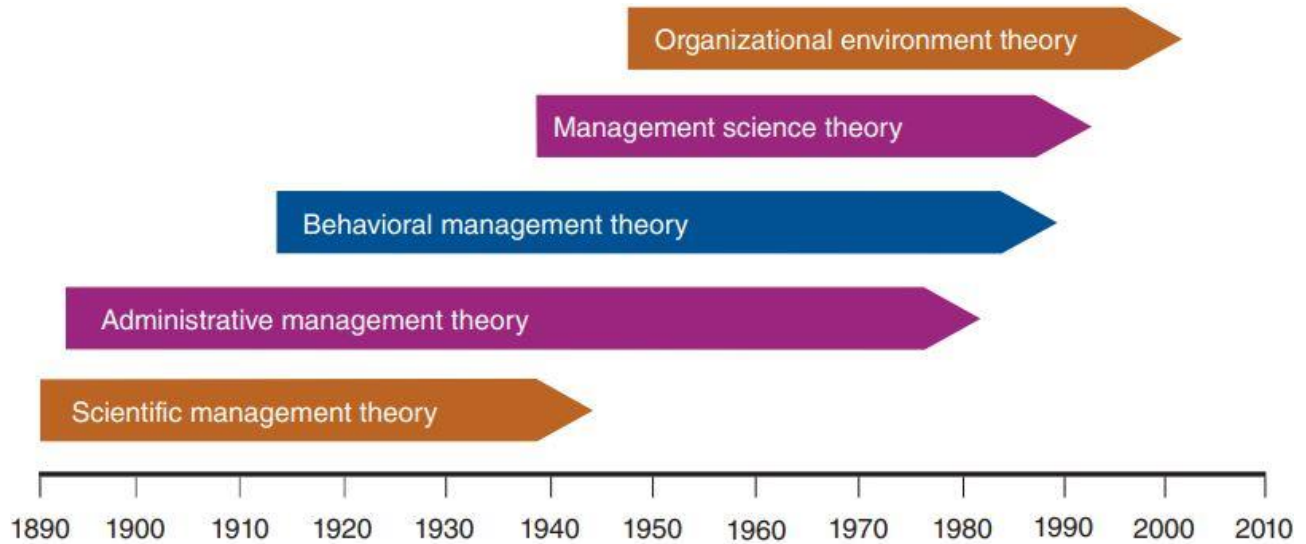
Science approach started in Britain during the Second World War. The complexity of some of their war-related problems called for special solutions that involved the coming together of several expert scientists (in the area of Mathematics, Physics etc.) into what was later referred to as the 'Operations Research Team' (Jeanty, 2019). The team used the primitive computer system available at the time to build mathematical models for efficient allocation of available resources within military operations. With this model, Britain gained significant success in the war and their model was soon copied by the United States.

When the war ended, the effectiveness of this approach immediately made its way into the industry. The industrial revolution was a period of technological progress and economic growth, and thus efficient allocation of resources became a salient problem for managers (Jeanty, 2019). The innovations associated with the Management Science theory (high-speed computers and communication among computers) provided an effective means for efficient allocation of resources and analysis of complex business problems. Robert McNamara (who was once the Secretary of Defense in both the Kennedy and Johnson Administration) tried to implement the Management Science theory at Ford Motor Company in the 1950s and 1960s as well as in his assignment as Secretary of Defense. As his young operations research team members moved up management positions, the Management Science approach flourished and was more appreciated among managers for its effectiveness and precision (Jeanty, 2019). Today, if one finds himself in a firm where "crunching the numbers" is the major way that management decisions are justified, it is thanks to McNamara and his team.

Some of the earliest tools that are utilized in the Management Science approach (e.g. linear programming) can be traced to William Cooper and Abraham Charnes. William Cooper was an American operations researcher and a professor of accounting from Harvard University. He was nicknamed 'Mr. Linear programming' with his work on optimal blending of aviation gasoline using shadow prices in Gulf Oil Corporation (Charnes and Cooper, 1959) and is often regarded as the father of the Management Science approach (although, the invention of the simplex method of generalized linear programming is credited to George Dantzig). William Cooper was the founding president of the Institute of Management Sciences. As years went by, more techniques and models were included in the Management Science approach (Banker, 2006).

### **Branches of the management science theory**

Over the years, four main branches of Management Science approach have gained ground. Each branch of the Management Science approach addresses a specific



**Figure 1.** The evolution of Management theories.  
Source: Jones and George (2016).

set of problems. The branches include the following;

### **Quantitative management**

This branch of the Management Science school makes use of mathematical tools (such as linear programming, financial modeling, simulation, queuing theory, etc.) to help managers make the strategic or tactical decisions (MeroSpark, 2014). For instance, financial modelling can help a manager decide how to invest his capital in the most rewarding way.

### **Operations research**

This branch of the Management Science approach provides managers with a set of techniques (e.g. stepping stone, economic order quantity) that can be used to analyze different aspects of an organization's production system with the aim of increasing efficiency (Jones and George, 2016). With the advent of information technology, regular communication and benchmarking has been made easier and this has impacted on the effectiveness of input sourcing and output marketing.

### **Total quality management (TQM)**

This branch of Management Science focuses on analyzing an organization's value chain (input, conversion and output process) to increase the overall quality of the product or service (Lawrence and Steck, 1991). Once again, sophisticated computer-controlled processes like

machine vision and three-dimensional printing help to enhance precision in production process and overall quality (Deming, 1986).

### **Management information system**

Management information systems generally refer to the collection of information systems that provide managers with information on both internal and external events. Information reduces uncertainty, thus managers make more quality decisions when there is more information available. This branch of Management Science theory helps design information systems (e.g. Transaction Processing Systems, Decision Support Systems, Office Automation Systems, etc.) that provide managers with both internal and external information to make quality decision. IT offers managers new and improved ways of handling information to help them make more accurate assessments of the situation and informed decisions (Dewett and Jones, 2001).

## **DISTINGUISHING FEATURES OF THE MANAGEMENT SCIENCE APPROACH**

Unlike the management theories before it, the Management Science approach applies mathematical models and techniques in a scientific manner to enhance business processes. Mathematical models uncover relationships among several variables within industries (Jeanty, 2019). A mathematical model such as limiting factor technique and linear programming can uncover bottlenecks that slow down the production process and

suggest the best way to circumvent such bottlenecks. The results obtained are often re-inputed back into the model so as to improve the model accuracy (such is the case with machine learning) and this improves the overall quality of decision making.

The Management Science approach involves some underlying assumptions (Rahman, 2013). First, it regards an organization's management structure as a problem-solving mechanism. Secondly, it assumes that all management problems can be expressed in a quantitative form. It assumes that most decision outcomes and human behavior are predictable.

### **CONTRIBUTIONS OF MANAGEMENT SCIENCE SCHOOL TO THE THEORIES OF MANAGEMENT**

One of the major contributions of the Management Science approach to management theories is the increase in precise prediction of certain aspects of the business process. Business processes and systems are expressed in measurable terms and fitted into a model that can predict possible outcomes when there are changes in its constituent variables. The Management Science approach brings a new and practical perspective on how the different aspects of the business, which were previously regarded as unrelated, depend on one another for the overall effectiveness of the organization (Jeanty, 2019). This school of thought provides a new and proactive method of dealing with complex managerial problems. The possibility of identifying existing relationship among the organizational variables gives managers a better understanding of the overall organization's process. Also, giving that organizational variables are expressed in measurable terms, it becomes easier to monitor processes and evaluate performance with a lot of precision, order and objectivity.

### **RELEVANCE OF MANAGEMENT SCIENCE THEORY IN CONTEMPORARY BUSINESS OPERATIONS**

According to Zand and Sorensen (1975), the aim of Management Science is to improve the effectiveness of an organization by persuading managers to use the conclusions of rigorous quantitative analysis to allocate resources, design information systems, and make policy decisions. These rigorous quantitative analysis are still quite relevant today. Hassan (2013), in his study, showed that many of the management theories and philosophies are relevant in addressing contemporary management issues for both small and large businesses. The Management Science theory is not merely a tool that can be used to improve efficiency and effectiveness of firms' operations. It refers to a category of methods that use quantitative tools and techniques to achieve optimum quality. There are many such methods that are currently

being used in contemporary businesses. For instance, the Management Science approach has brought about the development of computer technology which has had enormous impact on the contemporary business world (MeroSpark, 2014). According to Luthans and Stewart (1977), the complexity of organizational problems facing contemporary managers requires a more calculative approach to taking rational and effective decisions, thus basic computer applications can and have been developed to analyze and predict some management issues that may crop up at various organization levels. For instance, computer applications can determine the threshold on wages for different positions that will optimize employee motivation without wasting resources unnecessarily (Chron Contributor, 2020). This is currently helping businesses to optimize labor costs.

Another practical application of the Management Science approach in contemporary management and business process is in lean manufacturing. Lean manufacturing is a manufacturing approach that places emphasis on the minimization of waste while maximizing productivity simultaneously. Waste refers to any input or activity that does not add value from the customer's perspective. In 1991, Toyota Motor Company developed the lean manufacturing method in its production system (Jones and George, 2016). Linear programming and Economic Order Quantity are very important tools in minimizing waste. Toyota Motor Company also adopted the Just-in-Time (JIT) production system which emphasizes efficiency by ordering raw materials and other inputs strictly on demand so as to avoid unnecessary storage costs and other forms of wastage (Toyota, 1995).

There are many other practical applications of the techniques and models associated with the Management Science approach in contemporary business decision-making. Examples include; scheduling of passengers and crew in the airline industry, decision on location of new facilities, managing flow of water from reservoirs, gaining access to information needs of health care customers and providing solutions and understanding and analyzing the effects of strategies adopted by competitors (Navarro, 2015).

### **LIMITATIONS OF MANAGEMENT SCIENCE THEORY**

Although applications of Management Science are evident in many management practices (especially in planning, operations and controlling), it cannot be fitted to all kinds of management processes. The implementation of the Management Science theory involves some underlying assumptions (e.g. business processes can be quantified), and sometimes these assumptions fall short of real-world situations. Management problems that are more human than technical (e.g. staffing, leadership, organizing etc.) can hardly be solved using the

quantitative tools of Management Sciences. This is one of the biggest limitations of Management Science approach. Some studies view the Management Science theory as magnifying the need for technical managerial skills while downplaying the need for the human managerial skills (Katz, 1974; Weihrich, 1993) while others still believe that Management Science is a human science, in as much as it has man as both its object and subject (Zand and Sorensen, 1975). The theory ignores the importance of people, relationships and other non-quantifiable factors. Some aspects of management activities cannot be easily quantified because they involve some human elements which are unpredictable. For this reason, some have argued that it does not qualify as a school of management theories (Rahman, 2013). Also, the Management Science theory prescribes a limited number of tools for solving specific problems, and the effective utilization of these tools requires some level of expertise and technical skills.

## CONCLUSION

The study set out to discuss the history of the Management Science theory and its different branches, its contribution to the body of management theories, its relevance for contemporary management practices and the limitations of its application in decision-making. The Management Science theory was linked with the earlier theory of scientific management in that it applies scientific procedures in minimizing costs and maximizing output. However, unlike the scientific management, the Management Science approach expresses business processes in form of quantitative variables and uses operations research, quantitative techniques and information systems to optimize the utilization of resources and make quality business decisions. The history of the Management Science approach can be traced to Britain during the Second World War while the industrial application of the theory is traced to Robert McNamara during his time at Ford Motors Company in the 1950s. The application of linear programming (one of the Management Science tools) to business decision making can be traced to William Cooper (Mr. Linear programming) also in the 1950s.

Over the years, several branches of the Management Science theory have been developed on the basis of the nature of problems that the tools address. The Quantitative Management addresses decision-making regarding planning and strategy. Operations Research addresses decision-making problems regarding the efficiency of production process. Total Quality Management (TQM) addresses problems regarding the quality of organizations value chain. Management Information Systems provides a framework for extracting and analyzing information with regards to the internal and external environment of the business. This branch uses more of computer applications than quantitative tools.

The major contribution of the Management Science theory is the increased precision in the prediction of different factors affecting businesses. This increase in precision is hinged on the assumption of measurability of business processes in quantitative terms. Business models produced using the Management Science tools can predict different business variables and suggest an optimal combination of resources that can maximize output. Many of the Management Science tools and assumption are still quite relevance in contemporary management decision-making (e.g. lean manufacturing, Just-in-Time production, aircraft passenger scheduling, reservoir flow calculations and analysis of the magnitude of competitors' strategies). However, this management theory also has some limitations. It focuses more on the quantifiable aspects of the business processes and ignores some qualitative factors and processes that cannot be easily predicted, like human behavior, intrinsic motivation and stakeholder relationships. Thus, its applicability is limited. Also, a high level of knowledge and skills is required to effectively utilize some of the Management Science tools and the training required to acquire such skills may be expensive.

## CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

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