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The Impact of Covid-19 and Security Challenges in Nigeria on Building Technology

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ABSTRACT

Covid-19 has impacted significantly on the building construction business sector globally hence impacting adversely on the global economy. For Nigeria, the pandemic plunged the nation's economy into distress this is made worst by the crashed value of oil price leading to government instantaneous halt on building and construction of critical national infrastructures such as housing estate, roads, bridges, dams and flyovers. These projects are major sources of employments for the teeming population of the nation. However, it is interesting to know that we can only come out of the challenges presented by the pandemic by spending our way out of the economic recession by the government accelerating and embarking on massive multiple critical building and construction projects which shall return cash flow to the people. Neglecting such will enhance the already terrible state of the unemployment rate of the Nigerian population, integrating other predicaments such as worsening security challenges being experienced across the nation ranging from Boko-Haram, herder- farmers clashes, kidnapping, banditry, ethno-religious clashes and political instability is disastrous to national economy and social stability. This study emphasizes on identifying and overcoming covid-19 challenges faced by the building and construction sector and suggesting the way forward such as the factoring in of the disruptive digital technology into the construction sector called construction 4.0. Data and information used for this study were drawn from reviews of books and journals of various authors on the subject matter using content analysis approach.

Keywords: Covid-19 Challenges, Security Challenges, Disruptive Digital Technology, Socio – Economic Stability, Construction 4.0

INTRODUCTION

Covid-19 has impacted significantly on the building construction business sector globally, hence impacting adversely on the global economy. According to Ogunusi et al. (2020) for over four months and still counting, the entire world came to a standstill with the outbreak of an unprecedented pandemic-tagged Covid-19. This pandemic affected not only human health but also the operational health of businesses and organisations the construction industry inclusive.

The Nigerian economy was negatively impacted especially in the country's capital (Abuja) and financial centre (Lagos). In 2020, Nigeria's economy due to the pandemic is expected to experience its worst recession in four decades.

In the baseline scenario, the economy would contract by 3.2 percent this year. This forecast assumes an annual average oil price of \$30 a barrel. It is also assumed that the spread of Covid-19 eases away by the end of the second quarter and is contained in Nigeria by the third quarter of 2020. This revised growth projection is over 5 percentage points below the pre-Covid-19 forecast of 2.1 percent. Without recovery in oil prices Nigeria could experience negative growth of -7.4 percent in 2020, and the recession would extend into 2021. This will make the predicted 2020 recession at least twice as deep as that of 2015– 2016 and the deepest since the 1980s. However, it is estimated that real GDP (growth domestic product) growth would recover gradually and by 2022 would converge with the population growth rate of 2.6 percent. Failure to contain COVID-19 domestically would not only deepen the recession, but also impose a major burden on the already strained healthcare system. This, in turn, could cause a spike in morbidity and mortality rates, especially for low-income households and vulnerable communities (World Bank Group, 2020).

According to Zamani et al (2021) the construction industry plays a significant role in the nation's economic, societal, and political development. The construction organization consists of different class types and different project types. Larger contractors may have different perspectives than small and medium enterprises (SMEs) contractors on the problems faced because of COVID-19 for instance the issues on building projects might be different from infrastructure projects.

Alenezi (2020) opined that COVID-19 has caused delays in construction projects. His work collected quantitative and qualitative data from a wide range of professionals in the construction industry. The questionnaire was sent to 205 construction sector practitioners working in Kuwait, including engineers, architects, surveyors, construction management, and coordinators. Several categories of delay in construction projects during Covid-19 were identified: critical delay, concurrent delay, independent delay, non-excusable delay, and excusable delay. Most common reasons for these delays in projects were attributed to the fact that daily working period has been shortened and in several cases stopped.

Covid-19 Triggered Challenges facing the Building and Construction Industries

Kabiru and Yahaya (2020) addressed the impact of Covid-19 and discovered that professionals are faced with some challenges in the construction industry. The adverse effects of

Covid-19 had a significant impact, including affecting on-site work activities, the bill of quantities, project completion, law of contract, causing Force Majeure events in the Nigerian construction industry. In their work, it was observed that both parties (contractors and employers) agree that present Covid-19 poses a significant challenge in the construction industry. Some of these challenges are as listed below.

(i) Project Timeline

Project timeline is a schedule of project working time from starting until the expected time of completion of construction work. Due to Covid-19, the federal government had imposed the Movement Restriction Order (MRO) which started May 4th, 2020. This adversely affected the already planned and scheduled construction project design and delivery dates. The change of project timeline happened because construction activity had stopped during MRO, this caused project delay and complete downtime of building and construction activities nationwide.

(ii) Increase in Project Costs

A few factors identified has increased projects cost, which include the high price of materials cost and the Covid-19 test procedures cost. The high cost in material was as a result of continues changes in foreign exchange rates and increased in demand for supplies of logistics during the pandemic. The Naira depreciated in value compared to the dollar, building and construction material cost skyrocketed significantly. Even after the lockdown relaxation order prices of building materials continue to rise. Also, Covid-19 test procedures and government imposed conditions for mitigation and control of the pandemic after relaxation of the lockdown order and resumption of work to site gave additional cost to the companies.

(iii) Late Payment

Most of building and construction project payments are usually paid in phases. For government projects, payment will be made after the company claims the completed project's work phase as planned for categorized phase payments. The payment of claims made was delayed due to disrupted government operations during the lockdown order. With delay in payment employees social and economic lifestyle were seriously affected, this translates to severe hardship for construction and building workers and their families during the covid-19 lockdown in the country.

(iv) Logistics

This has to do with material delay issues due to global travel restrictions imposed by

almost every country in the world as a result of the pandemic. There was difficult procedures in supply chain due to the supplier company's operations being suspended and high placed order demand for supplies of materials. Also as a result of the pandemic many immigrant skilled expatriates' and labourers returned to their countries, this brought about scarcity of professionally skilled workforce in the building and construction industries. After the pandemic, local workers lacked the professional competence for quality job delivery. Ogunusi et al. (2020) opined that from September 2020, about 6.7% of apprentices are likely to lose jobs, while 20% of the workforce will be affected. They opined that Construction Company projects a 7.7% reduction of the workforce directly employed by companies , while the industry anticipates a 26.7% decrease in contract workers. The combination of the effects of the pandemic and lack of competence of local workers are responsible for these job losses.

(v) Reduced Number of Projects

Due to the covid-19 lockdown, business generally declined sharply. Government and individual clients call for tenders declined; the effect of this is that companies had problems in getting new projects. However, there is a little award of new tenders by the government for small infrastructures, because some projects are considered non ideal for such a time of restricted movements so as not to jeopardize the social distancing control protocols. Also, the competitiveness and lobbying of contractors is higher when the total number of projects has decreased, some of these struggles are unhealthy and can led to unnecessary strive and envy. Therefore, small and medium entrepreneurs (SMEs) contractors' with small liquidity faced more difficulties in getting new projects, as they need to compete with larger contractors; this makes it difficult for them to get projects during Covid-19 pandemic.

(vi) Severe Loose of Customers' (Clients) by Major Building and Construction Stake Holders

Adaptation of disruptive digital technology by Small and Medium Enterprise Building and construction industries was huge during the period of the covid-19 pandemic. Luo et al. (2020) identified three major challenges facing the design and construction industries during Covid-19, which are project delivery, design optimization, and communicating information among major building and construction project stakeholders. These challenges caused major companies to neglect minor customer clients, giving way for small companies to take advantage of the neglect and adopting disruptive approach by applying disruptive digital technology to establish a market share for themselves.

According to Matt (2018), when big businesses concentrate on meeting the needs of their major customers of some certain products, they tend to neglect those customers that demand only few of their products. Disruption comes in when smaller business firms takes advantage of the weakness of big established business companies in meeting the needs of few customers to target and supply the needs of these customers by an alternative product at a cheaper rate thereby establishing a new product and market and eventually competing with big business organization and possibly putting them out of business. For example, the emergence of the printing press disrupted the business of scribes, the internet and bloggers disrupted the print newspaper industries, the emergence of the Smartphone's disrupted many industries including the film and photography industries. The development and adaptation of emerging technologies like artificial intelligence, 3D printing, cloud computing, and many more continue to push mega industries towards disruption by smaller innovative enterprises thereby driving development and breaking the power of monopoly in the process.

The Way Forward for the Building and Construction Industries Amidst and after the Pandemic

(i) Deployment of Product, Organization and process Modeling and Building Information Modeling

Luo et al. (2020) identified three (3) challenges facing the design and construction of Leishenshan hospital during Covid-19, which are project delivery, design optimization, and communicating information among project stakeholders. A semi-structured interview of key stakeholders from Leishenshan hospital was conducted by the authors' to advance solutions and resolve the problems. Based on data collected from various sources, they found that adhering to a product, organization, and process (POP) modeling approach combined with building information modeling (BIM) allowed for the ultra-rapid creation, management, and communication of project-related information, resulting in the successful development of the fully functional, state-of-the-art infectious disease control specialty hospital in China.

Zamani et al (2021) outline two (2) strategies that should be adopted to address the effects of covid-19 in the building and construction industries, which are based on data collected from various sources, they found that there is the need to integrate POP (product, organization and process) modeling and BIM (building information modeling) for instance in China, when the virus attack started, construction industries were adhering to a product, organization, and process (POP) modeling approach combined with building information modeling (BIM) that allowed for the ultra-rapid creation, management, and communication of project-related information in

building of several hospitals for victims, these are sufficient for successful development and project management, development and delivery. A PPO model (Product Process Organisation) integrates a Product definition with a design Process definition and an Organization definition of the enterprise. The Process stands for a sequence of activities involved during design and does not refer to the manufacturing steps. Integration in the PPO model manages relationships between the three previous dimensions to keep an efficient trace of the design activity. This trace can be used to monitor how the product is defined, but also why it was defined in such a way. These gives opportunities to efficiently solve conflicts occurring between experts from various skills. To complete this model, an integrative approach is proposed. An integrative model is a model adaptive enough to integrate new concepts and know-how whenever they appear. This property is fundamental whenever design activity is based on negotiation between experts from different know-how and knowledge. Thus models are adapted to current collaboration and negotiation process of all integrating points of view of every partner. For instance, industrial product design management (PDM) systems provide a representation of product, which is based on a hierarchical decomposition of its structure. Every component of the hierarchy can be associated with various numerical documents. The structure is supposed to be agreed by every designer. Each designer attaches his own documents to components of the hierarchy as a specific representation of the component. Hence the parts are like the smallest atom of the big information structure that is shared through PDM (Noel, 2006).

The word "BIM" is defined as an acronym that stands for "Building Information Modeling". Since, BIM is a management process rather than a model, which often makes it confusing in the market, the name "Building Information Management" has become to be used more widely in recent times. BIM can be defined primarily as a digital representation of a construction, as an object-oriented three-dimensional model, and/or as a repository of project information to facilitate the interchange of information with interoperability and related software applications. BIM is based on collaboration between architects, engineers, contractors, employers, and consultants in a three-dimensional common knowledge environment and provides information sharing among these disciplines. BIM is an information management system for a structure to be constructed, extending from the initial design process to the construction phase, as well as the termination of the service and its continuation after implementation. In addition to increasing the coordination and cooperation between architect, engineer, subcontractor, contractor and employer/shareholders, BIM also builds a knowledge database for the building/structure. This new system, which includes the necessary information

to carry out communication perfectly and smoothly in construction project management, enables us to reduce our design and building costs by providing cooperation, interoperability, and communication. It ensures that all stakeholders acquire the information they need at all stages of the construction project by using necessary tools/programmes/software designed to identify the organization and project standards and responsibilities from the very beginning of the project. BIM is the job of keeping all kinds of information related to a construction structure with the help of the creation of a computer model. It can be broken into 3 main parts, which are as follows;

1. 3D computer model (Architectural, Statical, Mechanical and Electrical)
2. Work schedule
3. Cost information/estimation

Since the first of these 3 main breakdowns is a 3D computer model, it is defined as 3 Dimension (3D). The addition of the work schedule, i.e. time information, gives the model the 4th dimension (4D). When you add cost information to it, you have a 5-dimensional model (5D). Some of the potential benefits that will be provided by the implementation of the Building Information Management System in construction projects are listed below:

- Better communication and cooperation among all project team members (interoperability),
- Reduction of project's time/schedule, cost, quality and scope problems,
- Delivering projects to be more economical, quicker, reliable and/or less stressful in the construction environment.
- Faster and more efficient processes
- Increased effectiveness and productivity
- More controlled data and Life cycle
- Avoiding the cost of recurring/repeat of work
- More secured construction contracts
- More realistic visualization work can be produced from the BIM System with shorter time and budget.
- Classic CAD data and Cost estimating can be provided better and directly from the 3D BIM model.
- All superposition work, which takes too much time can be done in a 3D environment in a better coordinated way by using BIM System. Thus, the expected/unexpected problems between construction elements and systems are automatically detected, reported and solved by BIM system before starting work in the construction site.

- Construction works, and site planning can be done more smoothly with 3D, 4D, 5D e.t.c on visual features. Prevent disputes/conflicts between works and provide best resolution in order to ensure more efficient/effective flow of the project. Employers, Contractors, and sub-contractors can start business planning with BIM in the early stages of design (Umlt, Ersin and Mustafa, 2019)

(ii) **Deployment of Construction 4.0 to the 4th Generation Economy**

The world has evolved through four (4) economies. The earlier economic growth was driven by Agriculture, and then from early 20th century to mid seventies economy was driven by manufacturing all kind of products to make life better. Later, the growth was driven by Service economy, like logistics, IT services etc. Now it is driven globally by disruptive digital technologies using digital tools such social media, mobility, analytics and cloud- SMAC , internet of things- IOT, 3-D Printing and many other emerging technologies.

Today we are beginning to hear of terms like Digital India, Digital USA, Digital Germany, Smart countries e.t.c these are becoming common words for are common words for developed or rapidly developing countries. According to The products, services, processes, including in Construction Industry, are getting digital and disrupting all organizations globally. When project management software's are integrated into work flow automation technologies in the planning and design stage of production using software like Enterprise Resource Planning (ERP), Customer Relationship Management (CRM), eCommerce, Portals, Project Management, AutoCad, BIM, 3D, 4D & 5D etc. These have capacities to manipulate and handle Structured data like numbers we begin to see many emerging Construction technologies like Pre-fabrication, Pre-cast, Metallic/ Plastic or Hybrid formwork, Automation of concreting, plastering, 3-D Printing, Robotic Block or Tiles laying etc. In digital economy, technology is the key driving force by mimimizing human interventions throughout the lifecycle of the product. Technology also provides exceptional experience to digital age customers, employees and other stakeholders. India has a major focus on Construction 4.0 in terms of investments in housing (more than 60 millions till 2022) and infrastructure in coming years. It is imperative now to best leverage on technology for improving effectiveness, efficiency, labour, productivity, quality and most importantly stakeholders' happiness (Rastogi, 2017).

However, the major disadvantages of the digital economy technology and lean technology is the issue of machines substituting man. In Africa and other continents with huge population densities this can be very catastrophic and can lead to severe increase in the already terrible state of unemployment rate hence worsening the already bad state of socio-economic

development. Other disadvantages are issues of eWaste, malware attacks and possibilities of hackings. It is capital intensive and requires foundational infrastructures to run which many developing economy such as Nigeria are lagging behind.

(iii) Huge Capital infrastructural investment by Governments at all Levels

To mitigate the effects of the pandemic that plunged us into economic hardship and to keep the economy growing again, governments at all levels of federal, states and local must invest heavily on critical infrastructural developments to stimulate the economy. According to Finn (2020) governments globally emphasizes on public infrastructure investment as a response to recessions. Among the rationales for public infrastructure spending as a cyclical response is that during downturns, there is resource slack in the economy, meaning that plants and equipment, and time and human capital (people and their brains) are underused, and growth and income are lost. People's skills may depreciate forcing them to move or change sectors, and future growth opportunities are lost at home. Subscribers to this view may hold that the incremental spending by governments on critical infrastructures keeps people gainfully employed in the near term, and longer term growth and public welfare are better than otherwise. An important aspect of this view is that the public spending acceleration improves private sector performance; for example, better road and other transport systems help private businesses do what they do, and so improve household incomes. In the wake of the 2009 recession, governments in Europe, the United States, and Canada eventually introduced budget measures intended to provide discretionary (politically directed) fiscal stimulus to the economy, with varying degrees of success. Public infrastructure spending formed part of their responses.

In economics, much as in public discussion, the word infrastructure mean, for the most part, constructed projects that make an economy work, like roads, bridges, wastewater systems, highways and airports, and constructed public facilities.³ Infrastructure can be privately or publicly financed, owned or operated, and access to it, or access to infrastructure services, might either be free to all residents or available for a charge that covers some or all of the finance, construction, and operating costs, as for example in the case of some toll roads. Public infrastructure confers public and private benefits, and that is why governments invest in it. In principle, public goods theory suggests that governments can resolve a collective action problem, such as the lack of a regional highway, which produces benefits for a community and which individual actors might not be easily able to resolve themselves. Governments are often encouraged to respond to economic downturns by way of discretionary spending measures intended to stimulate growth, offsetting the negative impacts of reduced private sector activity.

(iv) Collaboration between the Private Sector and the Academia in Curriculum Development

Engineering is a dynamic applied science of physics, chemistry and mathematics for creative design of product and processes that satisfy human needs. Globally, there are recent practices that cuts across all fields of global business and the ICT that development conscious nations are laying huge emphasis on such as disruptive digital technology that can permit for continuous work in the face of a future pandemic either local or global, minimizing human presence and maximizing productivity.

The federal government most realizes this recent shift in technology and key in by first of all reviewing current policy on curriculum for engineering education to capture latest engineering practices across all levels of technical vocational education and training –TVET there must be s deliberate inclusive approach with the private engineering sector in the designing and development of these curriculum to reflect the requirements of practicing engineering sectors so that engineering and technologist graduates will no longer be considered as unemployable due to lack of acquisition of the requisite skills (Kalus et al, 2021)

(v) Restructuring the Security Architecture

The disturbing events of insecurity such as the kidnappings of foreign expatriates and local professional skilled building and civil engineers for ransom are becoming rampant. Though the federal government is doing the best it can to combat insecurity in Nigeria, security is not a one man show, it must be collaborative and inclusive of all state holders of governments. Even our schools are vulnerable and not spared from such attacks. Kalus et al. (2021) opined that, there cannot be learning and critical thinking in an environment with high degree of security entropy. Serenity and peace of mind are critical psychological factors that accelerates the learning process. With book-haram, bandits and kidnappers attacking schools and kidnapping students', critical thinking, creativity and innovations in the minds of students' are being threatened psychologically. It is therefore imperative for the federal government to decentralize the present security architecture give full autonomy to the state governors, local government chairmen, and traditional rulers' authourity to exercise control of policing their respective communities.

Recently Nigerians have being clamoring and debating on this subject matter. Without security it is impossible for there to socio-economic development, the federal government should be prompt to implement this. Community policing, engagement of local forest hunters and

vigilantes, and use of technology such as Close –circuit television cameras and Unmanned Aerial Vehicles (UAVs) are the way to go in ensuring adequate national security.

Conclusions

The covid-19 pandemic has really affected the building and construction industries so badly; inflicting social and economic hardship to building and construction workers' during the hit of the pandemic and even after the curve of the spread of the pandemic was relatively flattened. However, the pandemic brought with it some benefits in the broad applications of software's such as BIM, ERP CRM to the building and construction industries. There is also the rapid growth of SMEs, so many quickly adopted the disruptive digital technology to come into prominence. It is also very important to mention that insecurity in Nigeria can be very disastrous to the growth of business especially the building and construction industries. It was suggested that the security architecture of the security apparatus of Nigeria be decentralised for the all inclusive approach to reflect the inputs of government at all levels and the integration of the traditional rulers and vigilantes'' nationwide.

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