Full paper

International Journal of Real Estate Studies

INTREST

COVID-19 Pandemic: The Effects and Prospects in the Construction Industry

Mercy Ogunnusi[1]*, Mansur Hamma-adama[1]*,[2], Huda Salman[1], Tahar Kouider[1]

[1]*Scott Sutherland School of Architecture and Built Environment, Robert Gordon University, Aberdeen, United Kingdom*
[2]*Department of Civil Engineering, College of Engineering, Kaduna Polytechnic, Kaduna, Nigeria*

*Corresponding authors' email: m.o.ogunnusi@rgu.ac.uk; m.hamma-adama@rgu.ac.uk

Article history: Received: *5 August 2020* Received in revised form: *29 September 2020*
Accepted: *28 October 2020* Published online: *25 November 2020*

Abstract

COVID-19, social distancing, self-isolation, quarantine, furlough, palliatives, and many more emerged as the new vocabularies of the entire world, construction industry not excluded. It is precisely a decade from the last pandemic experienced by the human race. However, the most popular disease outbreak called Corona Virus Disease 2019 (COVID-19) was announced, which hit all the nations of the world within four months and was declared a pandemic in March 2020. This outbreak disrupted businesses around the globe, including built asset procurement and facility management. The United Kingdom, through the Construction Leadership Council, for instance, in responding to this unprecedented situation, published a new Site Operating Procedure (SOP). The effect of this Pandemic in these extraordinary times posed both positive and negative impacts in the Architecture, Engineering and Construction, Owner and Operator (AECOO) industry. Its effect has brought about innovative and diverse use of technology in an exemplary manner which may change the course of construction even after the extinction of coronavirus. This study explores the effects of COVID-19 on the built asset procurement and potential opportunities for the construction industry through a quantitative means. A survey was carried out on the built asset procurement professionals for the data collection. 71 questionnaires were received from Architects, Building Engineers, Civil/Structural Engineers, Electrical Engineers, Mechanical Engineers, Construction / Project Managers and Quantity Surveyors. SPSS 25 software (a social science statistical package) was used for the analysis of the data. The result reveals some challenges in the area of workflow and supply chain disruption, new policy issues, workers' anxiety and review of COVID-19 vs Force Majeure in standard forms of the construction contract. However, opportunities evolved in the field of modern procurement planning, the necessity for virtual working and unique design considerations. This study is essential to paving the way for the development of additional contingency plans and a new working strategy in a minimised human contact situation caused by the pandemic.

Keywords: Construction industry, COVID-19, effects, impact, pandemic

1.0 INTRODUCTION

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. Professional bodies such as CIOB, RICS and the likes in an attempt to preserve "construction businesses" are rolling out strategies to enable smooth sailing and transition into the new dispensation. The "Roadmap to Recovery" prepared by Construction Leadership Council (CLC) requires the construction industry to 'reinvent' by safeguarding 'construction businesses' and work collaboratively as it restores (CIOB, 2020a). The Nigerian economy was negatively impacted especially in the country's capital (Abuja) and financial centre (Lagos). The challenging situation may create insufficient revenues for some states to meet their immediate spending. The prognosis for the growth of the construction industry has been reviewed downward to 0.7% with possibility of further cut if actions in the short-term are severely disrupted more than envisage by the COVID-19 (GlobalData, 2020; Thomas, 2020). The United Kingdom Office for National Statistics (UK-ONS) reveals that ever since the 2008/2009 economic recession, the UK has not experienced a large (5%) GDP decline until the first quarter of 2020 due to the COVID-19 pandemic, where the construction sector falls by 2.6% (ONS, 2020, p. 8). South Africa is also confronted with labour shortages, massive national debt and low spending on infrastructure due to the weak economy (Hughes, 2020). The long-lasting and wide-ranging impact of COVID-19 no doubt affected the world. With virtually all the regions around the globe pulling to a standstill, throughout the spring period, the government concentration as we are approaching the lockdown easing is on placing the economy back on course (Ramboll, 2020). Remarkably, some construction sectors of Sub-Saharan Africa (SSA) are exploring the opportunity that emanated with COVID-19 compared with many other nations of the world. Indigenous manufacturing is one of the promising sectors in the SSA with the interference to supply chain globally, emphasising the significance of fostering the local capacity to encourage "industrial construction". This pandemic also divulged the need for investing in the communication infrastructure (Hughes, 2020).

No doubt that this pandemic came with its impact and prospects as the evidence above. Therefore, this research seeks to explore the impact and the effects of COVID-19 pandemic in the global construction industry. Thus, the objectives include exploring the current state of the industry, its periodic trend from March 2020 and readjustment of its workflows. The study commences with a literature review (limited) followed by a collection of primary data through a questionnaire survey, distributed to the construction and built assets professionals across the globe.

2.0 LITERATURE REVIEW

2.1 Current Scenario of Global Construction

Construction firms in the UK can breathe amid COVID-19 as the government announced the 'reverse charge' for Value added tax (VAT) payment for construction services pushed back to March 2021 from October 2020 (CIOB, 2020b). The public construction sector is one of the few industries that have been maintained (to some extent) in this COVID-19 pandemic (Kale, 2020). In the short term, activity is expected to continue.

Can COVID-19 be considered a risk? For this study, risk defined by PMBOK Guide cited by Eldosouky et al. (2014, p. 863) as an "uncertain event or condition that if it occurs, has a positive or negative effect on a project's objectives" was adopted. The authors further emphasised that risk in projects include threats known as adverse risk or downside events and opportunities known as beneficial or upside risk events. Abd El Khalek et al. (2016) furthermore concluded that the majority of construction companies are eager to penetrate the international markets to maximise their income and grow potential benefits. A construction firm's decision of penetrating the global markets must be grounded on a proper knowledge of the threats and the opportunities. However, can it be stated that the emergence of COVID-19 enabled the appropriate understanding of risks and opportunities to the construction industry?

The survey conducted by Build UK on behalf of Construction Leadership Council reveals that 43% of respondents of the "*Retaining Talent in Construction"* survey expected over longer-term to make redundancies (see Construction Manager, 2020a). From September 2020, about 6.7% of apprentices are likely to lose jobs, while 20% of the workforce will be affected. Construction company projects a 7.7% reduction of the workforce directly employed while the industry anticipates a 26.7% decrease in the agency workers and self-employed. The combination of the reduction of the self-employed and workers and the directly applied accounted for the reduction of workers expected in 2020. As of June 2020, averages of about 32% directly applied are already furloughed at the time of the survey (Lexology, 2020). Okonmah et al. (2020) recorded the case of COVID-19 in Nigeria. The Department of Petroleum Resources (DPR) directed the demobilisation of all non- crucial staff at the offshore site while imposing health and safety rationale to limit the spread of the COVID-19 on projects and site. The oil and gas sector declared the situation force majeure, which brings strong justification in support of the party who seeks to apply force majeure. This may, however, be not conclusive as a tribunal or court may consider all circumstances in a contractual context to warrant such claims. Can there be contingency consideration for such a situation as this, Otali and Odesola (2014, p. 589) defined contingency from PMI as "the amount of money needed above the estimate to reduce the risk overruns of project objectives to a level acceptable to the organisation". They concluded in the study that the three highly essential aspects that affect the percentage or sum to be permitted as a contingency in projects are the estimator's experience, projects complexity and projects location. However, consideration was not given to unforeseen circumstances or risk such as COVID-19. The authors also defined risk as "events within the defined project scope that are unforeseen, unknown, unexpected, unidentified or undefined" (Otali and Odesola, 2014, p. 589).

In rescuing the unprecedented situation, the Construction Leadership Council (CLC) assumed an intermediary role between the government and construction industry in identifying and delivering actions to support UK construction in fostering better efficiency. The council published its plan in three stages: *Restart, Reset, Reinvent*. The COVID-19 under the CLC produced the two–year scheme to ensure a stable for all parts of the sector in the future and also to boost productivity (CIOB, 2020a). The fallout in the global economy caused by the pandemic is compelling governments to derive policies for invigorating the economy. The tried-and-true method is being considered by many governments to boost the economy in the short-term which will, in turn, provide "societal benefit" in the long-term, which is an investment in infrastructure (Davisson & Losavio, 2020).

A typical effective change management system at this unprecedented time is the introduction of Site Operating Procedures (SOPs) by the Construction Leadership Council (2020) in the UK. All necessary measures to take which includes "when to travel to work, toilet facilities, First Aid and Emergency Service Response and cleaning are all stated. A letter from Minister for Local Government, Housing and Planning (Kevin Stewart) to Construction Scotland indicates movement to phase 1 on 28 May 2020 out of the 5 phases earmarked. Phase 1 facilitated the "physical distancing and enhanced hygiene," installation or expansion of existing toilet facilities and site welfare. The entire phases are listed below:

Phase 0: Planning
Phase 1: COVID-19 pre-start site preparation
Phase 2: "Soft start" to site works (only where physical distancing can be maintained)
Phase 3: Steady state operation (only where physical distancing can be maintained)
Phase 4: Steady state operation (where physical distancing can be maintained and/or with PPE use)
Phase 5: Increasing density/productivity with experience

All these recent global events experienced as a result of the emergence of this pandemic has created impact both positively and negatively in the construction environment as highlighted in subsequent section.

2.2 The Impact of COVID-19 to Construction Industry

For instance, Gumble (2020, p. 18) stressed that "as a society and as an industry, we will not be the same when this is over. We're adapting to working differently quite successfully (my steep learning curve with Skype notwithstanding!)". This indicates that the virtual environment will be more integrated into our construction activities as a "new normal" and there will be more flexibility of working due to adaptation of these technological tools. Gumble's (2020, p. 18) statement is also supported by Kale (2020) stating that "I suspect there are many office-based construction roles that can be done at home, and this period is likely to have proved that such flexibility is viable and should be more widely accepted". This is supported by Jones (2020), stating that innovative construction technology advancement has always moved construction onward. Technology has enabled the construction site to be safe with a more efficient workforce. It has also improved collaboration, boosted productivity and tackled other complex projects. For instance, artificial intelligence and robots are being deployed to the site to monitor the progress of work on-site with actionable and actual data to boost site work productivity. Construction companies that are adopting and implementing technology are gaining the rewards (especially in this COVID-19) with better collaboration, increased productivity and project completion under budget and on time leading to increased profit margin. More so, with COVID-19, the global greenhouse gas (GHG) emissions will decline compared to previous records. This could mark a "turning point" in the improvement of climate change as identified by Hepburn et al. (2020).

Furthermore, Bailey et al. (2020) highlighted the impact of COVID-19 pandemic and how it is being managed. This pandemic is having a substantial effect on construction projects; however, the legal implication varies from contract to contract, nations to nations. Much focus was being given to a standard form of contract wordings, the likes of NEC and FIDIC. Although, the pandemic was not rendering projects to incomplete, but was slowing processes causing disruption and delay. Some of the projects have stopped completely to commence work at a later date. Health and safety risk assessments need to be considered to be consistent with scientific, medical and government guidelines; for instance, people working in an enclosed environment are at higher risk than people working outside. COVID-19 being an unforeseeable circumstance can be considered to be a force majeure occurrence. Force majeure under any standard form of contract, be it FIDIC, will usually afford contract extension of time for the delay during the pandemic and not compensation for cost. Nevertheless, any new regulations given by the public authorities may have legal effect and override any contractual position/obligation initially laid down before the commencement of the projects. Given this restriction to movement during the pandemics 'locked down' is a modification of law which may attract extension of time compensation for the inevitable costs either way- "Sub-clause 13.7 of the 1999" and 2017 FIDIC Forms. Attention to the behaviour of parties is required in future to ensure a symmetry of liability along the supply chain for projects.

Hook (2020) also declared that the impact of this pandemic might force some of the Engineering and Construction companies to streamline debt, consider means of funding or risk bankruptcy. Looking ahead, Engineering and Construction companies will encounter a new dispensation which will include a change in the marketplace, investment in infrastructure by some of the "national government" to kick-start their recovery. In contrast, others may encounter limitations of resources. A survey conducted by Suiko (part of Turner & Townsend) on 45 projects completed during the pandemic, revealed the productivity losses of about 7% as a result of labour shortage and impact from social distancing (Construction Manager, 2020b). Poor transfer of design information while working remotely also accounted for 1% lost in productivity while material unavailability and delivery led to 7%. In response to extraordinary government power on movement restrictions and total "lockdown globally," Australia also restricted travel both within and without to limit the spread of the virus. Due to this unexpected situation, Indonesia and China remained lockdown and inaccessible as well for export of equipment, goods and plants required by the infrastructure and construction sector. This will inevitably cripple the delivery of projects. All in all, good relationships among the parties of the projects with instance resolution of the dispute will enable a smooth transition to pass the immediate crises.

Altogether, the collaboration will play a crucial role in the short run in the global reaction to this COVID-19 as opined by Arcadis (2020). The effect of the pandemic is presumed to be significant for the construction industry and the resolution of disputes. Henceforward, in the year 2020, the industry will be battling with the effect of COVID-19 pandemic on all kinds of projects. Therefore, the purpose of this research is to explore the impact of COVID-19 in the construction industry globally through the use of a quantitative method.

■3.0 METHODOLOGY

3.1 Introduction to Research Methodology

This research aims to explore the positive and the negative effect of the COVID-19 pandemic in the construction industry. This was achieved with the desk study review of limited (due to the recent emergence of the pandemic) literature and a field study with the collection of primary data from construction professionals in Architecture, Building Engineering, Civil/Structural Engineering, Electrical Engineering, Mechanical Engineering, Construction/Project Management and Quantity Surveying in the building industry. With the fact that COVID-19 is a pandemic and there was limited literature to evaluate for generating information, the researchers decided to seek for information globally to understand the positive and negative experiences of professionals all over the world to serve as a pedestal for further research. They are in the following specialisations; designer or consultants, contractor/construction, client, or work in the development authority. The size of the organization of the participants were identified as <10 personnel (micro), 10-50 personnel (small) 50-200 personnel (medium) and >200 personnel (large). The years of experience are 5-10 years, 11-15 years and >15 years. Above all this survey received responses from five continents of the world which includes Africa, Asia, Australia, Europe and North America. The generated primary data were then analysed with SPSS 25.0 analytical tool.

3.2 Population, Sampling and Questionnaire Survey

Sampling is a vital strategy in a statistical analysis, which comprises a selection of a few portions of a potential population so as to assess or learn something from the population at a cheaper cost. Simple random sampling (SRS), popularly known as "random sampling", includes the selection of sample at arbitrary from the sampling frame utilizing either random number tables (as in Thornhill et al., 2009) or an internet arbitrary number generator, such as Inquire about Randomizer. Meng (2013) described SRS as an essential type of sampling, which is frequently utilized as a sampling strategy itself or as a building block for more complex sampling strategies. Albeit frequent use of SRS in the academic writing, it appears without a clear definition — the guideline of SRS is that each conceivable sample has the same likelihood to be chosen, but the definition of "possible sample" may change over distinctive sampling designs. SRS is adopted in this study to reach a wide study domain as the subject is global (i.e. COVID-19 pandemic). The sample domain is construction industry based, which every stakeholder is a potential study sample. Ott and Longnecker (2001) explained how the central limit theorem holds true as for responses in a normally distributed study sample. When sample size is greater than or equal thirty (30), the central limit theorem is considered true or acceptable (Ott and Longnecker, 2001). The 71 responses received in this study is thus considered acceptable as the central limit theorem holds true.

The questionnaire comprises close-ended and open-ended questions with multiple-choice options. The survey questionnaire is designed online, hosted in google drive and shared in a google form. Link to the google form is shared on professional platforms such as LinkedIn and construction professionals' forums, as well as direct emails sent to the key players in the built environment. A total of 71 responses were received. The survey questionnaire was structured under the following subheadings: demography, project status due to COVID-19, impacts of COVID-19, and other comments.

There is diversity in the respondents' locations, especially in terms of legislation and IT infrastructure to support the "work from home" and compliance with the social distancing. Therefore, responses in these perspectives (governments' guidelines, decisions and supports) are evaluated qualitatively and exclusively. On the other hand, the stoppage of work and the significance of pandemic's effects/impacts were assessed quantitatively. The qualitative segment narrates respondents' experiences (lessons learnt) and government decisions. In comparison, the quantitative segment evaluates the importance in rating and tendencies of the components. The significance is evaluated through a 5-point Likert scale and based on how significant (RII $\geq$ 0.70) or mean $\geq$ 3.5 in a 5-point Likert scale (Badu et al., 2012).

■4.0 DATA ANALYSIS, RESULTS AND DISCUSSION

4.1 Data Analysis

The data fetched from the survey is from respondents across sixteen countries from five continents, analysed using descriptive statistics. Figure 1 presents the distribution of these respondents based on continents to avoid a clumsy presentation of data. The highest number of participants is from Africa with 54.9%, followed by Asia with 22.5%, Europe 18.3%, North America 2.8% and Australia 1.4%. The 16 countries of the participants are Nigeria, Zambia, South Africa, England, Scotland, Ireland, Barbados, Canada, Australia, United Arab Emirate, Saudi Arabia, Qatar, Russia, Nepal, Indonesia and India.

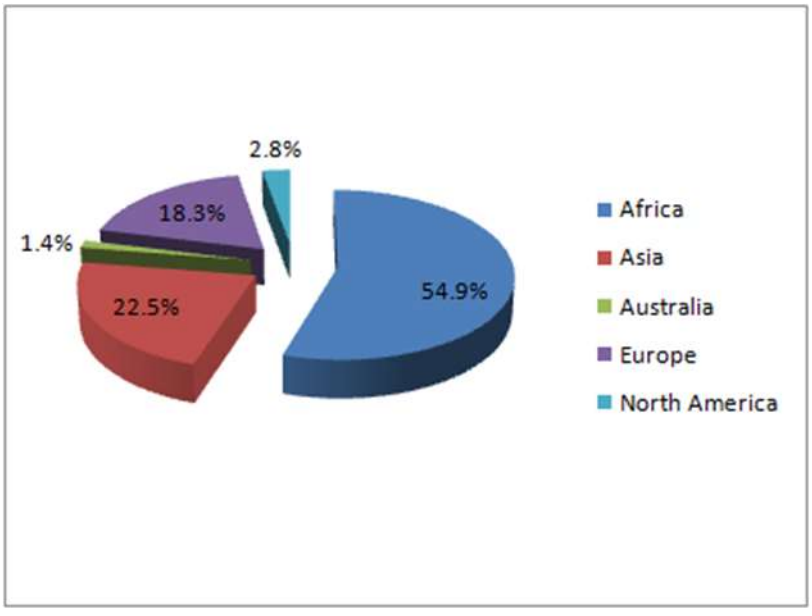

Figure 1 Participants' country of operation

The distribution of respondents in Table 1 suggests that the participants are skilled professionals considering their educational qualifications. Over 90% of the participants are first degree and second-degree holders, as such their responses regarding the study context are deemed essential and valid. Moreover, their specialty areas are of the study interest; they are primarily built environment professionals

(Architects, Civil Engineers, Construction/Project Managers and Quantity Surveyors). More than 80% are design and construction firms who are directly involved in projects rather than clients or regulatory authority.

Table 1 Demographic information of the participants

	Description	Number	Percentage (%)
Respondents Academic Qualification	Higher National Diploma	5	7.0
	First Degree	21	29.6
	MSc	44	62.0
	PhD	1	1.4
Respondents' Profession	Architect	13	18.3
	Building Engineering	3	4.2
	Civil/Structural Engineering	14	19.7
	Electrical Engineering	1	1.4
	Mechanical Engineering	1	1.4
	Construction/Project Management	24	33.8
	Quantity Surveying	15	21.1
Company's specialisation	Contractor/Construction	24	33.8
	Designer or Consultant	37	52.1
	Client	9	12.7
	Development Authority	1	1.4
Size of technical personnel in the Organisation	Less than 10personnel (Micro)	28	39.4
	10-50 Personnel (Small)	18	25.4
	50-200 Personnel (Medium)	4	5.6
	More than 200 personnel (Large)	21	29.6
Year of Experience	5-10years	20	28.2
	11-15years	11	15.5
	>15years	40	56.3
Continents of the participants	Africa	39	54.9
	Asia	16	22.5
	Australia	1	1.4
	Europe	13	18.3
	North America	2	2.8

The respondents are highly experienced in the industry, with over 70% of them having more than 10years of industry experience. On the other hand, the respondents are generally from Africa, Asia and Europe (in descending order) and that could be a limitation of the data coverage.

Table 2 Reliability alpha value

Reliability Statistics

Cronbach's Alpha	N of Items
.65	2

Reliability test is conducted to discover an internal consistency of the items and the scale used. In this way, Cronbach's alpha is used for examining the reliability, and relate with George and Mallery's (2003) adequacy. Any coefficient of Cronbach's alpha that is greater than 0.6 is considered acceptable. The Cronbach's alpha result of the two significant variables of this study (presented in Table 2) demonstrates a true and acceptable reliability of the inter-item and the scale of measurement.

4.2 Results and Discussion

It was evident from the project status that over 90% stated that their projects were affected during this Pandemic. About 51% of participants indicated that their projects were partially stopped due to the COVID-19, while up to 40% of the participants experienced full stoppage. One of the participants revealed that the projects were fully stopped at the initial stage and later turned to partial. Interestingly other participants indicated no experience of stoppage claiming that operation was restructured on a daily basis depending on the type of

the projects; a participant provided an insight claiming that the experience of both full stoppage and partial stoppage. Some had to stop having experienced an infected staff. Table 3 presents a summary of the quantitative data generated from the questionnaire survey.

Table 3 Participants' responses

Questions	Options/Descriptions	Frequencies	Percentage (%)
Did COVID-19 affect your project?	Yes	69	97.2
	No	2	2.8
Do you consider permanent changes to your working process?	Yes	42	59.2
	No	29	40.8
In the face of the Pandemic, did you obtain or anticipate getting any benefit from the government (e.g. tax or VAT waver, furlough)?	Yes	17	23.9
	No	54	76.1
In which way did COVID-19 affect your project(s)?	Full stoppage	29	40.8
	Partial stoppage	36	50.7
	Others	6	8.5
What is the current status of your project(s)?	Work returned with disruptions and progress affected	52	73.2
	Work has not returned	13	18.3
	Work returned without affecting our weekly progress	6	8.5
Reason(s) for suspension of work or why not resuming work?	Government decision	40	56.3
	Business decision	14	19.7
	Personal decision	7	9.9
	Other reasons	10	14.1
If COVID-19 affected your project, what is the level of its impact on your workflow?	Severe	11	15.5
	Major	23	32.4
	Moderate	27	38.0
	Minor	5	7.0
	Insignificant	5	7.0
Rate the impact of the lessons learnt on your projects / business	Very significant	0	0.0
	Significant	24	33.8
	Average	36	50.7
	Minor	6	8.5
	Minimal	5	7.0

As the easing of lockdown approaches, there was generally a great sign of relief as 73% indicated that work has returned with disruptions and progress affected. In comparison, about 8% returned to work without hindrance to the weekly progress of work. Unfortunately, 18% are still experiencing total lockdown on their projects. The work stoppage in the construction environment can be further confirmed through Aryal and Mishra (2020)'s finding. 56% indicated that work was suspended based on a government decision while it is a business decision for 14 number of participants. 10% of the participants are based on their personal decision. On the other hand, other decisions could be the new development of "work from home."

Some governments in different countries offered relief packages to assist the industry for sustenance during this period. For instance, the relief packages in the form of tax or VAT waiver in the case of the United Kingdom, or furlough are offered to corporate organisations to save the economy (CIOB, 2020b). Seventeen participants indicated either the receipt or anticipated the collection of the benefit from the government while 54 participants were not opportune to such benefits. Thus, with over 70% not getting benefit from the government, this indicated that the construction industry is not benefiting from most governments' subsidies and waivers. Furthermore, there is a serious concern on the state of the industry post-COVID-19 compared to other industries that benefited from such initiatives. Figure 2 describes how government and business decisions influenced the construction sites closure and their corresponding impacts on construction projects. The government decision appeared as a major reason for the stoppage of work in the construction industry amidst COVID-19 pandemic. Moreover, the government decision to lockdown is the main reason for full stoppage of work on-site and equally to the partial stop of work complemented by work from home and skeletal operations where necessary.

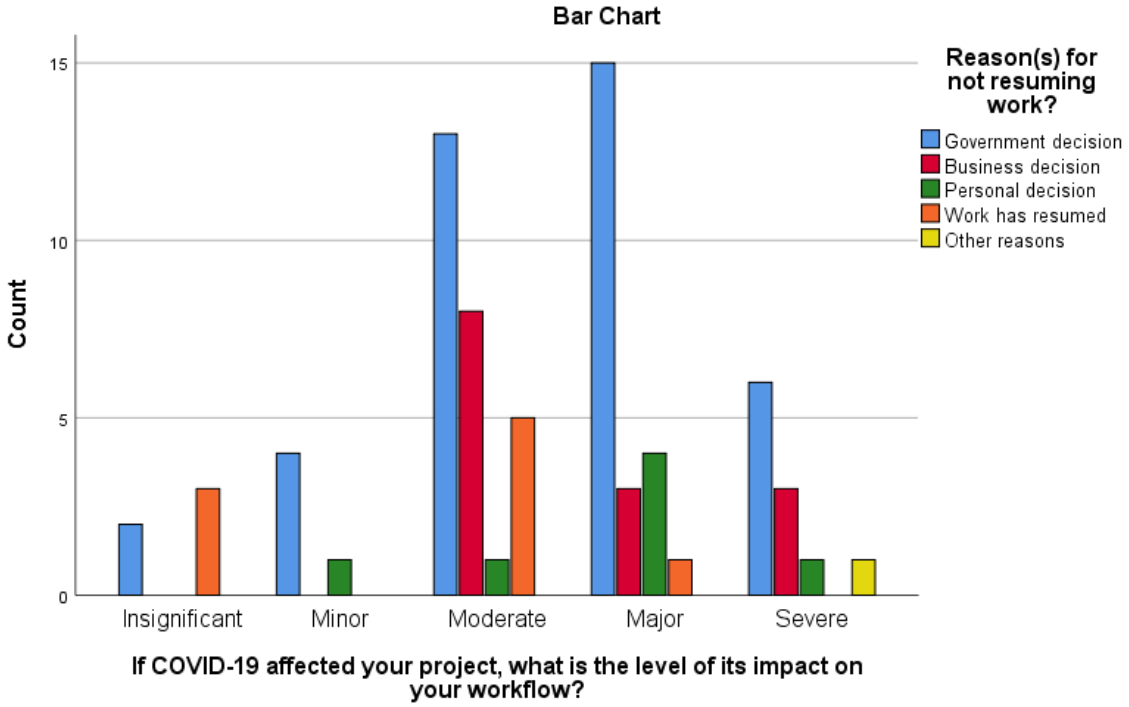

Figure 2 Frequency vs Impact plot: Impact of work stoppage on projects and reason(s)

On the other hand, there is moderate impact (38%) on the construction business and major (32%) in some instances. While the lessons learned during this Pandemic were not very clear as its rating ranges between "average" and "significant." Thus, the learning curve is building up as lockdown is being eased at different levels and stages; while companies are evaluating their losses and re-strategizing their work plans.

Table 4 ANOVA on lessons learnt due to COVID-19

ANOVA

The impact of the lessons learnt on projects/business as a result of COVID-19

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	12.326	4	3.081	5.531	.001
Within Groups	36.773	66	.557		
Total	49.099	70			

Analysis of variance was calculated (Table 4) to establish how significant it is to learn something new as a result of this Pandemic. The result indicated that the level of changes and effects of COVID-19 on projects had a significant impact on the outcome of the industry after the Pandemic, $F(4, 66) = 5.53$, $p = .001$. Thus, this suggested that the null hypothesis is rejected for having only 1% chance that this issue could have happened (by chance) the way it is. Therefore, the effect of COVID-19 on construction projects has a significant influence on the future of most construction firms.

4.2.1 Positive Experiences from the Participants

To identify the positive and negative effect of the Pandemic, insightful and informative experiences were gathered from the participants. The first, as obvious globally, is the "Opportunity to improve on virtual alternatives." Remarkably, the situation has enabled the compulsory usage of technology to attend to operational needs such as correspondence, meetings, webinars which could have been done initially face to face as stated by Gumble (2020). The positive experiences include the deployment of technological tools and enhancement of their usage; learn to re-organise Work Plan; the advantage of having bulk materials on-site; learn always to plan ahead; encourage collaboration and risk assessment; workspace management and design consideration; consider additional PPE(s) and social distancing; plan for unforeseen circumstances and inclusion of contingency to cover such events; and increase off-site working (i.e. off-site construction or use of precast elements).

4.2.2 Negative Experiences from the Participants

Despite the positive experiences, unexpected "delays in the completion of projects" also raises its ugly head. Even without COVID-19, construction delay which most times results in time overrun and cost overruns is one of the major setbacks that the construction industry has been battling with; now with this Pandemic, the case has become extraordinarily complex. The research participants identified several negative experiences. These include hardship suffered by daily labourers, a delay that affects project budget, disruption suffered by a well-planned project while the lockdown was never considered during tender/contract. There is also a slowdown in revenue from the real estate sector, the implication to HSE rule - new/modify rules (as a result of the COVID-19), and ineffective or impossible site-based working process from home.

Overall, the result expressed the impact of lockdown in the construction industry, the government effort to resuscitate the construction industry from the impact of COVID-19. The effect and prospects of the pandemic was also confirmed from the survey as negative and positives in diverse quarters - see summation from Gumble (2020) and Hook (2020).

■5.0 CONCLUSION

The paper explored the experience of professionals in the construction industry as it relates to COVID-19 through literature reviews and questionnaire survey. The primary data were elicited from construction professionals, Architect, Engineers, Quantity Surveyors, Builders, Construction and Project Managers from around 16 countries in five continents. Construction industry will have to reevaluate the option of strict office work as this pandemic has brought about the possibility of "working from home". The eye-opener is discovered as, not all construction work is office-based. It is evident that the world is diving more and more digitally, hence professionals are expected to embrace innovative technology to improve productivity. The need for more preparation towards the threat and opportunity posed by risk is essential. The question now is, can there be a review of contingency? Should construction projects be insured? Would there be a need for a review of the standard forms of contract? This study discovered that COVID-19 significantly affected the procurement of the built asset and construction industry at large, and this is as a result of the full and partial stoppage of works majority decided by the authorities. The impact of the stoppage has quite outweighed the lessons learnt during the lockdown imposed in various countries. The majority of players in the construction industry were unable to benefit from various programmes introduced by governments during the peak of this Pandemic; as a result, some companies may likely go into a serious difficulty that may lead to collapse or going out of business. Most firms have resumed work around the world with moderately major disruption to the workflow and progress of work.

The lessons learned include several eye-opening events as a result of this disruption, ranging from the deployment of various strategies to virtual working (using technology tools) where such can work, and workspace management and additional design considerations. Likewise, planning with unforeseen circumstances (including other contingency covering that), and the reduction of on-site work through the use of prefabricated elements. The lockdown was never considered during tendering for any construction works as such well-planned projects were equally affected by this pandemic. Some implications of COVID-19 can go along in modification of HSE rules, contingency plan, and force majeure in standard forms of construction contract. The experience of COVID-19 in the construction industry is not yet over as the learning curve has not completed the circle. In the end, if these experiences are harmonised, a comprehensive turnaround strategy for contingency plan would be produced. The study sharpens a way to a comprehensive development of such strategy to ripe diverse experiences in global challenges.

A limitation encountered during this research is the minimal number of the data collection when compared with arrays of construction professionals all over the world. It would be expected that such data could have a larger number of survey participants than the number evaluated. However, the number limit was considered due to the research time frame and also the demographic style to cover opinion and trends from professionals in different nations of the world. Further study could expand to involve more participants so as to explore further updates on the impact of COVID-19 in the construction industry from mid-2020 onward. Another limitation is the shortage of literature to revert to in-depth for this particular study. This is an unprecedented event which caught the entire world unaware and including the ardent risk takers in the construction industry.

References

Abd El Khalek, H., Aziz, R. F., & Kamel, H. (2016). Uncertainty and risk factors assessment for cross-country pipelines projects using AHP. *American Journal of Civil Engineering*, *4*(1), 12-23.

Arcadis. (2020). Arcadis global construction disputes report 2020: Collaborating to achieve project excellence. Retrieved from https://www.arcadis.com/en/middle-east/our-perspectives/2020/06/arcadis-global-construction-disputes-report-2020/.

Aryal, R., & Mishra, A. K. (2020, July). *Effect of COVID-19 and lockdown on construction industry*. Paper presented at the One-day Online International Conference on Effects of COVID-19 and Lockdown on Environment. Retrieved from https://www.researchgate.net/publication/343318378_Effect_of_COVID-19_and_lockdown_on_construction_industry.

Badu, E., Edwards, D. J., Owusu-Manu, D., & Brown, D. M. (2012). Barriers to the implementation of innovative financing (IF) of infrastructure. *Journal of Financial Management of Property and Construction*, *17*(3), 253-273.

Bailey, J., Bouchardie, N., & Madalena, I. (2020, April 14). COVID-19: The current impact on construction and engineering projects. *White & Case*. Retrieved from https://www.whitecase.com/publications/alert/covid-19-current-impact-construction-engineering-projects.

Chartered Institute of Building (CIOB). (2020a, June 1). CIOB welcomes "Roadmap to Recovery" for the construction industry. Retrieved from https://www.ciob.org/media-centre/news/ciob-welcomes-roadmap-recovery-construction-industry.

Chartered Institute of Building (CIOB). (2020b, June 10). Delay in VAT rule change gives construction firms room to breathe amid COVID-19. Retrieved from https://www.ciob.org/media-centre/news/delay-vat-rule-change-gives-construction-firms-room-breathe-amid-covid-19.

Construction Leadership Council. (2020). Construction sector - Site operating procedures. Protecting your workforce during coronavirus (Covid-19). Retrieved from https://www.constructionleadershipcouncil.co.uk/wp-content/uploads/2020/07/Site-Operating-Procedures-Version-5.pdf.

Construction Manager. (2020a, June 17). Construction expected to shed 10% of workforce by September. Retrieved from https://www.constructionmanagermagazine.com/construction-expected-to-shed-10-of-workforce-by-september/.

Construction Manager. (2020b, June 23). Covid-19 causing extra 15% productivity loss on UK sites. Retrieved from https://www.constructionmanagermagazine.com/covid-19-causing-extra-15-productivity-loss-on-uk-sites/.

Davisson, K., & Losavio, J. (2020, April 28). How sustainable infrastructure can aid the post-COVID recovery. Retrieved from https://www.weforum.org/agenda/2020/04/coronavirus-covid-19-sustainable-infrastructure-investments-aid-recovery/.

Eldosouky, I. A., Ibrahim, A. H., & Mohammed, H. E.-D. (2014). Management of construction cost contingency covering upside and downside risks. *Alexandria Engineering Journal, 53*(4), 863-881.

George, D., & Mallery, P. (2003). *SPSS for Windows step by step: A simple guide and reference* (4th ed.). Boston, MA: Allyn and Bacon.

GlobalData. (2020). Construction in Nigeria: COVID-19 sector impact. Retrieved from https://www.marketresearch.com/GlobalData-v3648/Construction-Nigeria-COVID-Sector-Impact-13237763/.

Gumble, C. (2020). Making the best of a bad situation. *Construction Manager*, May, p. 18. Retrieved from https://www.constructionmanagermagazine.com/wp-content/uploads/2020/06/Construction_Manager_May_2020.pdf.

Hepburn, C., O'Callaghan, B., Stern, N., Stiglitz, J., & Zenghelis, D. (2020). Will COVID-19 fiscal recovery packages accelerate or retard progress on climate change? *Oxford Review of Economic Policy, 36*(Supplement_1), S359-S381.

Hook, J. (2020). Engineering & construction in a post-COVID world: Weathering the storm. Retrieved from https://www.pwc.com/gx/en/issues/crisis-solutions/covid-19/engineering-construction-post-covid-world.html.

Hughes, L. (2020). The impact of Covid-19 on construction industry in Sub-Saharan Africa. Retrieved from https://www.arcadis.com/en/africa/our-perspectives/articles/the-impact-of-covid19-on-construction-industry-in-sub-saharan-africa/.

Jones, K. (2020, April 16). Construction technology is reshaping the industry. Retrieved on 27 July 2020 from https://www.constructconnect.com/blog/technology-reshaping-construction-industry.

Kale, A. R. (2020). Impact of Covid-19 on infrastructure and environment. *Purakala, 31*(37), 98-105.

Lexology. (2020). COVID-19 weekly round-up. Retrieved from https://www.lexology.com/library/detail.aspx?g=965bd525-c837-4663-8e0f-c63b7362bd0f.

Meng, X. (2013). Scalable simple random sampling and stratified sampling. In S. Dasgupta & D. McAllester (Eds.), *ICML-13. Proceedings of the 30th international conference on machine learning* (Vol. 28, pp. 531-539). Brookline, MA: JMLR W&CP.

Office for National Statistics (ONS). (2020). GDP first quarterly estimate, United Kingdom; January to March 2020. Retrieved from https://www.ons.gov.uk/releases/gdpfirstquarterlyestimateukjanuarytomarch2020.

Okonmah, N.-M., Abdulkareem, H., & Fagbohunlu, B. (2020, May). COVID-19: Nigerian construction and infrastructure industry. Retrieved from https://www.aluko-oyebode.com/insights/covid-19-nigerian-construction-and-infrastructure-industry/#.

Otali, M., & Odesola, I. (2014). Effectiveness evaluation of contingency sum as a risk management tool for construction projects in Niger Delta, Nigeria. *Ethiopian Journal of Environmental Studies and Management, 7*(6), 588-598.

Ott, R. L., & Longnecker, M. (2001). *An introduction to statistical methods and data analysis* (5th ed.). Pacific Grove, CA: Duxbury.

Ramboll. (2020). COVID-19. Retrieved from: https://uk.ramboll.com/.

Thornhill, A., Saunders, M., & Lewis, P. (2009). *Research methods for business students*. London: Prentice Hall.

Thomas, E. (2020, April 22). GlobalData forecasts disruption for construction industry in Eastern and Western Europe. *World Cement.* Retrieved from https://www.worldcement.com/europe-cis/22042020/globaldata-eastern-european-construction-output-to-contract-by-14-in-2020/.