**ENGINERING LAW REPORT**

**ON**

**ENGINEERING STRATEGIES FOR HANDLING COVID-19 FOR ENVIRONMENTAL HEALTH AND ECONOMIC SUSTAINABILITY**

**PREPARED BY,**

**UJIAGBE ANTHONY OSAGIE**

**(17/ENG03/053)**

**A TERM PAPER SUBMITTED TO**

**THE DEPARTMENT OF CIVIL ENGINEERING,**

**COLLEGE OF ENGINEERING,**

**AFEBABALOLA UNIVERSITY, ADO-EKITI NIGERIA,**

**ENG 384: ENGINEERING LAW AND MANGERIAL ECONOMICS**

**APRIL, 2020.**

**ACKNOWLEDEMENT**

My gratitude to my Almighty father who has seen me through with his infinite mercy and for his kindness and mercy in my life.

My gratitude goes to Engr. Bello and other lectures of engineering law and managerial economics for being able to participate in this research.

Special thanks to the members of the academic of Afe Babalola University. My gratitude also goes to the department of Civil Engineering for helping on this report.

**ABSTRACT**

Coronaviruses are a large family of viruses that are known to cause illness ranging from the common cold to more severe diseases such as Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS).

A novel coronavirus (COVID-19) was identified in 2019 in Wuhan, China. This is a new coronavirus that has not been previously identified in humans.

This course provides a general introduction to COVID-19 and emerging respiratory viruses and is intended for public health professionals, incident managers and personnel working for the United Nations, international organizations and NGOs.

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**INTRODUCTION**

Coronavirus disease 2019 (COVID-19) is defined as illness caused by a novel coronavirus now called severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2; formerly called 2019-nCoV), which was first identified amid an outbreak of respiratory illness cases in Wuhan City, Hubei Province, China.It was initially reported to the WHO on December 31, 2019. On January 30, 2020, the WHO declared the COVID-19 outbreak a global health emergency.On March 11, 2020, the WHO declared COVID-19 a global pandemic, its first such designation since declaring H1N1 influenza a pandemic in 2009.

Illness caused by SARS-CoV-2 was recently termed COVID-19 by the WHO, the new acronym derived from "coronavirus disease 2019. " The name was chosen to avoid stigmatizing the virus's origins in terms of populations, geography, or animal associations

**TRANSMISSION PROCESS**Respiratory infections can be transmitted through droplets of different sizes: when the droplet particles are >5-10μm in diameter they are referred to as respiratory droplets, and when then are <5μm in diameter, they are referred to as droplet nuclei.According to current evidence, COVID-19 virus is primarily transmitted between people through respiratory droplets and contact routes.In an analysis of 75,465 COVID-19 cases in China, airborne transmission was not reported.

Droplet transmission occurs when a person is in in close contact (within 1 m) with someone who has respiratory symptoms (e.g., coughing or sneezing) and is therefore at risk of having his/her mucosae (mouth and nose) or conjunctiva (eyes) exposed to potentially infective respiratory droplets. Transmission may also occur through fomites in the immediate environment around the infected person.8 Therefore, transmission of the COVID-19 virus can occur by direct contact with infected people and indirect contact with surfaces in the immediate environment or with objects used on the infected person (e.g., stethoscope or thermometer).

Airborne transmission is different from droplet transmission as it refers to the presence of microbes within droplet nuclei, which are generally considered to be particles <5μm in diameter, can remain in the air for long periods of time and be transmitted to others over distances greater than 1 m.

In the context of COVID-19, airborne transmission may be possible in specific circumstances and settings in which procedures or support treatments that generate aerosols are performed; i.e., endotracheal intubation, bronchoscopy, open suctioning, administration of nebulized treatment, manual ventilation before intubation, turning the patient to the prone position, disconnecting the patient from the ventilator, non-invasive positive-pressure ventilation, tracheostomy, and cardiopulmonary resuscitation.

There is some evidence that COVID-19 infection may lead to intestinal infection and be present in faeces. However, to date only one study has cultured the COVID-19 virus from a single stool specimen.There have been no reports of faecal−oral transmission of the COVID-19 virus to date.

**SYMTOMS OF COVID-19**

The most common symptoms of COVID-19 are fever, tiredness, and dry cough. Some patients may have aches and pains, nasal congestion, runny nose, sore throat or diarrhea. These symptoms are usually mild and begin gradually. Some people become infected but don’t develop any symptoms and don't feel unwell. Most people (about 80%) recover from the disease without needing special treatment. Around 1 out of every 6 people who gets COVID-19 becomes seriously ill and develops difficulty breathing. Older people, and those with underlying medical problems like high blood pressure, heart problems or diabetes, are more likely to develop serious illness. People with fever, cough and difficulty breathing should seek medical attention.

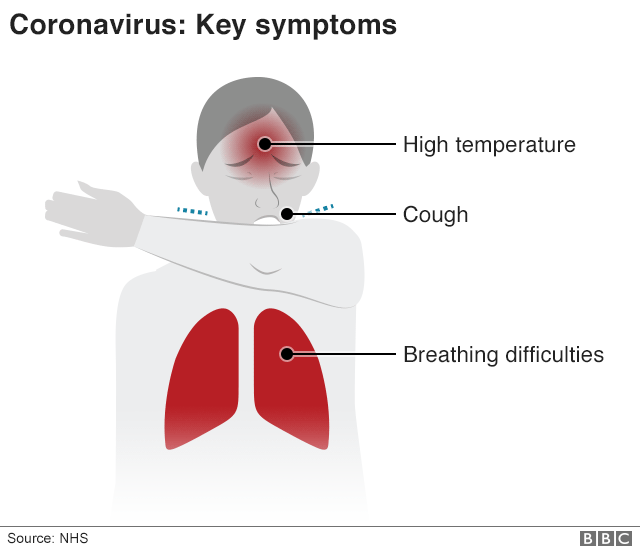
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Fig: 1

**PREVENTIVE MEASURES**

Stay aware of the latest information on the COVID-19 outbreak, available on the WHO website and through your national and local public health authority. Many countries around the world have seen cases of COVID-19 and several have seen outbreaks. Authorities in China and some other countries have succeeded in slowing or stopping their outbreaks. However, the situation is unpredictable so check regularly for the latest news.

You can reduce your chances of being infected or spreading COVID-19 by taking some simple precautions:

* Regularly and thoroughly clean your hands with an alcohol-based hand rub or wash them with soap and water.  
  Why? Washing your hands with soap and water or using alcohol-based hand rub kills viruses that may be on your hands.
* Maintain at least 1 metre (3 feet) distance between yourself and anyone who is coughing or sneezing.  
  Why? When someone coughs or sneezes they spray small liquid droplets from their nose or mouth which may contain virus. If you are too close, you can breathe in the droplets, including the COVID-19 virus if the person coughing has the disease.
* Avoid touching eyes, nose and mouth.  
  Why? Hands touch many surfaces and can pick up viruses. Once contaminated, hands can transfer the virus to your eyes, nose or mouth. From there, the virus can enter your body and can make you sick.
* Make sure you, and the people around you, follow good respiratory hygiene. This means covering your mouth and nose with your bent elbow or tissue when you cough or sneeze. Then dispose of the used tissue immediately.  
  Why? Droplets spread virus. By following good respiratory hygiene you protect the people around you from viruses such as cold, flu and COVID-19.
* Stay home if you feel unwell. If you have a fever, cough and difficulty breathing, seek medical attention and call in advance. Follow the directions of your local health authority.  
  Why? National and local authorities will have the most up to date information on the situation in your area. Calling in advance will allow your health care provider to quickly direct you to the right health facility. This will also protect you and help prevent spread of viruses and other infections.
* Keep up to date on the latest COVID-19 hotspots (cities or local areas where COVID-19 is spreading widely). If possible, avoid traveling to places  – especially if you are an older person or have diabetes, heart or lung disease.  
  Why? You have a higher chance of catching COVID-19 in one of these areas.

**Protection measures for persons who are in or have recently visited (past 14 days) areas where COVID-19 is spreading**

* Follow the guidance outlined above (Protection measures for everyone)
* Self-isolate by staying at home if you begin to feel unwell, even with mild symptoms such as headache, low grade fever (37.3 C or above) and slight runny nose, until you recover. If it is essential for you to have someone bring you supplies or to go out, e.g. to buy food, then wear a mask to avoid infecting other people.  
  Why? Avoiding contact with others and visits to medical facilities will allow these facilities to operate more effectively and help protect you and others from possible COVID-19 and other viruses.
* If you develop fever, cough and difficulty breathing, seek medical advice promptly as this may be due to a respiratory infection or other serious condition. Call in advance and tell your provider of any recent travel or contact with travelers.  
  Why? Calling in advance will allow your health care provider to quickly direct you to the right health facility. This will also help to prevent possible spread of COVID-19 and other viruses.

**EFFECTS OF CORONA VIRUS ON HUMAN LIVES**

COVID-19 is the biggest global event—and challenge—of our lifetimes. As such, it is changing human attitudes and behaviors today and forcing organizations to respond. However, the need to respond won’t end when the virus’s immediate threat eventually recedes.

Imagine it's September. Things are back to normal. We can meet face to face. Travel is possible. But things have changed. COVID-19 has forever changed the experience of being a customer, employees, citizen, human. Expect to see behavior change at scale for some time to come.

**COST OF CONFIDENCE**

An explicit message of COVID-19 is that other people/places can carry an invisible threat. Deciding on what to do especially in relation to large decisions, such as holidays and where to live or work is becoming a more anxious process. Many purchases are being postponed. All of this will make risk less tolerable and the familiar more valuable.

The erosion of confidence will make trust way more important than ever before. This will necessitate a “trust multiplier” action that, to be effective, rebuilds trust quickly and credibly. Focus will be on confidence-building through every channel. Justifiable optimism will sell well. All of this may change the nature of what we regard as premium products and services.

**THE VIRTUAL CENTURY**

The enforced shift during the worst of the pandemic to virtual working, consuming and socializing will fuel a massive and further shift to virtual activity for anything. It will affect ways of communicating across learning, working, transacting and consuming. This will impact on everyone.

Adoption of digital by those yet to do so will be accelerated and a reduction of the obstacles to going virtual for any sort of experience will be required. Winners will be those who test and explore all of the associated creative possibilities. Anything that can be done virtually will be.

**EVERY BUSINESS IS A HEALTH BUSINESS**

People are concluding that they cannot rely on existing health structures but, nonetheless, want all the help they can get, in every aspect of their lives. Health experiences will be in demand and, vice versa, health should be considered in every experience.

The concerns about health amplified during the crisis will not ebb after it is over. Rather, health will dominate. A health economy will emerge with opportunities for all to plug into. Every business will need to understand how it can be part of a new health ecosystem that will dominate citizen thinking.

**COCOONING**

Everyone being told to self-isolate means a return en masse to home as the epicenter of life and experience. At the height of the crisis, many—workers, especially—are spending more time at home. After, this pattern will endure with meaningfulness and comfort carrying a price premium.

There will be a rise in home spending—on the home and made at home as people will stay more local. Desire for cocooning, along with opportunities for those with creative strategies to enable it, will move center-stage. Winners will be those who zero their sights on the home.

**THE REINVENTION OF AUTHORITY**

Dependence on experts and strong government recommendation—plus executive powers to start resolving the pandemic backed by citizen compliance—lends real weight to central authority, which in many markets has been eroded recently in popular culture. If governments get their handling of the crisis broadly right, expect top-down control to be back in fashion; if not, the reverse.

A reinvention of authority is likely after the effect of travel limitations, self-isolation and lockdown officially mandated by many governments. Greater acceptance for the role of government and companies in society, and the importance of collective behavior, may occur.

**EFFECTS OF CORONA VIRUS ON NIGERIAN ECONOMY**

For most developing economies, the odds of sliding into a downturn are gradually expected as the global coronavirus outbreak puts severe pressure on the economy. For Nigeria, the country is still sluggishly grappling with recovery from the 2016 economic recession which was a fall out of global oil price crash and insufficient foreign exchange earnings to meet imports. In the spirit of economic recovery and growth sustainability, the Nigerian federal budget for the 2020 fiscal year was prepared with significant revenue expectations but with contestable realizations. The approved budget had projected revenue collections at N8.24 Trillion, an increase of about 20% from 2019 figure. The revenue assumptions are premised on increased global oil demand and stable market with oil price benchmark and oil output respectively at $57 per barrel and 2.18 Million Barrels Per Day.

The emergence of COVID-19 and its increasing incidence in Nigeria has called for drastic review and changes in the earlier revenue expectations and fiscal projections. Compared to events that led to recession in 2016, the current state of the global economy poses more difficulties ahead as the oil price is currently below US$30 with projections that it will dip further going by the price war among key players in the industry. Unfortunately, the nation has grossly underachieved in setting aside sufficient buffers for rainy days such as it faces in the coming days. In addressing these daunting economic challenges, the current considerations to revise the budget downward is inevitable. However, certain considerations that are expected in the review must not be left out. The assumptions and benchmarks must be based on realizable thresholds and estimates to ensure optimum budget performance, especially on the non-oil revenue components.

Furthermore, cutting expenditures must be done such that the already excluded group and vulnerable are not left to bear the brunt of the economic contraction. The economic and growth recovery program which has the aim of increasing social inclusion by creating jobs and providing support for the poorest and most vulnerable members of society through investments in social programs and providing social amenities will no doubt suffers some setbacks. Besides, the downward review of the budget and contractions in public spending could be devastating on poverty and unemployment.

**STRATEGIES THAT ENGINEERS SHOULD ADAPT TO IN HANDLING CORONA VIRUS**

**Strategies to Optimize the Supply of PPE and Equipment**

Personal protective equipment (PPE) is used every day by healthcare personnel (HCP) to protect themselves, patients, and others when providing care. PPE helps protect HCP from potentially infectious patients and materials, toxic medications, and other potentially dangerous substances used in healthcare delivery.

PPE shortages are currently posing a tremendous challenge to healthcare officials all over the world because of the COVID-19 pandemic. Healthcare facilities are having difficulty accessing the needed PPE and are having to identify alternate ways to provide patient care.

Engineers together with the help of different healthcare agencies optimization strategies for PPE offer options for use when PPE supplies are stressed, running low, or absent. Contingency strategies can help stretch PPE supplies when shortages are anticipated, for example if facilities have sufficient supplies now but are likely to run out soon. Crisis strategies can be considered during severe PPE shortages and should be used with the contingency options to help stretch available supplies for the most critical needs. As PPE availability returns to normal, healthcare facilities should promptly resume standard practices.

**All healthcare facilities should begin using PPE contingency strategies now.**

* Maximize use of engineering controls, such as barriers and maintained ventilation systems, and administrative controls, such as altering work practices to minimize patient contacts.
* Cancel elective and non-urgent procedures/appointments.
* Reserve PPE for HCP and replace PPE normally used for source control with other barrier precautions such as tissues.
* Use re-usable PPE that can be reprocessed.
* Use PPE beyond the manufacturer-designated shelf life for training.
* Consider allowing HCP to extend use of respirators, facemasks, and eye protection, beyond a single patient contact.

**Strategies to Allocate Ventilators from Stockpiles to Facilities**

During a large-scale public health emergency involving a respiratory disease like COVID-19, federal, state, or local stockpiled ventilators should be deployed in a way that optimizes the effectiveness, efficiency, and equity of this scarce resource. Decisions on the allocation of stockpiled ventilators to facilities should be based on multiple factors, including:1

* Assessment of need
* Determination of facilities’ ability to absorb additional ventilators
* Ethical considerations to inform how this scarce resource is provided to facilities to save as many lives as possible
* Input from state and local leadership, legal and ethical experts, and informed stakeholders

State and local planners can use the strategies in this guide to assist them when allocating ventilators from public health stockpiles to hospitals and other facilities during a pandemic.

**Assessment of need:**

* Use available surveillance data to predict the number of ventilators needed
  + Growth in number of daily cases (increasing, stable, decreasing)
  + Number of hospitalizations
  + Percentage of hospitalizations with critical illness requiring critical care
  + Percentage of critically ill patients needing ventilatory support
* Assess the number of ventilators currently available for use by each facility
  + Ventilators currently not in use or in storage
  + Ventilators anticipated to be available from surge contracts or sharing agreements
  + Ventilators in use that may be available for future use

**ECONOMIC STRATEGIES**

**CRISIS MANAGEMENT AND RESPONSE**

* Work closely with subcontractors (and governments) and consider emergency measures to assist them in the case of widespread construction site shutdowns.
* Assess how profitability, loans, revolving credit and cash flow reserves can support ongoing operations in a low-revenue environment — in light of current (and forecasted) cash operating expenses, taxes and other cash expense items.
* Review capital and corporate cost budgets to help identify not only marginal investments, but also discretionary items that can be cut.
* Consider divesting non-core or possibly underperforming assets or assessing mergers and acquisitions (M&A) prospects as potential sources of cash.
* Consider refinancing debt — although access to capital may be constrained.
* Work closely with municipal, state and federal governments to coordinate plans for worker and consumer safety, while keeping mission-critical projects running.
* To help assess labor costs, consider workforce contingency planning scenarios, including during a period of diminished demand and activity.

**WORKFORCE**

* Confirm that your employees are safe and know how to protect themselves. Consider instituting sanitation rules in the workplace and assess mobility policies to encourage remote working, when necessary and possible. Ask employees who are sick to stay home until they are better. Stagger shifts, increase distance between workers and ban visitors to construction sites. Eliminate non-essential travel.
* Consider “forward-paying” subcontractors whose construction sites have been shut down due to COVID-19 containment efforts.
* Establish risk-mitigation programs for employees who still need to work on-site. Invest in education campaigns for front-line employees who have to be on-site so they know what to do  to minimize the spread of the disease and what to do if they experience symptoms.
* Consider potential workforce scenarios to help reduce immediate labor costs.
* Gather necessary data on employees (geography, visas, etc.) and track movements during the crisis.
* Consider which functions may be outsourced to help trim operating costs.

**OPERATION AND SUPPLY CHAIN**

* Work with local, state and federal governments — and your subcontractors — to help assess which construction projects may be shut down, and prepare accordingly.
* Transfer new knowledge down the supply chain. Update leading practices as the situation evolves, and assist subcontractors and governments in implementing them. This may require increasing transparency in the supply chain through daily self-reporting with critical suppliers.
* Gain a keener, real-time situational awareness of your supply chains, especially those affecting critical materials and components. Identify potentially weak links in the supply chain — especially in geographies currently affected by COVID-19 and those that could be impacted in the future.
* Prepare for supply chain pivots that could mean identifying alternative suppliers.
* Prioritize cybersecurity and system resiliency in response to significantly higher levels of remote access to core systems, and because employees and management could be more susceptible to social engineering efforts in the midst of a crisis.
* Evaluate the use of automation solutions to reduce the number of workers on sites. Companies that have piloted solutions should ramp them up carefully, while others should start exploring them. Focus on autonomous materials movement (e.g., autonomous forklifts and cranes and high-payload drones) and the automation of repetitive tasks.

**FINANCIAL REPORTING**

* Broaden disclosures to go beyond what’s required in financial statements. For example, you might consider disclosing management’s analysis of the current and potential future impact of liquidity and credit crunch on the business.
* Plan for impairment and disclosure considerations, particularly if your company’s fiscal year ends on or after Jan. 1, 2020, as any adverse financial implications may be considered a Type I subsequent event (vs. a Type II).
* Plan for disclosures about risks, such as how recent events may impact current and future judgments and the estimates inherent in financial reporting (e.g., inventory obsolescence, receivables collectibility or debt covenants).
* Proactively communicate with lenders and other stakeholders to avoid surprises and enable potential rescheduling of debt or alternative financing sources.

**TAX AND TRADE**

* Plan for — and assess — potentially major tax-related changes announced by the government that could impact your employees (e.g., payroll tax cut, sick leave pay).
* Companies with extensive international supply chains should consider the tax and transfer-pricing components of restructuring their supply chains. Planning should go deeper than merely identifying alternate suppliers. Implications could include customs and duties, as well as transfer-pricing considerations if the substitute components or materials are internally sourced.
* Companies need to consider trade and customs impacts. Global companies should evaluate whether it is advantageous to repatriate overseas cash from foreign subsidiaries.
* Companies with stronger balance sheets may have M&A opportunities.

**CONCLUSION**

As the COVID-19 crisis unfolds, E&C companies will likely be hit on numerous fronts. Yet, how your company will be impacted depends on what segments you serve and where you sit in the industry’s value chain. For instance, large E&C firms with federal contracts will likely experience some protection, and that protection could extend to a lesser degree to companies holding state and local contracts. Projects commissioned by private enterprises, though, may be more precarious — especially if the contracts are with companies who may be hardest hit by the volatility of the markets and the severity of COVID-19 (such as energy companies in survival mode during a low oil-price environment).

How the subcontractor middle market fares amid this crisis in the short term could dictate how the industry in general may fare in the long term. Keeping construction workers safe and subcontractor firms’ balance sheets healthy are critical for the overall recovery of the industry. This will also help prevent a possible buying spree of distressed middle-market firms by foreign investors.

Large multinational E&C players will also need to look beyond their own economic viability. They may need to coordinate closely with the public sector to help forge plans central to public safety and the solvency of their workforce, while keeping the lights on in their operations. This should be especially relevant for firms designing and building projects connected to critical infrastructure, such as energy and power, transport, communications, food and agriculture and others.

Many E&C companies will be compelled to make cuts during this volatile period. Some will be austere. So, be surgical with cuts while balancing short- and long-term needs.

Keep in mind that austerity measures should be tempered to preserve long-term objectives. Although moving quickly can certainly create an advantage, knowing where you’re headed will help you ensure the changes you make are more impactful.