Identification of the Challenges Imposed by COVID-19 Pandemic on Sri Lankan Construction Projects

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Abstract: Coronavirus (COVID-19) is a global pandemic which spreading all over the world which ruining lives of hundreds of people & effect negatively on business matters over the world. This can trigger different kinds of challenges to all the industries while affecting world economy. Thus this paper aims to identify the challenges imposed by COVID-19 pandemic on Sri Lankan construction projects. This research was assessed through detailed questionnaire survey and interviews. The number of distributed questionnaires were 50 and the response rate was 82% which added a positive mark on the research study. Frequency index method & content analysis were used to analyse the collected data. The findings highlighted the main challenges among construction industry due to coronavirus as delay of completion, issues with supply chain management & change the public perception on site. It is recommended to spend the period of working from home fruitfully & to start the site works stage wise with the involvement of less number of labours at the beginning stage. While this research focused on the challenges, further study can be done to investigate about the renaissance & the industry predictions of the construction sector for post COVID-19 world.

Keywords: Coronavirus (COVID-19), Pandemic, Sri Lanka

Introduction

Unforeseeable events always occurs risk to any kind of business (Okema, 2000). Currently the whole world is standstill due to an unpredicted harmful effect which is the spreading of a deadly coronavirus also called as COVID-19 which is a severe health crisis (Chopra and Nagar, 2020). This is an unpredicted situation which impact on every families & business matters around the world.

The daily events of all over the world stopped, airports closed, movements restricted, new regulations has been passed and even some countries are locked-down by imposing curfews for months and a massive quarantine happens across the world. Sri Lanka also effected with this situation and restricted people to stay home & maintain social distance to minimize the exposure & to stop spreading of the virus & advised to work from home.

The enacted new laws and regulations by government will be directly impact on the construction industry because it is more contract with & contrast to the environment & engaged with lot of stakeholders at a once in projects. The main objective of the research study is to identify the challenges imposed by COVID-19 pandemic on the Sri Lankan construction projects, which could be occurred and make suggestions to take the industry to a better place with new phase through a limited forecast on the scenario in Sri Lanka.

By finding the first case from the Wuhan city in China on December 2019, by now (May,2019) the coronavirus almost affect to the whole world

covered nearly 172 nations (Chopra and Nagar, 2020) and the World Health Organization (WHO) marked this situation as a global pandemic and took emergency protocols to manage the situation.

Construction projects need typically everyone at a construction site to be involved with work either to perform a several task, or to supervise & check the work done according to the specifications (Okema, 2000). With the new norm of social distancing the WHO advised people to keep at least 1m distance from each. This will be a difficult task to adopt at once, but for the safety of everyone we have to follow up with the government rules. The government persuade people to work from home, forced to shut down the construction sites and advised only travel if it's essential. Construction projects need at site work & this will be a new challenge for the parties in construction industry because they weren't prepared for this kind of situations (Laing, 2020). Practical reality is to shut down the sites because materials can't be delivered to sites, far away staff members couldn't come for the work places and also issues with maintaining social distance among labours.

Any activities give hands to spread the COVID-19, it should be stop because always safety is the first aspect to consider. Now the investment should be surviving than winning due to the unpredictable bad outcomes which could be happen near future. Hamid (2020) stated that both private & public sectors are messed up due to this public health crisis.

The COVID-19 pandemic is a heavy blow to the construction industry. The situation is up to now under controlled but not fully evacuated. How big this going to be?, how long will this last?, and what are the impacts?, are yet to be discovered until an antidote is found (Chopra and Nagar, 2020).

Construction industry is one of the engine of national economy in Sri Lankan context which has contributed approximately 6.8% to the GDP (Annual Report 2018, Central Bank of Sri Lanka). The heavy blow of this issue will be effect on the construction and it will lead to bad impacts on the global economy (Chopra and Nagar, 2020), and ultimately coronavirus will not only fatal to human lives but also destroy the countries' economy. It is highlighted the importance of preparation to a next wave of the coronavirus. This paper will be beneficial to the parties in construction industry to understand the upcoming key challenges & make suggestions for the betterment of the industry.

Literature Review

An epidemic is an event in which a disease is actively spreading. Generally, it's an outbreak that has grown out of control but is often within one country or location. A pandemic is on a far greater geographic scale that affects a much large number of people (Maital & Barzani, 2020). The Coronavirus (Covid-19) was marked as a global pandemic by the WHO has not only infect on the human life but also effected the global economy which having a potential of destroy the livelihoods, industries, businesses and the entire economy in a larger scale (Laing, 2020). The particular disease evolved like a pandemic with the extensive spread within the number of nations all over the world (Hamid and Huam, 2020).

The first COVID-19 case in Sri Lanka occurred 10th of March 2020 and thereafter the other infected people slowly exposed but no immediate rises. By 25th of March, the total number of cases crossed the 100 & government started to get strong protocols to mediate & control the situation. As a developing country at the beginning stage the testing facilities were limited. With the improvement of the number of tests over the country the escalation of 300 cases discovered within 4-5 days. According to Ministry of Health, Sri Lanka confirmed 847 cases & 09 deaths have been reported till 10th of May 2020.

The construction industry plays an important role in the formation of the country's economy. The blow of COVID-19 pandemic will definitely hit the industries & damage the economic state (Chopra and Nagar, 2020). The experience of this kind of a situation is new to the globe and it will be the biggest challenge the world have to face the most. Nagar (2020) stated that, the quantum of the impact will depend on the time period of the lockdown & the time takes the economy to get back in the line. Narrowly it describes the time & cost which are comes under the main pillars of the construction industry & this emphasize the key issue towards construction sector in long term & could change the shape of the industry (Laing, 2020).

The delay of projects will be a common phenomenal due to this COVID-19 pandemic with the strict behaviour of government. The curfew imposed all over the country & advised people to stay home & make social distance. The less movement of workers engaged in construction activities, and non- availability of inputs during lockdown will also result in delay of projects (Chopra and Nagar, 2020). Work from home concept was adopted to those who are productive at working off-site and the company heads had the power to get the most essential staff members to the organizations, but with the quarantine process, discourage them to travel and lead day to day work processes a mess.

The labours have to be compensated with additional wages for the unexpected situation. Some companies have to ensure their staff safety, giving adequate food, water and sanitary supplies which will indeed add to the extra cost of the project as there is complete ban on the construction activities (Chopra and Nagar, 2020). He further emphasized the issue with the supply chain. Hamid (2020) confirmed the statement, as the lockdown has obstructed the import & export facilities of materials will negatively affect in long-term on construction industry. The steel products, technical construction equipments, electronic equipments will get affected by this condition and the companies will have to pay a higher price to acquire these products in future & delay the time.

This is a global pandemic which is not only effect to Sri Lanka. Both developed & developing countries are seeking to cope with the pandemic & face all the barriers with the limited resource capitals available (Chohan, 2020). The clients of every projects do have to understand about the situation and have to face for the consequences because neither party is responsible for the issues arising along with this COVID-19 pandemic. Davis (2020) stated that in construction everything finally comes to time & money. By considering that fact it's marked the dangerous of how unpredictable the virus will be on the construction industry. The paper will narrow down some of the key challenges & make recommendations how to overcome those based on the professional views.

Research Methodology

The main objective of the research is to identify the key challenges cause to the construction industry due to the coronavirus pandemic. To evaluate the challenges a large range of community which attached to the construction industry in Sri Lanka was targeted. The research was completely evaluated through questionnaire survey and online interviews with the concerned authorities. This was a combination of both qualitative (interviews) and quantitative (a predominant way via questionnaire survey) analysis to confirm & make concrete recommendations based on the views of different parties by several methods.

Data Collection Methods

A web based detailed questionnaire (Google forms) was circulated among professional groups in construction industry, Sri Lanka sent through e-mails to the construction firms. Questionnaires were distributed among professionals in order to

obtain suitable responses to the questions & different viewpoints were ranked accordingly to the "Likert Scale" (Likert, 1932). A total number of questionnaires distributed was 50 (selected by stratified random sampling) & the response rate was 82% including from 05 Project Managers (PM), 15 Quantity Surveyors (QS), 10 Engineers (Eng), 10 Clients (C) and 10 Contractors (CR).

Semi-structured interviews provide the freedom to discuss about numerous areas widely (Naoum, 1998, p.58). A purposive sample was selected for the semi-structured interviews since the objective is to select the partakers who have better knowledge & industry experience in the area of research study. Online interviews were done due to the current situation based on COVID-19 pandemic by maintaining the main norm of stay home & making of social distance because of the curfew & movement barriers around the country. The professionals which covered through the interviews were Quantity Surveyors, Clients, Engineers, Contractors & Project Managers.

Data Analysis Methods

Data analysis was done with the use of Frequency Index (FI) analysis (data gathered through questionnaire survey) which express the frequency of the factors which challenge the Sri Lankan construction industry (Le-Hoai, et al., 2008), and the content analysis was done to analyse the data which gathered through the interviews.

$$Frequency\ Index\ (FI) = \frac{\sum_{i=1}^{5} ai \text{ x } fi}{H \text{ x } N} \quad \text{(Eq: 1)}$$

Where:

i = Score of the factor ranging from "Least Effect =1" to "Mostly Effect =5"

ai = Weight of the response for the ith response

fi = The frequency of the ith response from all respondents

H = Highest ranking available, which is 5 in this survey

N = Total number of respondents who have answered the question

Presentation was in the forms of graphs and tables. A cording system was used to identify the factors separately for the easiness of understanding.

Data Analysis

Construction activity is a complex work item which needs the hand of different parties who specialized in different areas of profession. So it is essential to cover the target population and discuss experience based on their trades.

A. Background Findings

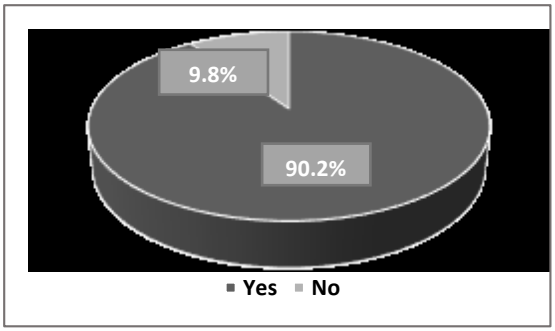

Figure 1. Respondent based on profession

The general information of respondents including their profession and experience in the industry were assessed because based on the perspective of different people the answers to the questions may vary due to their thinking capacity and knowledge. The degree of responses are discussed below.

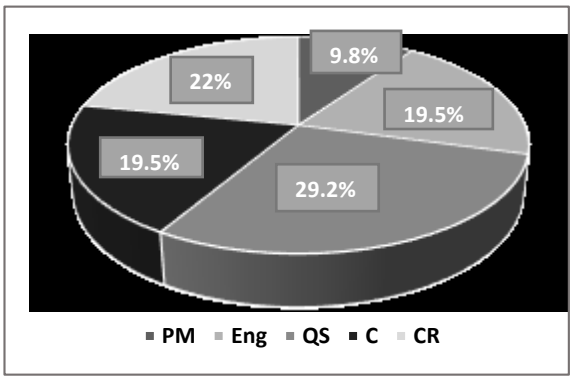

Figure 2. Respond on construction projects stopped due to

Then targeted to find out whether the construction sites which these professionals was working stopped due to this situation. More than 90% of respondents were stated that there sites were shut down because still the curfew has imposed all over the country which highlighted it as a serious problem to the construction industry and the need of identifying the upcoming challenges along with the pandemic & get the necessary solutions.

COVID - 19

The COVID-19 is an unforseen situation. Then target to find out whether the parties have experienced similar kind of situations previously, because good decision making on this type of challenges were purely based on the proper experiences. The majority of the respondents with 75.6% weren't face this kind of similar scenarios at their time period of working which will be a challenge when decision making. Then questioned whether they think that still construction sites can be reopened by following the health guidelines enacted by the government. The majority of them said "No", with the

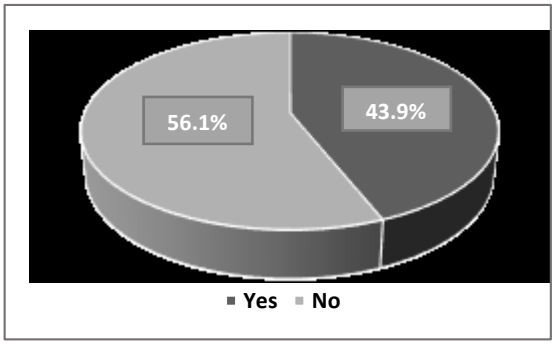

Figure 3. Respond on construction projects can be re-opened by follwing health guidelines

percentage of 56.1% because not having proper experience will lead opening sites to a challenge and the panic due to the deadly virus.

Though the majority was afraid according to the Fig. 3, 43.9% were said that opening sites with necessary precautions are essential because we can't stay lockdown for the rest of the whole year. Practical reality is face to the challenge by adopting proper solutions.

B. Rank the Key Challenges

According to the research there are major 15 challenges which categorized by considering the impact of COVID-19 pandemic on Sri Lankan construction industry. The challenges are identified from the literature survey and mark 15 factors out of them to rank according to the frequency of its impact. The frequency index was computed based on the degree of agreement of the respondents. The scores gained by the respondents in the questionnaire were summed up for each factor. The factors identified based on a coding system for the easy of identification and rank as tabulated below.

Table 1. Ranked challenges causes due to COVID-19 on the construction industry according to the frequency index analysis

Code	Challenge	FI	rank
CH04	Delay of completion of the project	0.932	1
CH01	Damage the Supply Chain with shortage & delay materials	0.815	2
CH05	Change the public perception on site & less confident and laziness among labours	0.707	3
CH14	Global uncertainty, market condition & economic challenge	0.693	4
CH10	Temporary suspension & termination of contracts	0.683	5
CH15	Legal issues & lack of expertise professionals	0.668	6
CH03	Reduce the productivity & production lines standstill	0.659	7

CH02	Workforce problems with shortage of labours	0.654	8
CH11	Feasibility of adopting to new situation & continue site work	0.644	9
CH12	Issues with own organization & co-operate with other stakeholders	0.620	10
CH07	Poor decision making due to not having enough previous experience on similar scenario	0.610	11
CH06	Future funding difficulties	0.551	12
CH13	Demand for the types of projects & fewer clients	0.546	13
CH08	Adoption to mobile works	0.522	14
CH09	Local government shutdowns affect on-site & off-site material stores	0.522	14

According to Table 1, the top rank of the challenge was the delay of project completion (CH04). It's logical to anticipate because of the absenteeism. Many projects are time sensitive because contractors have various projects lined up through the year. Davis (2020) said that if pandemics become a recurring phenomenon, we can anticipate significant population shifts away from dense urban areas which lead shortage of staff along with reducing the working hours (CH02) and get time to recruit new people. An interviewee said that, "*Although COVID-19 is unforeseeable, contractors still be contractually responsible for delays & cost overruns*". The longer completion will be the hardest hit on the industry which aren't go away anytime soon.

The next mostly impacted challenge which rank on 2nd was damaging the supply chain of materials (CH01). The COVID-19 would affect the critical path of the project & obviously paralysed the construction activities. Chohan (2020) also confirmed this as a serious challenge as this will be negatively impact on the material delivery & will have a shortage of material around the world. An interviewee said that, "*Supply chain will affect long after the coronavirus neutralized*". According to the Table 02, the material which on & off site much (CH09) not be mostly effected as it is the least challenge which ranked among others.

The next most challenge will be start up works at site as usual due to the public perception & less confident among labours (CH05). This can be occur due to the lack of Personal Protective Equipments (PPE) at sites and health & safety problems at working places. The mental conditions with new situation make people more angry & anxious and get the work done out of them indeed will be a challenge. Feasibility of adopting to the new situation at site (CH11) will also be a challenge with new health guidelines.

The next challenge is the economic state of the country (CH14) which also confirmed by Chopra and Nagar (2020) as risk of regression will be elevated without arguments. This will effect on construction projects with future funding (CH06) which also ranked as the 12th challenge. Temporary suspension & termination of contracts (CH10) is the 5th most rank which likely to occur due to reduction of the number of workers. An interviewee said that, "*This will negatively impact on construction cost & time of completion because recruiting subcontractors add additional cost & time. On the other hand, the lack of specialist contractors for separate works will damage the quality of the product*".

The next challenge ranked as, Legal issues & lack of expertise professionals (CH15) to consult on these kind of situations. An interviewee stated some of the fields which legal disputes could occur as claims for Extention of Time (EOT) & additional cost, suspention and termination of contracts. When external circumstance create pressure on one, it will effect on all (Lewis, 1988). An interviewee highlighted not having enough experience will lead for poor decision making (CH07). Construction work always go along with contractual provisions. To get a better advice on the situation & to reduce arising of disputes, we have to consult professionals with experience,

which all most lack in the Sri Lankan construction industry.

Issues with own organization & co-operate with other stakeholders (CH12) ranked as the 10th challenge different from the findings of Chopra and Nagar (2020). They highlighted dealing with contractors regarding payment process as the biggest challenge. An interviewee said that, "*Construction always have issues with longest waiting lists for payments. With the economic unstability, this will become a mess and the COVID-19 disaster will be a recipe for this mess*". As tabulated above, demand for the types of projects & fewer clients (CH13) which ranked as a less challenge based on analysed data is contrast with the findings of Hamid and Huam (2020). Their study revealed that clients will be more focused on the healthcare construction, healthcare related modifications on buildings, warehouses, educational & public buildings. Construction of apartments, social housing, hotels, entertainment centres & infrastructures which having the higher demand now, will be the least with time and it will be a great challenge to the industry.

The factors were rank based on the responds of different parties in the construction industry according to their knowledge on COVID-19 relates with construction. Based on results it was revealed that the coronavirus pandemic will be a deadly challenge on construction sector & need to get actions to limit the arising of issues.

Conclusion

The COVID-19 global pandemic may well become the most crucial economic and social failure event in decades. It is continue to impact the construction sector in challenging ways (Laing, 2020). The facing of the challenges cause due to the COVID-19 pandemic will change the construction industry to a modern face with new strategies (Chopra and Nagar, 2020). Social distance will be the new norm by doing less group activities with more clearly defined objectives. This situation will keep labour under controlled environment & reduce the amount of time in the field by adopting to mobile works with new technology & advanced interfaces. This will reduce the more of office work & increase the capability of working from home. But this also made labours & staff lazy, lethargic & stressed in long-term.

The virus pot a spotlight on the importance on labours health & safety and the construction sites will be more clean & safe. With the coronavirus outbreak, the industry could focused on making buildings healthier by improving indoor air quality as well. An interviewee said that, "*Now the all stakeholders will much consider on the contract document provisions on risk management strategies will turn construction in to a new trend*". The Supply chain management will be re-calibrate & enhanced the adoption of off-site construction methods. If we manage the situation properly we can get the maximum opportunity out of this COVID-19 threat confirming the statement that, "Every dark cloud has a silver line".

Recommendations

Construction work always go along with contracts and the contractual matters have to be discussed based on the event. The COVID-19 pandemic is an unforseen event to the industry which more stakeholders doesn't have a better experience & would make conflicts on contractual provisions (Laing, 2020). In a construction project to limit the risk that a future event prevent which performing the contract by either parties include under a clause "*Force Majeure*" (Lewis, 1988). Cary Wright, Construction Lawyer (2003) said that the *force majeure* clause operates as a method of risk allocation. He mentioned that a *force majeure* event must have been unforeseeable & its occurrence must be beyond the control of the concerned parties.

The majority of the interview parties consider this event under *force majeure* because no one is ready for this kind of situation. An interviewee

said that, "*Though the force majeure clause have no specific terms on viruses, it can be considered as an act of God. This is not an epidemic, it's a global pandemic. The ability of non-performance of the contract can be excused because neither party is responsible*". Another interviewee said that this will depend on the contract clauses of the projects & need to be prove with solid evidences that sole cause of damage to the construction project work is COVID-19.

Based on the data analysis the followings were recommended based on two categories to win the challenges of COVID-19 pandemic.

A. Recommendations for the Period of "Work From Home"

Still the situation is continuing & people forced to work from home. Though this is not practical to the construction industry there were some works suggested which can be fruitful in the period of work from home by the professionals.

List out the pre-tasks by understanding the priorities and re-schedule the project planning

Online meeting can be conducted & discuss about the impacts of the situation on the construction process of projects in long-term

Reference of drawing & finding loopholes

Review the contract document to understand the contractual rights and obligations that arise in an unforeseen events

Managing accounts and change orders

Preparation of tender BOQ (Bill of Quantities) compilation

Arrange the IPA (Interim Application Payments) which had piled up due to busy schedules

Consult a professional insurance counsellor on the legal base (to get legal advice) & about contractual matters based on the situation

Make positive attitude behalf of the company & give all the co-operation

Co-ordinate with the subcontractors & discuss about the updated schedules to avoid arising of disputes in future

B. Recommendations for the Sites to be Re-Opened

The COVID-19 pandemic will take time to heal. It might take 2-3 years based on the character of the virus. Until then the country can't be kept locked down. We have to face this challenge by understanding the situation well and follow up the safety precautions as advised by the government. The followings were suggested to follow up when the constructions sites were opened.

Construction sites must be opened stage wise (one phase at a time) according to the trade of the labors (single trade of work at a time) & shift the workers to maintain the social distance

Prepared for the increase of the absenteeism of the labors by training them with many trades as possible by the supervisors

Encourage the industry stakeholders to integrate the work with modern software relates to construction

Supply chain must be re-calibrate & manage with alternative materials & back-up methods

Make situational awareness programs among the site staff & encouraged them to follow up with the safety precautions to avoid the spreading of coronavirus

Increase the effort for the site safety & provide all the staff members & labors with proper Personal Protective Equipment (PPE) kits (including of respiratory masks, safety goggles, hand sanitizers, full body suits, gloves, boots etc) and disinfection of the site

Randomly check the site staff with PCR tests, involved with Ministry of Health, to avoid the risk of been infected to the other members of the project & to assure the particular construction site is free of coronavirus

Improve the mental & physical health of the labors

Proper planning & reschedule the project with addressing the future risk must be done with the guidance of the Project Manager (Avoid the next wave of virus)

Make weekly updates about COVID-19 situation at sites & take necessary actions

Financial support should be given by the government to the construction industry

Future Research Directions

The researchers must do their research regarding the COVID-19 with every possible outcome & effects on the construction sector which will help for the betterment of the industry on behalf of the country's' economy (Hamid and Huam, 2020). While this research focusing on the key challenges on the Sri Lankan construction industry due to COVID-19, further study can be done to investigate about the renaissance & the industry predictions of the construction sector for post COVID-19 world.

Another study can be done to identify how the construction industry can be integrated with modern technology developments and their applications. A similar study can be improved to identify the contractual provisions about construction disputes & application on them in the industry against these kind of unforseen risk events.

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