

Covid 19: Impacts and Challenges in the Construction Industry

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Abstract

This study was conducted to determine the impacts of Covid 19 and how profound challenges are being managed in the construction industry. A management program was also proposed for safe work practices. A quantitative research method was employed in this study. The respondents of this study were employees from different construction industries, whether private or government agencies. They were selected through the convenience sampling technique.

More respondents were in the younger age bracket, more males, more respondents were employed in government agencies, almost engineers, and mostly new in the agency. Telework became common with a very high-level contribution regarding the impacts of Covid-19 in the construction industry. Activities required or recommended to maintain a healthy work environment have a very high level of contribution regarding challenges the construction industries face in times of Covid 19.

According to age, gender, and type of agency, the respondents have the same assessment that there is a significant difference in the impact of Covid-19 in construction industries. Age, gender, type of agency, and position in the agency also have a significant difference in the challenges of Covid-19 in construction industries. All the proposed management programs in terms of engineering controls and administrative controls were highly recommended.

Keywords— Construction industry, Covid-19 Impacts and Challenges, Health and Safety Management

I. INTRODUCTION

Covid-19 came as a shock to the whole world. Members of society, health systems, economies and government worldwide have experienced varying degrees of impact due to the COVID-19 pandemic.

The construction industry is one of which was heavily impacted. The nature of the impacts and extent of the complications largely depend upon the location of the respective businesses and underlying projects. Direct impacts have ranged from a slowdown of available materials and labor to suspensions and, in some instances, terminations of parties or entire projects. Construction activities remain unstable in some

provinces and cities depending on whether construction is an important business.

According to Statistica Research Department: The construction industry is a key sector within the Philippine economy, contributing a gross value added of about 336 billion Philippine pesos during the fourth quarter of 2020. In terms of capital formation, which refers to the total construction expenditures by private and public firms, the sector reported significant contractions in 2020, largely due to the disruptions caused by the global coronavirus (COVID-19) pandemic.

The construction industry has been forced to adapt to significant challenges and formulate

solutions to alleviate the delays and other impacts caused by COVID-19. Due to this pandemic, finishing a project is hard to accomplish. It is slowing them down, causing delay and disruption of construction projects, or some have even stopped, usually intending to continue work at a future date.

Some countries have even had specific orders demanding construction sites to close or enabling contractors to suspend works and extend the time until the end of the state of emergency, especially in government projects. COVID-19 pandemics generally do involve contractual provisions concerning unexpected events that cannot be stopped or overcome. It is understood that it constitute a force majeure event.

Because of this situation, employers must provide and maintain an appropriate working environment that is safe and without risks to employees' health. If not possible, it includes prevention and control, at least reducing risks to health and safety connected with potential exposure to COVID-19. On the other hand, employees must be responsible for taking care of their own and others' health and safety in the workplace by cooperating with their employers about any action they take.

This study was then conducted to determine the impacts of Covid 19 and how profound challenges are being managed in the construction industry. A management program was also proposed for safe work practices.

Objectives. This study was conducted to determine the impacts and challenges in the construction industries amidst Covid-19. A management program was also proposed for safe work practices.

The following are the specific objectives:

1. Describe the profile of the respondents in terms of:
 - 1.1 age
 - 1.2 gender
 - 1.3 type of agency
 - 1.4 position in the agency
 - 1.5 number of years in the agency
2. Describe the impacts of Covid – 19 that change the construction industry.

3. Describe the challenges construction industries are facing during Covid – 19.
4. Determine if there is a significant difference between the impacts and challenges of Covid-19 in construction industries when the respondents are grouped according to their profile.
5. Propose a management program to have safe work practices in the construction industry amidst Covid 19 in terms of:
 - 5.1 engineering controls
 - 5.2 administrative controls

II. MATERIALS AND METHODS

A quantitative research method was employed in this study. It refers to a set of strategies, techniques, and assumptions used to study psychological, social, and economic processes by exploring numeric patterns (Coghlan and Brydon-Miller, 2014).

The type of quantitative research used in this study was descriptive research. Before reaching why something happens, we also need to understand how, when, and where it happens. The impact and challenges of the pandemic that invaded the entire world, particularly in the construction industry, were sought by this study. Furthermore, a management program was proposed to have safe work practices amidst Covid 19.

Respondents and Sampling Technique. The target respondents were project engineers, site engineers, material engineers, maintenance engineers, maintenance inspectors, planning and design, researchers, and architects. They were selected through the convenience sampling technique because it is fast, inexpensive, and readily available. It is a non-probability sampling technique where subjects were selected because of their convenient availability.

Research Instrument. The questionnaire was the primary tool used in gathering data. It consisted of four parts. Part 1 was the profile of the respondents. Part 2 was the impacts of Covid 19 in the construction industry. Part 3 was the challenges the construction industries are facing in times of Covid 19. Part 4 was the proposed management program to have safe work

practices in the construction industry amidst Covid 19.

Statistical Treatment of Data. The data gathered from the survey questionnaire were treated statistically using the following tools:

1. Frequency and percentage were used to describe the profile of the respondents.
2. The Relative Importance Index (RII) described the impacts and challenges that changed the construction industry during the pandemic.

A Relative Importance Index (RII) was selected as a suitable analytical method to achieve the study's objective (Doloi et al., 2012). It was used to analyze the ratings received through the questionnaires and establish a mean rating point representing the rating for each group contributor. Each calculation was carried out using the RII formula:

$$\text{Relative Importance Index (RII)} = \frac{\sum W}{A \times N}$$

where:

W - represents the rating given to each factor by the respondents. For example, for factors that cause delay, 4 is for a very high contributing factor, 3 is for a high contributing factor, 2 is for a low contributing factor, and 1 is for a very low contributing factor.

A - is the highest weight (4 for this study) and N - represents the total number of respondents.

Table 1. RII Level of Contribution and Internal Consistency

Scale	Level of Contribution	Internal Consistency
4	Very High	$0.75 \leq \text{RII} \leq 1.0$
3	High	$0.50 \leq \text{RII} \leq 0.74$
2	Low	$0.25 \leq \text{RII} \leq 0.49$
1	Very Low	$0.00 \leq \text{RII} \leq 0.24$

The items in the questionnaire were answered using the following scale:

- 4 – Always - The impacts/challenges are always observed
- 3 – Frequently - The impacts/challenges are frequently observed

2 – Sometimes - The impacts/challenges are sometimes observed

1 – Rarely - The impacts/challenges are rarely observed

4 Strongly agree - highly recommended

3 Agree - recommended

2 Disagree - slightly recommended

1 Strongly disagree - not recommended at all

3. ANOVA was used to determine if there is a significant difference in assessing the impacts and challenges of Covid 19 in construction industries when the respondents are grouped according to their profile.

4. Weighted mean was used to propose a management program to have safe work practices in the construction industry amidst Covid 19.

III.RESULTS AND DISCUSSION

Table 2, profile of the respondents, revealed that most of those working in the construction industry are young professionals in an early age bracket, 21 to 30, consisting of 69.7 percent. Most of them are newly graduates and have not yet taken the board examination since the Professional Regulation Commission has put the board examination on hold due to the pandemic.

Table 2. Profile of respondents according to age

Age bracket	Frequency	Percent
21 to 30	85	69.7
31 to 40	26	21.3
41 to 50	5	4.0
51 to 60	3	2.5
61 and above	3	2.5
Total	122	100

The construction industry is still male dominated with 70.5% of the respondents are male, as shown in Table 3, since engineering programs are mostly consisted of male students. This maybe due to gender issue that engineering courses fit male better than female.

Table 3. Profile of respondents according to gender

Gender	Frequency	Percent
Male	86	70.5
Female	36	29.5
Total	122	100

Table 4 shows that most of the respondents were from government agencies. When asked about why they are employed in a government agency, the respondents talked about issues of security of tenure, better retirement policies and benefits.

Table 4. Profile of respondents according to the type of agency

Type of agency	Frequency	Percent
Private	45	36.9
Government	77	63.1
Total	122	100

Table 5 shows that most of the respondents are in the key positions, as Project Engineers and Site Engineers. Since the respondents are in the millennial group (ages 25 to 40), which dominate the work force, they were fit to be assigned on field works, such as project implementation, inspection and decision-making. The third highest numbers of respondents are Engineer II, which assists in design, development, implementation, and analysis of technical products and systems.

Table 5. Profile of respondents according to position in the agency

Position in the agency	Frequency	Percent
Manager	1	0.8
Project Engineer	16	13.1
Site Engineer	13	10.7
Maintenance Engineer	11	9.0
Project Inspector	8	6.6
Material Inspector	8	6.6
Planning and Design	6	4.9
Project Officer II	9	7.4
Engineer III	6	4.9

Engineer II	14	11.5
Engineer A	6	4.9
Plant Engineer	8	6.6
Head	6	4.9
Sales and Operations	6	4.9
Architect	2	1.6
Total	122	100

Table 6 reveals that most of the respondents are newly hired or still gaining experience in work. According to constructconnect.com (by Conley Smith), contractors are starting to understand that younger workers want flexible schedules, prefer to work independently, and require lots of upward mobility and they are Tech-Savvy. With large numbers of boomers retiring, this situation will be an excellent opportunity for millennials

Table 6. Profile of respondents according to number of years in the agency

Number of Years	Frequency	Percent
1 to 5	65	53.3
6 to 10	20	16.4
11 to 15	12	9.8
16 to 20	9	7.4
21 to 25	8	6.6
26 and above	8	6.6
Total	122	100

Based on the responses from Table 7, the three (3) major impacts of Covid-19 in the construction industry are the (1) work-from-home scheme or telework, (2) quarantine and travel bans and (3) delays of materials.

Because of the nature of the coronavirus outbreak, the safest possible option for companies is to let employees work from home. It has made every individual adjust and learn to virtual technology in the comforts of their homes. However, unforeseen expenses, forecasts and projections, the unknown factor, and the nervousness and anxiety of what may be a negative future full of unsure data have slowed the design and construction industry into a turtle pace (Panganiban, 2021). One of the most significant struggles contractors face is

that projects take longer. Delays of materials to construction sites were expected because of quarantines and travel bans. Sometimes, demand for project types changes and supply chains are recalibrated. Hence, it resulted in a backlog of work not being completed, leading to project suspension or even project termination.

Table 7. *Impacts of Covid-19 in the construction industry*

S/ N	Impacts of Covid-19	RII	RII Ranking	Level of Contrib ution
1	Anxiety among workers	0.717	4	High
2	Projects take longer	0.676	5	High
3	Telework became common	0.791	1	Very High
4	Demand for project types changes	0.672	6.5	High
5	Supply chains were recalibrated	0.672	6.5	High
6	Delays of materials	0.721	3	High
7	Fewer clients	0.582	8	High
8	Quarantines and travel bans	0.744	2	High
9	Project suspension or termination	0.561	9	High

Based on the results on table 8, the three major challenges are (1) Activities to maintain a healthy work environment, (2) issues with public transportation, and (3) sanitation of offices and job sites.

The safety and health of the employees is always one of the main concern and obligations of the employer even during the normal times, thereby, in the era of Covid-19, minimizing the spread of virus has become a top priority. This will be a challenging phase for contractors and construction owners on construction projects, as

field workers, by definition, cannot work from home and often must work in very close proximity to others. The basic requirements of wearing PPEs at work, social distancing and washing of hands must be implemented plus additional facilities must be added and reworked such as wash area, alcohol dispensing units and temperature scanners at every corner accessible and additional work areas due to social distancing.

The issues on public transport was already one of the biggest problems for all municipalities. With Covid-19 pandemic and social distancing, difficulty of mass transportation were experienced by commuters specially students and the workforce.

Sanitation of offices and facilities from time to time is necessary, such as sanitation of surfaces on shared equipment and common areas. The cleaning solutions to be used and the cleaning recommendations for workplaces must be observed to ensure health and safety of workers.

Table 8. *Challenges the construction industry are facing in times of Covid 19*

S/ N	Challenges of Covid-19	RII	RII Ranking	Level of Contri bution
1	Labor shortage	0.607	14	High
2	Shrinking backlog	0.617	13	High
3	Increasing construction materials	0.684	8	High
4	Disrupted supply chain	0.676	9	High
5	Decreasing construction costs	0.471	17	Low
6	Decline in work	0.576	15	High
7	Lack of skilled labor	0.574	16	High
8	Declined revenues	0.639	12	High
9	There is a need for more thorough and frequent	0.758	3	Very High

	cleaning of offices and job sites			
	Activities required or recommended to maintain a healthy work environment	0.811	1	Very High
10	Increased employee absenteeism triggered by illness	0.713	6	High
11	Issues with public transportation	0.779	2	Very High
12	The necessity of reduced on-site staffing	0.656	10.5	High
13	Additional shift work	0.656	10.5	High
14	Material transportation delays	0.727	5	High
15	Increased operating costs	0.738	4	High
16	Payment delays	0.691	7	High
17				

Significant differences between impacts and challenges of Covid-19 in construction industries when the respondents are grouped according to their profile are presented in Table 9 and Table 10.

Table 9 shows that Covid 19 has significant impact on age, gender and type of agency, while Table 10 shows that the pandemic has significant challenges on age, gender, type of agency and position in the agency.

According to the World Health Organization, older people are facing the most threats and challenges at this time in all countries. COVID-19 brought risk to all age groups, but older people face significant risk of developing severe illness if they contract the disease due to physiological changes that come with ageing and potential underlying health conditions.

Florence Thibaut and Patricia Cremers on Women's Mental Health in the Time of Covid-19 Pandemic wrote that Covid-19 pandemic has

affected women more profoundly than men in several areas, both at workplace (especially in the health and social sector), and at home with an increased workload due to lockdown and quarantine measures. Women became stressed about balancing family and job obligations. It caused them to experience more health problems than men. Some of the health problems they encountered were insomnia, depression, migraines, nervousness, and post-traumatic stress disorder.

Regarding the agency and position in the agency where they were employed, according to workforce institute, government employees who remain on the frontlines in fighting this pandemic continue to be negatively impacted. Construction workers, workers in the medical field, health facility staff such as cleaners, laundry and catering were ostly affected due to the nature of their work.

Table 9. ANOVA on Impacts of Covid-19 when Grouped According to Profile

	F-value	p-value	Decision	Remarks
Age	2.370	.003	Reject Ho	Significant
Gender	0.497	.000	Reject Ho	Significant
Type of agency	1.900	.022	Reject Ho	Significant
Position in the agency	20.82	.103	Retain Ho	Not Significant
Number of years in the agency	3.641	.086	Retain Ho	Not Significant

Note: The null hypothesis (Ho) is rejected when the p-value is less than or equal to 0.05; otherwise, retain.

Table 10. ANOVA on Challenges of Covid-19 when Grouped According to Profile

	F-value	p-value	Decision	Remarks
Age	2.587	.000	Reject Ho	Significant
Gender	3.448	.000	Reject Ho	Significant
Type of agency	3.807	.000	Reject Ho	Significant
Position in the agency	1.713	.025	Reject Ho	Significant
Number of years in the agency	1.079	.379	Retain Ho	Not Significant

Note: The null hypothesis (Ho) is rejected when the p-value is less than or equal to 0.05; otherwise, retain.

The proposed management program in terms of engineering controls and administrative controls respectively to have safe work practices in the construction industry amidst Covid-19 are presented in Table 11 and Table 12.

As shown in Table 11, the proposed a management programs in terms of engineering controls to combat the challenges the construction industry faces during this pandemic were all obtained a verbal description of highly recommended.

If the top management team lacks awareness of a safe working environment, it will be difficult for the employees to work safely. Site personnel is likely to experience fear and apprehension as their level of exposure to the coronavirus increases at work (Wang, Pan, Ho, Xu, and Ho, 2020), especially if they feel that the vendors or other staff are not practicing safety measures such as social distancing and wearing of face masks and face shields. Significant safety improvements should be implemented, and smaller workforces should be considered, adequate PPE is needed, and increase the time for sanitation.

According to OSHA Alert, there is a need to protect the health and safety of the construction workers and workplaces during the Covid-19 pandemic (OSHA Guidelines, 2021). This study proposed to continue using other standard control measures. It includes personal protective equipment (PPE) necessary to protect workers from other job hazards connected with different construction activities. They should not share tools and equipment whenever possible. However, if sharing cannot be avoided, clean and disinfect the tools and equipment before each use. For good hygiene practices, it is recommended that workers have clean and disinfected toilets with enough soap and water and alcohol-based sanitizers.

Table 11. Proposed management program in terms of engineering controls

S/N	Engineering Controls	Weighted Mean	Verbal Interpretation
1	Use closed doors and walls, whenever feasible, as physical barriers to separate workers from any individuals experiencing signs or symptoms consistent with COVID-19.	3.48	Highly Recommended
2	To the extent possible, screen all visitors on all construction sites before their arrival on the job site for signs and symptoms of COVID-19.	3.59	Highly Recommended
3	Adopt staggered work schedules, e.g., provide alternating workdays or extra shifts, to reduce the total number of employees on a job site at any given time	3.38	Highly Recommended
4	Identify choke points where workers are forced to stand together, such as hallways, hoists and elevators, ingress and egress points, break areas, and buses, and implement policies to maintain social distancing.	3.56	Highly Recommended
5	Institute a rigorous housekeeping program to reduce dust levels on the job site.	3.57	Highly Recommended
6	Coordinate site deliveries in line with the employer's minimal contact and cleaning protocols. Delivery personnel should remain in their vehicles if	3.57	Highly Recommended

	at all possible.			
7	In elevators and personnel hoists, ensure 6 feet distance between passengers in all directions and equip operators with appropriate respiratory protection and other necessary PPE.	3.31	Highly Recommended	
8	Keep in-person meetings (including toolbox talks and safety meetings) as short as possible, limit the number of workers in attendance, and use social distancing practices.	3.67	Highly Recommended	
9	Avoid sharing of hand tools, powered equipment, and other items. If sharing is necessary, sanitize the tools, equipment, and other items between uses	3.56	Highly Recommended	
10	Limit the number of people inside a vehicle or increase the number of trips to allow for physical distancing; increase use of fresh air ventilation in vehicles	3.61	Highly Recommended	
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Interpretation	3.25 – 4.00	2.50 – 3.24	1.75 – 2.49	1.00 – 1.74

Another management program being proposed was training and re-training. Training and re-training can be a helpful tool for preventing mental, physical, and emotional problems, and employers must convey their rules in a language that everyone can understand to promote the health and safety of their workforce (James, Chivilo, and Koger, 2020). Adopting alternative work arrangements is being proposed, especially during the community quarantine period. It can have positive effects on the performance and productivity of employees.

Workers should adapt social distancing requirements, follow the latest policies for proper sanitation and comply with PPE requirements. Hygiene, health, and protection have never been to Covid-19 should be made more transparent. It is a significant challenge to provide a safe working environment and practices, primarily when multiple entities of various sizes work together.

The most effective way for companies to keep functioning while ensuring their workers' health and safety is by working remotely. But there are adverse effects on employees' mental health and well-being while doing work remotely. Management should have enough knowledge and skills that can counter the threats to workers. There should be a healthy workplace environment for continuous communication with co-workers and supervisors. Good communication between employers and their employees is essential to maintain the flow of work successfully. In that way, workers can participate through virtual interactive sessions. They can provide suggestions on how to handle the changes inherent in working from home. Online tools can be utilized to enhance productivity, checking in with management when additional support is needed. It should be clarified what constitutes effective on-site management, compliance reporting, and regulation so that construction employees know the level of support they need.

Table 12. Proposed a management program in terms of administrative controls

S/N	Administrative Controls	Weighted Mean	Verbal Interpretation
1	Train and re-train employees on the spread of the disease in the geographic areas in which they work.	3.57	Highly Recommended
2	Make every effort to protect workers through measures other than PPE. When workers need PPE, employers must comply with OSHA's standards for PPE in construction.	3.54	Highly Recommended
3	Screen calls when scheduling indoor construction work to assess potential exposures and circumstances in the work	3.48	Highly Recommended

	environment before worker entry.			
4	Create policies and procedures that apply to the employee's duties related to potential exposures to Covid 19.	3.64	Highly Recommended	
5	Provide cleaning materials (if soap and water are not immediately available, use alcohol-based hand sanitizer that contains at least 60% alcohol and rub hands until they are dry.	3.67	Highly Recommended	
6	Sanitize commonly touched surfaces and equipment (such as hoists, site trailers, door handles)	3.74	Highly Recommended	
7	Removal and disposal of any PPE being used must be properly observed.	3.79	Highly Recommended	
8	Keep construction sites safe and open.	3.67	Highly Recommended	
9	Create a hybrid work schedule by identifying the tasks that can be accomplished remotely and having at least a part of your team stay at home.	3.51	Highly Recommended	
10	Ensure clean toilets and handwashing facilities. Clean and disinfect portable job site toilets regularly. Fill hand sanitizer dispensers regularly. Disinfect frequently touched items (i.e., door pulls and toilet seats) regularly.	3.77	Highly Recommended	
11	Provide good ventilation to the workplace.	3.69	Highly Recommended	
12	Plan worksite mobility and transportation to take into account physical distancing, including for hoist operations	3.66	Highly Recommended	
13	Encourage physical distancing and make sure everyone knows the capacity limits for the spaces they are using	3.69	Highly Recommended	
14	Conduct work area inspections to verify workers are practicing physical distancing	3.62	Highly Recommended	
15	Reschedule any unnecessary visits to the workplace by supply chain partners, vendors, or others who do not need to be there now	3.57	Highly Recommended	
16	Hold meetings outside or in ample space and, if necessary, hold multiple meetings to limit the size of groups	3.62	Highly Recommended	
17	Encourage physical distancing and make sure everyone knows the capacity limits for the spaces they are using	3.66	Highly Recommended	
18	Use signage to reinforce your policies and control measures	3.67	Highly Recommended	
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Interpretation	3.25 – 4.00	2.50 – 3.24	1.75 – 2.49	1.00 – 1.74

IV. CONCLUSION

The COVID-19 pandemic has had a significant impact on the construction sector, which is a profound challenge to economic cycles. These impacts have resulted in the need for industry members to address both short-term and long-term business challenges as the construction industry is faced with a new national, and even international, environment.

With challenges such as skilled labor shortage and backlog decline to mention, due to work from home scheme, transportation restrictions, anxiety and fear, it is impossible to finish projects according to pre-pandemic timelines, forcing construction firms to adjust.

It is essential that employees are properly educated and trained on Covid-19-related safety enhancements and procedures. Educating employees includes not only verbal training

presentations, but also posting signage and keeping written training material; in visible places on the jobsite.

The construction team players should build, maintain, and strengthen connections throughout the entire the industry, using a variety of different approaches to implement safety and resiliency.

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