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Prediction of Cost Overrun in Construction Using Artificial Neural Network

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ABSTRACT: The principal causes of delays in this research study were analyzed after data collection using a questionnaire survey with a wide range of construction professionals based in High-rise Projects. The findings of this study could help the construction industry better analyze not just the principal reasons of delays on construction projects, but also how to minimize them through appropriate planning. Despite its importance in ensuring the safe application of working processes, safety leadership is occasionally overlooked in recommendations.Aside from addressing increased demand, good decision-making during the construction phase can mitigate Delay concerns, however additional research is required. This could involve research on decision-making processes, the content of construction site management training programs, the value of training programs in building a more skilled workforce, and the use of pre-cast materials. An investigation into construction project delays in India during the outbreak.Because high-rise projects are vital to the city, they must be completed quickly. Almost all Indian projects are late. Delay is the most common, complex, and dangerous problem in construction. Most construction projects in poor countries run late. Regardless of size or complexity, deadlines and unpredictability abound. Every construction project has delays, and the severity of these delays varies widely. This study reviews prior research on time and cost overrun drivers.

KEYWORDS: Low Rise & High Rise Buildings, Cost-benefit analysis,ANN

I. INTRODUCTION

Management of the supply chain

In several places of the world, the supply chain has been interrupted in various ways. Various construction materials are necessary, but they are not reaching the construction site from outside due to lockdown, which is causing delays in the construction process. Various resources for construction work that come from various industries in the country or overseas via various vehicles, those items cannot come. Because all cars are unable to come to lockdown, the essential materials are unable to arrive, and the work is halted. It has not only caused the construction sector to shut down, but it has also harmed the livelihoods of those who transport these materials in cars, as well as the factories that produce these products, which are losing a lot of money because they are not being sold.

An issue with transportation

All modes of mobility in the country have been hampered as a result of the nationwide lockdown. As a result, no materials are being delivered to the construction industry, and no workers are able to work from home. As a result, the work has come to a halt.

Labor scarcity

To begin with, workers are unable to get to work since the transit system is entirely shut down. Second, because the sickness is caused by a viral infection, workers who come into touch with one another are more likely to spread it. As a result, many workers refuse to come to work. Furthermore, forcing workers to labour without any protection is impossible.

Financial difficulty

Companies are not making any profit as a result of the work stoppage; on the contrary, more losses are being incurred, and not only the company is losing money, but all of the suppliers who provide the required materials to various companies for use in the construction sector are also losing a lot of money. Since the company's shutdown, the supply chain has been disrupted, and factories that create goods have ceased operations, resulting in several job losses. Furthermore, the government is unable to collect adequate taxes from all of these sites due to the non-sale of factory-produced goods and the shutdown of the building sector, which has a direct influence on the country's GDP, which impacts the global economy.

Issues with contractual implication

It is primarily based on the 'force major' clause. This clause has a number of rules, one of which is 'Large Scale Epidemic.' This category includes the COVID-19 pandemic. Different contractors placed their various tools in various locations for usage in various machinery construction sectors, but because to the lockdown, all of these equipment have been laying around for a long period. Companies have contracts with contractors to work with all of this equipment for a fee, and if the contract includes a 'Force Majeure' clause, the contractor will not be compensated by the agency if the project is delayed. When contractors stop working, the effect is a significant financial loss.

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Unemployment
Because of the lockdown, businesses are losing a lot of money. As a result, businesses are unable to appropriately compensate their employees, and many people are laid off. Many people's jobs have been taken away as a result of this. Their families are also dealing with a lot of difficulties as a result of their job loss. Overall, a concerning scenario has developed.

1.1.1 Background Information

The building sector, the coronavirus pandemic and past research investigations are all included in this section.

Coronavirus Pandemic and the Construction Industry

COVID-19 has had an impact on a variety of economic, social, and industrial activities. Despite the fact that the construction industry was one of the most hit by the pandemic, there was a lot of misunderstanding and uncertainty about how to deal with the pandemic on construction sites due to the lack of clear construction-related guidelines and best practises. This section provides background information and statistics about the construction industry in order to put the paper's focus on this business in context.

The construction industry is a crucial driver of growth and prosperity in the United States, employing over 4.7 percent of the workforce. The construction business, on the other hand, is a project-based industry, with significant complexities and uncertainties. As a result, the construction industry is extremely sensitive to market conditions, posing unique challenges for businesses and their senior executives to survive and thrive (Hartono et al. 2019). A cascade of business failures in the construction industry might have a detrimental impact on the entire economy.

Furthermore, construction contractors are working in an industry that has been profoundly altered by the pandemic's public health and economic repercussions. The epidemic is prompting concern and significant changes in the construction and housing markets, particularly in terms of the touring, building, financing, and settlement processes.

Research Gap

Literature Review of Existing Studies and Identification of Research Gap This subsection provides an extensive literature review of existing studies related to the topic of this research to better identify and position the research gap. Industry Insights and ASCE performed recent surveys to provide updated and useful information and background on COVID-19 in the construction industry with input from more than members. According to these surveys;

(2) Up to 63% of the organizations perceive that stay at home and social distancing measures are very important, and respondents in the Northeast expressed the most concerns;
(3) 20% of the organizations have rescinded offers to entry-level employees and interns;
(4) 14% of the organizations are facing potential contract penalties due to project delays;
(5) organizations are facing negative consequences including cancelation or delay of contracts, cash flow challenges, hiring freezes, absenteeism, supply chain shortages, layoffs, and furloughs (unpaid);
(6) despite the gradual reopening of the national economy, the percentage of companies expressing moderate to major concerns over their long-term viability increased from 16% to 29%, and the smallest organizations (less than 20 employees) and the largest organizations expressed the most concern over their long-term viability;
(7) 50% of the companies have experienced coronavirus-related delays in receiving material and products from suppliers;
(8) workforce reductions were experienced because one-quarter of the companies have furloughed, laid-off, and terminated their employees since March 1, 2020;
(9) A large percentage (41%) of the organizations reported that they did not apply for funds provided by the Pay check Protection Program, and the reason was speculated to be related to their size, because 35% of the companies had 500þ employees, which made them ineligible for the program; and
(10) In the most recent survey, companies were realizing that their operations likely will not return to normal until, and expectations for participation in large group activities, organizational travel, and a return to normal inoffice work have been pushed back significantly.

1.2 Problem Definition

To study the increased requirement Delay factors can be minimized by proper decision-making throughout the construction process but further research is required. This could include research into the communication of decisions, the content of training programmes for construction site managers, the value of apprenticeship schemes to provide a more skilled workforce, the possibilities of greater use of pre-cast materials etc. this study identified the causes of delays on construction projects in India during covid-19.

1.3 Need For Construction

Further research can be conducted through case studies in construction projects and this will help to identify the other factors that may be causes of delay factors as well as to identify what procedures could be used to minimize the factors causing delays on construction Projects in India during covid-19, and beyond

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1.5 Aims and Objectives

1. To study an Economic, environmental and social attributes, while the factors which stimulate through the satisfaction, were incorporated into this methodology
2. To study the cost-benefit analysis process through some High-rise projects.
3. To evaluate the factors based on the questionnaire & Case Study through various programs. This includes identifying different parameters for delay & cost overruns in view of respondents & comparing them.
4. Evaluate the impact of advance technology to improve construction activities that relate to time.
5. To find the factor that delays in construction activity in case of emergency and to overcome this factors with advance construction technology

II. RELATED WORK

Shelly Stiles, David Golightly, Brendan Ryan 5 December 2020. [1], Impact of SITUATION on health and safety in the construction sectorIt is a sector where safety has reached a plateau that still accounts for a significant number of injuries, lost working days, and a fatality injury rate in Great Britain 1.31 per 100,000 workers that is three times the all industry rate and where evidence of effective safety interventions is scarce.Followings are the major findings from above paper:-There is, however, a potential knowledge gap regarding the practical feasibility and impact of applying SITUATION It measures within construction, made more difficult by factors such as the temporary nature of projects and complex working arrangements. This article presents a commentary on safe construction during, and beyond, SITUATION, covering the human factors challenges and practicalities of implementing SITUATION measures. Hari Bhakta Sharma et al. Peñaloza et al., 2020; Wilson et al., 2009 Strengths, Weaknesses, Opportunities and Threats (SWOT) Analysis of China's Prevention and Control Strategy for the SITUATION Epidemic, Construction-related risks include more than the work performed on site. There is movement to and from site, including travel for people to get to work, possibly to and from communal lodgings. At the site, there needs to be facilities for eating, for toilets and rest areas, for storage of materials, and for storage of tools. There is variability in the type of tasks performed while much civil engineering work may be outside, building or refurbishment plastering, electrical work may be performed inside. Construction is also a sector where the risks of safety must be balanced within the context of production and the need to deliver. Perfection in safety needs to be traded off against factors such as cost, capacity, efficiency, and quality.

Followings are the major findings from above paper:-This paper highlighted the pressing issues and global challenges of solid waste management in the context of the current SITUATION crisis. To reduced economic activities due to SITUATION have certainly made air and water cleaner as per many reports, change in the dynamics of plastic, food, and biomedical waste generation during the same time has however stirred the woes of solid waste management. McClure et al., 2020, Downturns, Construction Delays, and the Situation, Work with hazardous materials and exposure to potentially harmful conditions that impact the respiratory function may also mean greater risk of underlying health problems linked to COVID-19. Data are limited and direct causal pathways are still not well understood, these factors may explain why this sector has experienced higher incidence of COVID-19.Followings are the major findings from above paper:-The findings from this research determined the major causes of delays based on an importance index, and the main conclusions from output of the data could help the construction sector To better assess not only the major causes of delays on construction projects but also how to minimize them by proper planning. Situation in Wuhan: Sociodemographic characteristics and hospital support measures associated with the immediate psychological impact on healthcare workers, Woolley et al., 2020 An implication of the PDO is that it can make more complex the communication and management of safety. Safety is managed down the hierarchy, but feedback up the hierarchy is often restrictedFollowings are the major findings from above paper:-In this research work, a case study in the state of Tamil Nadu was considered to find a suitable a HCW disposal alternative in Indian context. 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.Briscoe & Dainty, 2005; Briscoe et al., 2020; Infection Prevention and Control and novel coronavirus (SITUATION): standard precautions and use of personal protective equipment, Projects and priorities change during their execution, with contractors leaving and joining, hampering clear management and communication of safety. There is a lack of Typical structure of a Project Delivery Organization Typical medium-sized Project Delivery Organization Project scope Civil/rail from the supply chain it is very difficult for the principal contractor to implement effective interventions due to the mixed messages received by the workforce regarding priorities It is a relevant question as to whether the influencing factors for general safety within the PDO will also have a bearing on the implementation of COVID-guidance.Followings are the major findings from above paper:-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.

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III. PROPOSED ALGORITHM

SPSS SOFTWARE-

Analysis of the questionnaires survey was done using IBM SPSS Software. SPSS Statistics is a software package used for statistical analysis. The software name originally stood for Statistical Package for the Social Sciences (SPSS), reflecting the original market. It is a Windows based program that can be used to perform data entry and analysis and to create tables and graphs. It is capable of handling large amounts of data and can perform all of the analyses covered in the text and much more. It is a widely used program for statistical analysis in social science. It is also used by market researchers, health researchers, survey companies, government, education researchers, marketing organizations, data miners, and others. All the responses obtained from the questionnaires are entered in to the software. First, the variables or the questions are entered in the data view, then, the responses are entered into the software from the various data entered into the software, frequency can be found which is used to determine the importance factor.

SPSS data View:

The Questionary Survey responses were reported in excel file. After opening data, SPSS displays them in a spread sheet-like fashion as shown in below figure. The excel file was export in data View and check the values and other information in spread sheet.

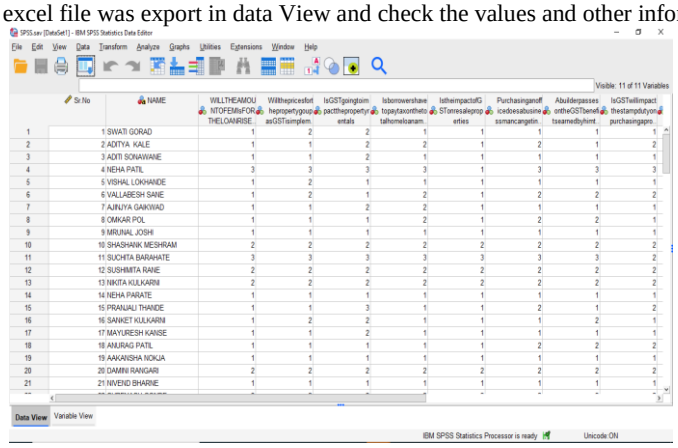
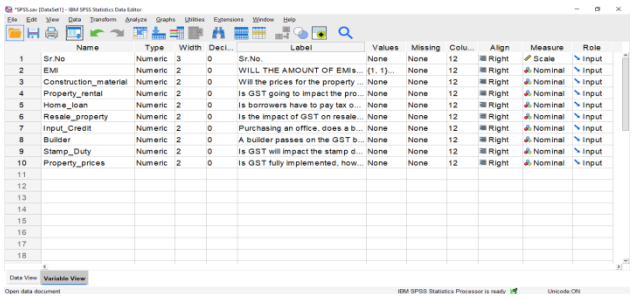


Figure: SPSS Data view

SPSS Variable View:

An SPSS data file always has a second sheet called variable view. It shows the metadata associated with the data. Metadata is information about the meaning of variables and data values.In Variable View, different columns are displayed. Each line corresponds to a variable. A variable is simply a quantity of something, which varies and can be measured, such as height, weight, number of children, educational level, gender and so forth.Name of the variable it is your own choice, but make it understandable and do not use numbers or symbols as the first letter since SPSS will not accept it. Moreover, you cannot use spaces in the name. The name of variable was used such as EMI, Construction material etc. The variable view spread sheet is shown in the below figure.



	Name	Type	Width	Deci...	Label	Values	Missing	Colu...	Align	Measure	Role
1	Sr.No	Numeric	3	0	Sr.No.	None	None	12	Right	Scale	Input
2	EMI	Numeric	2	0	WILL THE AMOUNT OF EMIs...	{1, 1}...	None	12	Right	Nominal	Input
3	Construction_material	Numeric	2	0	Will the prices for the property ...	None	None	12	Right	Nominal	Input
4	Property_rental	Numeric	2	0	Is GST going to impact the pro...	None	None	12	Right	Nominal	Input
5	Home_loan	Numeric	2	0	Is borrowers have to pay tax o...	None	None	12	Right	Nominal	Input
6	Resale_property	Numeric	2	0	Is the impact of GST on resale...	None	None	12	Right	Nominal	Input
7	Input_Credit	Numeric	2	0	Purchasing an office, does a b...	None	None	12	Right	Nominal	Input
8	Builder	Numeric	2	0	A builder passes on the GST b...	None	None	12	Right	Nominal	Input
9	Stamp_Duty	Numeric	2	0	Is GST will impact the stamp d...	None	None	12	Right	Nominal	Input
10	Property_prices	Numeric	2	0	Is GST fully implemented, how...	None	None	12	Right	Nominal	Input

Figure: SPSS Variable View

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SPSS Data analysis: SPSS can open all sorts of data and display them -and their metadata- in two sheets in its Data Editor window.In our data contain a variable holding respondents' on GST related question, we can compute the frequency by navigating to Descriptive Statistics as shown in below fig**. For better understanding and detailed study pie charts and Bar chart option is also selected.

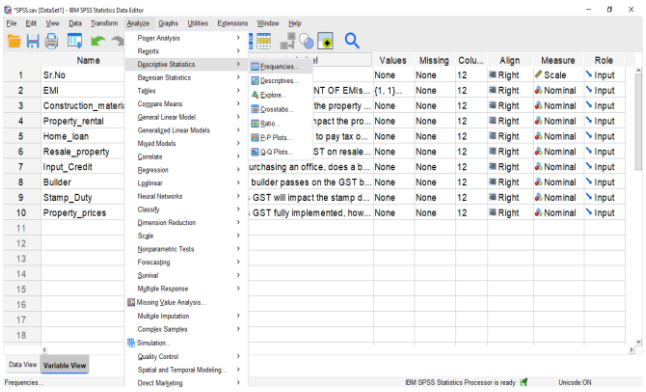
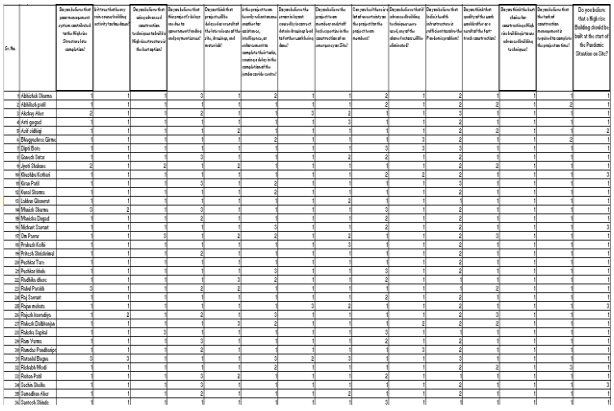


Figure: Variable selection for calculating frequency SPSS Output Window:

After clicking Ok, a new window opens up, SPSS output viewer window. It holds a nice table with all statistics on all variables we chose. The screenshot below shows what it looks like.As we see, the Output Viewer window has a different layout and structure than the Data Editor window we saw earlier. Creating output in SPSS does not change our data in any way; unlike Excel, SPSS uses different windows for data and research outcomes based on those data.

Survey Report



Frequency Table

Do you believe that poor management system contributed to the High rise Structure late completion?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	44	88.0	88.0	88.0
	NO	2	4.0	4.0	92.0
	OTHER	4	8.0	8.0	100.0
	Total	50	100.0	100.0	

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Is it true that heavy rain causes building activity to slow down?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	44	88.0	88.0	88.0
	NO	4	8.0	8.0	96.0
	OTHER	2	4.0	4.0	100.0
	Total	50	100.0	100.0	

Do you believe that using advanced construction techniques to build a High rise structure is the best option?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	45	90.0	90.0	90.0
	NO	3	6.0	6.0	96.0
	OTHER	2	4.0	4.0	100.0
	Total	50	100.0	100.0	

Do you believe that this project's delays are due to government funding and payment issues?

RII Method

Sr. No.	Questions	YES(N1)	No(N2)	CANT SAY(N3)	Total
1	Do you believe that poor management system contributed to the High rise Structure late completion?	44	2	4	50
2	Is it true that heavy rain causes building activity to slow down?	44	4	2	50
3	Do you believe that using advanced construction techniques to build a High rise structure is the best option?	45	3	2	50
4	Do you believe that this project's delays are due to government funding and payment issues?	33	7	10	50
5	Do you think that project will be delayed as a result of the late release of the site, drawings, and materials?	39	8	3	50
6	Is the project team heavily reliant on one another for assistance, intelligence, or enforcement to complete their tasks, causing a delay in the completion of the High rise structure?	33	11	6	50
7	Do you believe the errors in layout caused by incorrect data in drawings lead to further work being done?	44	2	4	50
8	Do you believe the project team members and staff lack expertise in the construction of an emergency Site ?	37	8	5	50
9	Can you feel there is a lot of uncertainty on the project for the project team members?	31	13	6	50
10	Do you believe that if advanced building techniques were used, any of the above factors will be eliminated?	43	3	4	50
11	Do you believe that India's health infrastructure is sufficient to solve the Pandemic problem?	9	36	5	50
12	Do you think that quality of the work would suffer as a result of the fast-track construction?	39	8	3	50
13	Do you think the best choice for constructing a High rise building is to use advanced building techniques?	46	2	2	50
14	Do you believe that the task of construction management is required to complete the project on time?	46	2	2	50
15	Do you believe that a High rise Building should be built at the start of the Pandemic Situation on Site?	43	1	6	50

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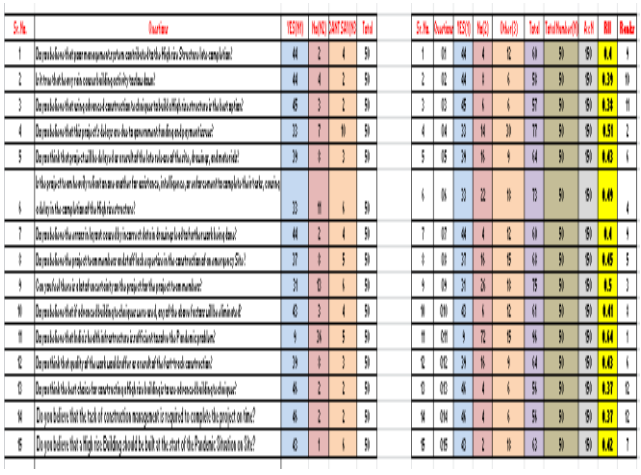

Indeed, with less physical activity, the new manufacturing processes decrease waste using new construction materials. In order to achieve sustainable development and to reduce waste, the policies outlined in this study need to be understood and fully implemented. Not only must all these practices be followed by administrators, but also by the workers.

- ✓ Concentrated networks for factories
- ✓ Community in Technologies
- ✓ Consistency at foundation
  - JIT Producing
  - Uniform factory filling
- ✓ Manufacturing Kanban control scheme
- ✓ Minimized Times for Setup

The questionnaire was circulated across large construction projects, including site engineers, Painter, Plasterer, Meson Brickwork, steel binder, and the employee workforce, as well as small construction projects.

The findings summarized and the author's influence measured, grouped into seven categories of factors affecting the Cost and Time efficiency of construction workers at the construction site, as follows:

Table: Ranking of factors on workers themselves

Factors	RII	Impact	Ranking
Experience of workers	4.29	Very high	5
Labour Discipline	4.12	Very high	5
Physical ability	4.01	High	4
Psychophysiology ability	3.78	High	4
Labour Intensity	3.52	Mid	3
Age	3.41	Low	2
Gender	3.19	Extreme Low	1
Level of training	3.09	Extreme Low	1

The lower the labor rate, the lower the productivity, the human being's physiological psychological problems would have an effect on the standard of work, thereby impacting productivity. The higher the age, the more experience is acquired, however physical strength can be reduced, thus greatly affecting labor productivity.

Table: Ranking of operational and managerial factors

Factors	RII	Impact	Ranking
Ability to organize production	4.23	Very high	5
Construction supervision	4.20	High	4
Application of technology	3.92	Mid	3
Workers' arrangement	3.73	Low	2
Labour's Communication	2.89	Extreme low	1

The ability to organize production is the leading influence with RII= 4.23, and the organization of construction supervision with RII= 4.20 is ranked second. It can be seen that the capacity to organize and oversee the construction of contractors, especially the site manager, can decide management and organization, development and direct construction on the site. These have a clear effect on

the increase or decline in labour production and have a major impact on it. With RIIs being 3.73 and 3.92, the factors to be calculated with a high degree of control are the application of technologies and worker structure. That is to say, from the viewpoint of workers, technologies and labor agreements contribute significantly to their performance.

Table: Ranking of factors that motivate employees

Factors	RII	Impact	Ranking
Types of salary payment	4.27	Very high	5
Staff Support	4.05	High	4
Reward Mechanism	3.69	High	4
Spiritual Life	3.58	Mid	3
Training and improving skills	3.32	Low	2
Initiative at work	3.18	Extreme low	1

Factors that have a high effect on time & cost efficiency include skilled training, skills upgrading and innovation. These variables directly impact employee motivation, taking work to the satisfaction and sense of obligation of construction workers

Table: Ranking of factors of working tools and objects

Factors	RII	Impact	Ranking
Quality of building materials	4.25	Very High	5
Quality of working tools	4.01	High	4
Complexity of works	3.72	Low	2
Material transport methods	3.02	Extreme Low	1

The difficulty of the work with RII = 3.78 and the material transfer methods with RII = 3.22 are high-impact variables. These factors influence job efficiency, which, as stated, would also impact of new construction materials. Organizations need to use machinery, equipment and resources that must be appropriate for goods and technology in order to ensure the achievement and growth of productivity; ensure regular readiness and service during the work shift; ensure that raw materials and semi-finished products put into production must have obvious origin and qualification.

Table: Ranking of natural environmental factors

Factors	RII	Impact	Ranking
Weather conditions	4.82	Very High	5
Regulations,	3.42	High	4
Geological and	3.27	Mid	3
hydrological conditions	3.12	Low	2
laws on construction	3.02	Extreme Low	1

Factors governing the cost of structure

a. Specifications and units of measurements.
b. Materials-quality and their market rates.
c. Labour-skilled, unskilled. Their turnover and wages per day
d. Contingencies like water, transport, electricity and unforeseen items.
e. Overheads.
f. Profits expected.

Drawings:

Drawings of the structure to be constructed are based on the designs. The dimensions of all components and the details of the meshes, bars etc shall be clearly shown in the drawings. Schedules showing the meshes shall be shown.

Components of estimate

A. Materials: Quantity and Rates From the drawings, the quantities of the materials like steel, mesh, sand and cement can be calculated. For the skeletal steel, from the bar diameters and their spacing in two directions, the weight per unit area can be obtained. From the type and size of mesh and their number of layers, the area of mesh reinforcement can be calculated. From the thickness of the

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B. Labour required: The man-hours per unit of construction of ferrocrete items based on our experience. The wages of the skilled and unskilled labour will be as per the rates payable in that area. Labour component of ferrocrete items is on higher side, may go up to 20 % sometime.

C. Contingencies Generally the ferrocrete items are fabricated and tied in factory, and then taken to the site for mortaring. Hence the cost of handling, transporting, hoisting and erecting of the cage at site, octroi, water charges etc are considered under contingencies. They vary from 5 to 8 %.

D. Overheads The key to the best ferrocrete construction lies in its strict supervision. A full time supervisor at site is a must. His charges will have to be considered in addition to office and other expenses, while working out the overheads. Overheads may be taken up to 8 to 10 %.

E. Profits Ferrocrete construction is a specialized job and profit margins expected in it are higher if the design is complicated.

Cost analysis for single ferrocement channel
Therefore cost for 3m ferrocement roofing channel

Roofing = 900 Rs.

Consider Room size: 10ft. × 10ft.

No. of ferrocement channel required = 8

Cost of channels required =8×900 =7200 Rs.

Cost of gap filling between channels and installation=1000Rs.

Total cost required for 100sq. ft. =8200 Rs.

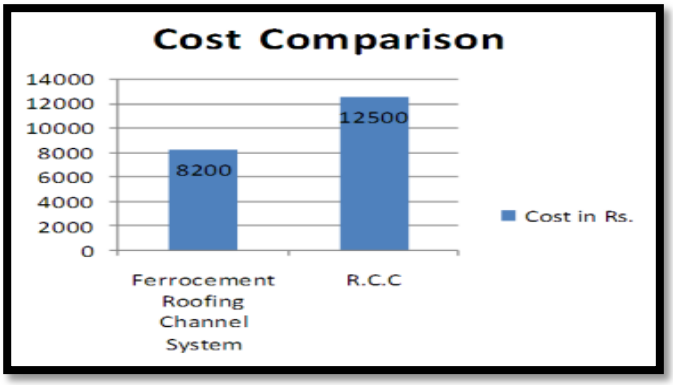
Therefore Total cost using ferrocement channel roofing system = 82 Rs. /sq. ft

Total cost using conventional (R.C.C) roofing system = 125 Rs. /sq. ft

Therefore % saving = 35%

Item	Qty.	Rate	Amount (Rs.)
Steel	3.55 kg	46/kg	164
Chicken mesh	36 sq. ft.	5.5/sq. ft	198
Cement	0.5 bag	300/bag	150
sand	0.035 cu. m	4500/brass	56
Labour (skill)	1	125/3hr.	125
(semi-skill)	2	80/3hr.	160
	Total		853
	Contingencies, Tools and plants charges (Add 2% in total)		**900**

IV. SIMULATION RESULTS



Total Cost analysis:
A) Ferrocement Structure's cost analysis: Approximate costs were made by referring to Chandra Mohan Hangekar's Do-It-Yourself Build Your Home Yourself Book from Ferrocement Society
India before construction of the Ferrocement Structure; before construction, the total approximate cost amounted to 1,46,8,620 Rs and after construction the total approximate cost was 1,38,4,300 Rs. As a result of the use of reused and locally available materials and reduced further charges, costs were reduced.
B) Load-bearing structure with the same base area cost analysis: The Plinth area method was used to cost the load bearing structure using the Plinth area rate from CPWD 2020. The cost of the load bearing structure was approximately 1,77,4,765 Rs.

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C).Cost analysis of RCC structure of same plinth area: Approximate costing of RCC structure was done using Plinth Area Method by considering Plinth area rates from CPWD 2020.Total approximate cost for RCC structure came to be 1,90,8,505 Rs.

Time analysis:

Time analysis was done by using Gantt chart method.
A).Time required for Ferrocement farmhouse came to be 125 Days.
B).Time required for Load bearing structure was calculated by previous industry experience which came to be 180 Days.
C).Time required for RCC structure was calculated by previous industry experience which came to be 250 Days.

Experimental Investigation

Material Collection

Cement

Ordinary IS: 269 – 1976 Portland cement, 40 grade. All of the specimens were cast with ordinary Portland cement, grade 40. To produce pastes of uniform consistency, different types of cement require different amounts of water. Different types of cement will result in different rates of strength development in concrete. The most important factor in producing high-quality concrete is choosing the right brand and type of cement. Because the type of cement used affects the rate of hydration, the strength of the concrete at an early age can be significantly influenced. It's also crucial to make sure that the chemical and mineral admixtures are compatible with cement.

Aggregate

Local river sand conforming to IS: 383 –1970 Grading zone II. Local river sand will be used. All specimens will be cast in IS 4.75mm sand.

Aggregate

Crushed blue granite stones of nominal size 12.5 mm as per IS: 383 – 1970. All specimens will be cast in crushed granite aggregate with a specific gravity of 2.77 and a 4.75 mm sieve. Several studies concluded that the composite's strength should be limited by coarse aggregate size. Aside from cement paste-to-aggregate ratio, aggregate type impacts concrete dimensional stability.

SR.NO	MATERIAL	BEFORE PANDAMIC	AFTER PANDEMIC	PERCENTAGE INCREASE
1	STEEL	40	85	113%
2	CEMENT	270	365	35%
3	METAL	2300	2500	9%
4	NATURAL SAND	4000	5000	25%
5	CRUSH SAND	2900	3500	20%
6	BRICK	8	14	75%
7	ELECTTIC POINT	550	750	36%
8	PLUMBING MATERIAL			110%
9	NAL OR TAB FITTING METRIAL			55%
10	FLOORING	110	150	20%
11	GRILL	60	100	67%
12	PAINTING	22	35	30%
13	WINDOW	170	230	35%
14	DOOR	120	170	42%
15	RCC LABOR	120	140	17%
16	BRICK WORK PLASTER LABOR	100	130	30%
17	TILE WORK LABOR	40	60	50%
	Total Average Increase In COST			**45%**

V. CONCLUSION AND FUTURE WORK

- The experience of Pandemic in the construction industry is not yet over as the learning curve has not completed the circle
- Where such can work, and workspace management, additional design considerations and Services to the Situation

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- 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.
- Likewise, planning with unforeseen circumstances including other contingency covering that, and the reduction of on-site work through the use of prefabricated elements
- Further study could expand to involve more participants so as to explore further updates on the impact of Pandemic 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.
- In the end, if these experiences are harmonized, a comprehensive turnaround strategy for contingency plan would be produced
- It seen that for there is increase in rate for construction materials after pandemic period that before pandemic.
- There is almost 45% increase on an average after pandemic period.

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