ILCE | INSTITUTE FOR LEAN CONSTRUCTION EXCELLENCE

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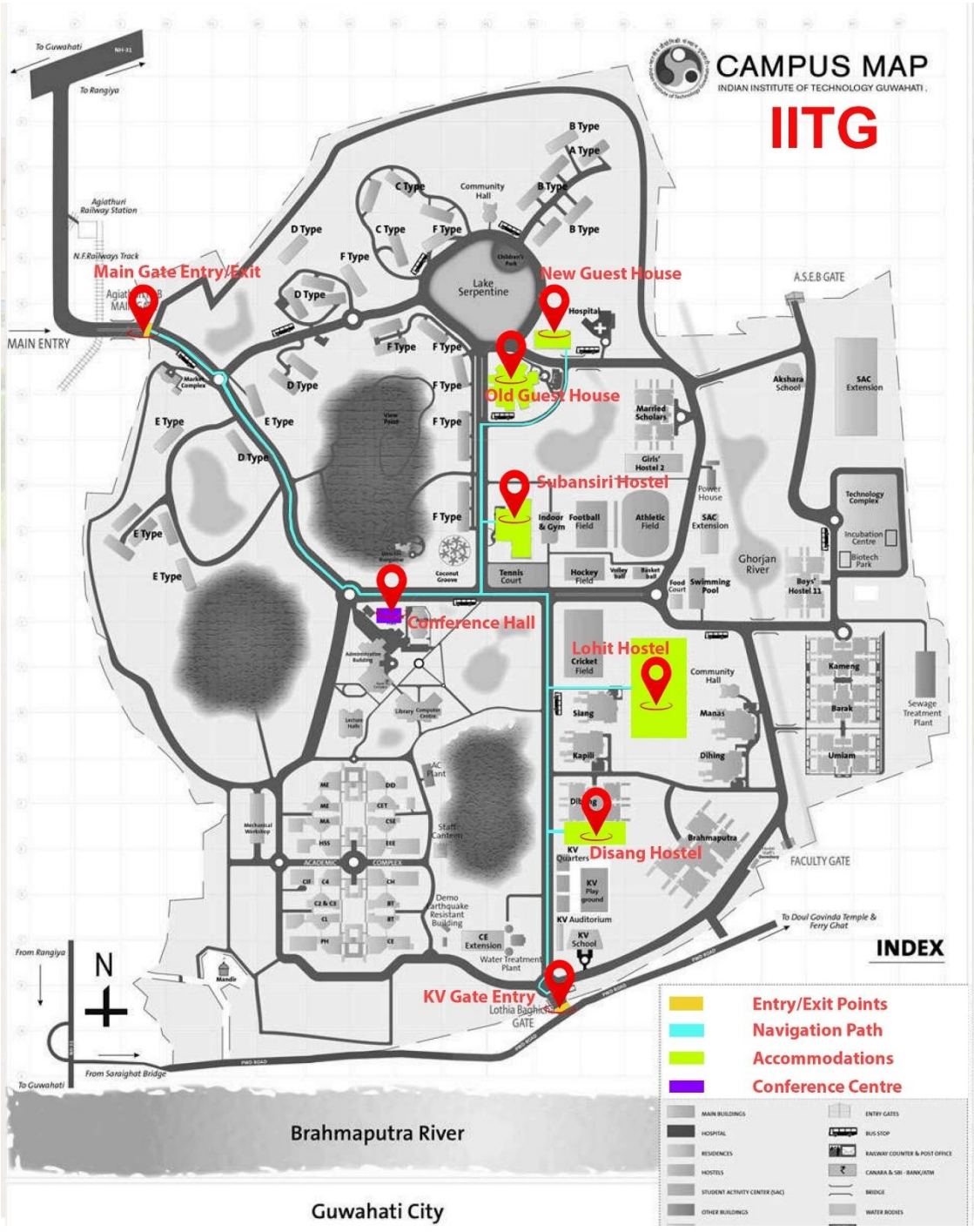
CAMPUS MAP
INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
IITG
To Guwahati
To Rangiya
Agiathuri Railway Station
N.F.Railways Track
MAIN ENTRY
Main Gate Entry/Exit
New Guest House
Old Guest House
Subansiri Hostel
Conference Hall
Lohit Hostel
Disang Hostel
KV Gate Entry
Lake Serpentine
Hospital
A.S.E.B GATE
Akshara School
SAC Extension
Married Scholars
Girls' Hostel 2
Power House
Technology Complex
Incubation Centre
Biotech Park
Ghorjan River
Boys' Hostel 11
Swimming Pool
Food Court
Tennis Court
Hockey Field
Volley ball
Basket ball
Indoor & Gym
Football Field
Athletic Field
Coconut Grove
Cricket Field
Community Hall
Kameng
Barak
Umiam
Sewage Treatment Plant
Siang
Manas
Kapili
Dihing
Brahmaputra
FACULTY GATE
KV Quarters
KV Play ground
KV Auditorium
KV School
Demo Earthquake Resistant Building
CE Extension
Water Treatment Plant
Staff Canteen
Mechanical Workshop
Library
Computer Centre
Lecture Halls
Administrative Building
Lothia Baghicha GATE
To Doul Govinda Temple & Ferry Ghat
From Rangiya
From Saraighat Bridge
To Guwahati
N
PWD ROAD
INDEX
Entry/Exit Points
Navigation Path
Accommodations
Conference Centre
MAIN BUILDINGS
HOSPITAL
RESIDENCES
HOSTELS
STUDENT ACTIVITY CENTER (SAC)
OTHER BUILDINGS
ENTRY GATES
BUS STOP
RAILWAY COUNTER & POST OFFICE
CANARA & SBI - BANK/ATM
BRIDGE
WATER BODIES
Brahmaputra River
Guwahati City

Message from Mr. Anup Mathew, Chairman ILCE & Senior Vice-President & Business Head, Godrej Construction

About the Construction Industry

The Construction Industry is one of the largest industries in the world. It employs about 7% of the world's working population. Global construction spending is projected to increase from $13 trillion in 2023 to a striking $22 trillion in 2040, which would require a CAGR of 3.2 %. In 2023, $13 trillion worth of gross annual output was devoted to construction projects globally, constituting 7% of global gross output.

In India, the construction sector, along with the output generated from real estate services and ownership of dwellings, contributes approximately 16 to 18% to the economy's total output.

The building and construction sector globally has an important part to play in addressing the urgent issue of climate change. The buildings and construction sector globally is showing an increase in both emissions and energy use. Currently, buildings and construction sector are the source of ~40% of the world's energy related carbon emissions. (Source: - McKinsey, World GBC and other sources).

The Industry Problem

By 2040, the industry could grow by around 70%, but engineers and constructors in many parts of the world are struggling to deliver even today's project pipeline. Construction Industry has a serious productivity-related problem, in addition to shortages in the workforce, retirement, shorter job cycles, and competition for talent

have caused a decline in the construction workforce's skill and experience levels. The World Economic Forum reported that building and related trades were among the most highly experienced positions to experience job shortages across the European Union. In India, 71 Mn of the workforce is estimated to be employed in the construction sector and only 19% i.e. 1.3 Mn of the workforce are skilled employees.

The net-zero transition may be delayed, growth ambitions may be deferred, and countries may struggle to meet the infrastructure and housing needs for their populations. The industry is lacking sufficient capable workers, and economic labour productivity (the economic value added per hour worked) has stagnated for decades globally despite technological advancements and improvements by individual firms. An increase in productivity is hence needed to allow the industry to deliver projects with the same or fewer people per project. It would also create the financial space within construction companies to increase wages and invest in better tools and practices.

The construction industry's uptake of technology has been slow over the past several decades. Time and cost overruns on construction projects are often the norm in most parts of the world. Project professionals that manage to propel improvement efforts in their projects often struggle to scale their efforts across the entire project portfolio. Every project has a different scope, context, team, and culture, which can be empowering for teams, but it can also result in distinctive ways of working and a resistance to adapt to changes or learnings coming from outside the project.

The high interdependence of work activities by several agencies on a construction project site requires very good, coordinated effort by stakeholders. This can be achieved through excellent project management skills and effective project execution capabilities. While there have been improvements in the adoption of better project management practices by some of the organisations in the industry, it's effective implementation across the industry is often found to be lacking.

About Lean Construction

Adopting Lean Tools and Principles can definitely help the Construction Industry improve its operational efficiency, promote collaboration with business partners, and thus enhance its ability to consistently deliver projects as per the commitments made to

customers. This would, in turn, help these organisations improve their overall business performance.

Lean Construction is still in a relatively nascent stage globally as compared to Lean Manufacturing. Where Lean has been deployed effectively, organisations have seen significant reduction in time and costs due to better utilisation of resources. Most Indian construction sites have several low-hanging improvement opportunities. Many EPC contractors and real estate developers in India are either unaware of Lean Construction principles or have not really adopted them in a meaningful way. This is resulting in huge wastes of our national resources and have a significant adverse impact on the timely and effective delivery of our construction projects. Hence, employing Lean principles and techniques effectively can certainly result in substantial cost and time savings and other related benefits for stakeholders in the Construction industry.

About ILCE

ILCE is a non-profit organisation formed by a group of reputed like-minded organisations from the Indian Construction and Real Estate sector. The ILCE Board consists of leaders from these organisations, and IIT Madras, who is the knowledge partner. ILCE's Purpose is to help create value for the Construction Industry by enabling its stakeholders to become aware of Lean Principles, develop and internalise Lean Concepts on their projects, and to eventually develop a Lean Culture within their organisations.

The Way Forward

The true success of Lean implementation is possible only when there is an effective cultural change brought about among all the stakeholders involved in the project. This also helps strengthen team spirit and drive the organisation's improvement initiatives effectively. Needless to say, such cultural transformations need strong support from the top management of the organisation. A focused approach towards effectively imbibing these cultural changes in an organisation across all its functions can help overcome many of the hurdles faced in the Lean Journey. This would eventually provide significant benefits for all the stakeholders in the entire Construction Ecosystem.

Message from Prof. Laishram Boeing Singh, Chair of ILCC 2024 & Professor, Indian Institute of Technology Guwahati, Guwahati

Dear Colleagues, Delegates, and Distinguished Guests,

It is a great honor to welcome you to the International Lean Construction Conference (ILCC) 2024 at IIT Guwahati. This year's conference, focused on the theme of "*Lean Construction 4.0: Project Delivery for Resilient Infrastructure*," addresses a critical intersection of technology, resilience, and sustainability in construction.

As our world faces increasing challenges from climate impacts to urban growth, the role of resilient infrastructure has never been more vital. Lean Construction 4.0 combines the proven principles of lean methodology with advanced digital tools of Industry 4.0, including Artificial Intelligence, Big Data, and IoT. This integration empowers us to drive efficiency, minimize resource waste, and create infrastructures capable of adapting to future uncertainties.

The theme of the conference speaks to the shared responsibility within our field to innovate and build systems that stand the test of time. By embracing Lean Construction 4.0, we can enhance project delivery processes, improve collaboration, and build resilient communities that can weather unforeseen challenges. This conference brings together experts from across academia, industry, and government to discuss these approaches and share insights that will shape the future of construction.

Throughout ILCC 2024, I encourage each of you to engage in meaningful discussions, explore new ideas, and connect with colleagues who share your commitment to progress in resilient infrastructure. Together, let us build a foundation for smarter, sustainable growth in construction and beyond.

Thank you for joining us on this important journey. I look forward to the productive exchanges and collaborative outcomes that will emerge from this gathering.

ILCC 2024 presents

Indian Lean Construction Conference

"Lean Construction 4.0- Project Delivery for Resilient Infrastructure"

November 24-27, 2024

National Conference Organizing Committee

1. Prof. Laishram Boeing Singh, IIT Guwahati
2. Prof. Koshy Varghese, IIT Madras & Director, ILCE
3. Dr. Ganesh Devkar, CEPT University
4. Dr. Bhargav Dave, Founder and CEO at VisiLean Oy
5. Dr. Marimuthu K, Technical Secretary, ILCE

With Best Compliments from

the Chairman of Board of Directors, and Directors

of

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ILCE Team

Mr. Anup Mathew
(Godrej Construction)

Mr. Akhil Gupta
(Shapoorji Pallonji)

Mr. Sagar Gandhi
(Shapoorji Pallonji)

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(Arcop Associates)

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(URC Construction)

Mr. Ashutosh Kapoor
(Partner, KPMG India)

Dr. Koshy Vargese
(IIT Madras)

Mr Kaezad Karanjawala
Secretary General, ILCE

Dr Marimuthu K
Technical Secretary, ILCE

Workshop Schedule

24 Nov 2024 Day 1: Workshop Day					
From	**To**	**Duration**	**Venue:** Conference Hall 2, Conference Centre		
08.00 AM	08.45 AM	00.45	***Registration & Networking***		
08.45 AM	09.15 AM	00.30	Inauguration, Welcome address Dr Laishram Boeing Singh, Professor, IIT Guwahati; Conference Chair – ILCC2024 Prof Koshy Varghese, Professor, IIT Madras; Director, ILCE Dr Bhargav Dave, Co-Founder and CEO, VisiLean Oy Mr Kalyan Vaidyanathan, Director of Business Development, Bentley Systems India Ltd Mr Thirumalai Rajan, Cofounder and CEO, Flowscape Technology and Management Solutions LLP; Senior Project Officer, IIT Madras		
09.15 AM	10.15 AM	01.00	**Keynote#1:** Takt Planning and Control – Dr Bhargav Dave, Co-Founder and CEO, VisiLean Oy		
10.15 AM	11.15 AM	01.00	**Keynote#2:** Last Planner System – Mr Kalyan Vaidyanathan, Director of Business Development, Bentley Systems India Ltd		
11.15 AM	11.30 AM	00.15	***Tea Break & Networking***		
11.30 AM	12.30 PM	01.00	**Keynote#3:** Analysis of Construction Processes using Discrete Event Simulation – Mr Thirumalai Rajan, Cofounder and CEO, Flowscape Technology and Management Solutions LLP; Senior Project Officer, IIT Madras		
12.30 PM	01.30 PM	01.00	***Group Photo & Lunch Break***		
			Track A - Takt Planning and Control **Venue:** Conference Hall 1	**Track B** - Last Planner System **Venue:** Conference Hall 3	**Track C** - Discrete Event Simulation **Venue:** Conference Hall 4
01.30 PM	02.45 PM	01.15	Group 1	Group 2	Group 3
02.45 PM	03.00 PM	00.15	***Tea Break & Shift Break***		
03.00 PM	04.15 PM	01.15	Group 3	Group 1	Group 2
04.15 PM	04.30 PM	00.15	***Shift Break***		
04.30 PM	05.45 PM	01.15	Group 2	Group 3	Group 1
05.45 PM	06.00 PM	00.15	***Concluding Remarks & Feedback***		

Industry Day Schedule- Day 2

25 Nov 2024 Day 2: Industry Day			
From	**To**	**Duration**	**Venue:** Conference Hall 2, Conference Centre
08.15 AM	09.15 AM	1.00	***Registration & Networking***
09.15 AM	09.45 AM	0.30	**Inauguration: Inaugural Address** Academic Patron: Prof Devendra Jalihal, Director, IITG Industry Patron: Mr Anup Mathew, ILCE Chairman Mr Kaezad Karanjawala, Secretary-General, ILCE
09.45 AM	10.15 AM	0.30	**Chief-Guest: Keynote Address 1: Eco-system for Infrastructure on Win-Win-Win Mode for "Vikasit Bharat"** Speaker: Mr Ravi Prasad, Director General (RD) & Special Secretary (retd), Ministry of Road Transport & Highways, Govt. of India
10.15 AM	10.35 AM	0.20	**Invited Talk 1: Lean Construction Implementation Strategy for Organizations** Speaker: Mr Sharique Khan, Construction Lead, Jacobs (Saudi Arabia)
10.35 AM	10.50 AM	0.15	Q&A Session - Moderator: Prof Koshy Varghese, IIT Madras
10.50 AM	11.10 AM	0.20	***Tea Break & Networking***
11.10 AM	11.30 AM	0.20	**Invited Talk 2: The Human element in Lean Construction: Driving Success Through people** Speaker: Dr Abraham Cyril Issac, Assistant Professor, IIT Guwahati
11.30 AM	11.50 AM	0.20	**Invited Talk 3: Implementation of Lean Principles on Projects by KPMG** Speaker: Mr Nilabha Dey, Director, Major Projects Advisory, KPMG India
11.50 AM	12.05 PM	0.15	Q&A Session - Moderator: Prof Koshy Varghese, IIT Madras
12.05 PM	01.00 PM	0.55	**Panel Discussion 1 (Lean + Leadership): The Role of Lean Leadership in Driving Transformation and Resilience in an Organisation and Industry** Speakers: (1) Mr Devarajan Chinnusamy, Managing Director, URC Construction (P) Ltd; Director, ILCE (2) Manishkumar Chauhan, Cluster Project Manager, Northeast Region, L&T Construction, Buildings & Factories Vertical (3) Mr. Ashutosh Kapoor, Partner, KPMG India; Director, ILCE Moderator: Prof Ashwin Mahalingam, IIT Madras
01.00 PM	01.10 PM	0.10	Group Photo Session (venue)
01.10 PM	02.15 PM	1.05	***Lunch Break***
02.15 PM	02.35 PM	0.20	**Invited Talk 4: Lean construction management during construction and leveraging LCM to better improve safety deliverables on project site** Speaker: Mr Pruthvi B A, Manager HSE, BOSCH India
02.35 PM	02.55 PM	0.20	**Invited Talk 5: ILCE Lean Maturity Model (ILMM): Current Status & Future Direction** Speaker: Mr Kalyan Vaidyanathan, Dr Marimuthu K, Prof Koshy Varghese
02.55 PM	03.10 PM	0.15	Q&A Session – Moderator: Dr Laishram Boeing Singh, Professor, IIT Guwahati
03.10 PM	03.30 PM	0.20	***Tea Break & Networking***
03.30 PM	04.30 PM	1.00	**Panel Discussion 2 (Lean + Technology): How do Lean practices and digital technologies transform project delivery and efficiency?** Speakers: (1) Rahul Kashyap, Director - BIM Services, Intelligent Consulting Engineers (ICE) (2) Aneev Ansari, Head - Planning, Delivery Assurance & Systems, Godrej Construction (3) Dr. Shobha Ramalingam, Associate Professor, NICMAR University (4) Mr Suraj Sontakke, Senior Project Manager VDC, vConstruct Pvt Ltd Moderator: Dr Nikhil Bugalia, Assistant Professor, IIT Madras
04.30 PM	06.00 PM	1.30	**Keynote Address 2:** Speakers: Dr Cynthia C.Y. Tsao, Founder, Building AEC Learning, Owner - Navilean, LLC, USA Mr Marty Corrado, Director of Industrialized Construction, The Boldt Company, USA Q&A Session - Moderator: Mr Kalyan Vaidyanathan
06.00 PM	06.10 PM	0.10	***Concluding Remarks & Feedback***

Conference Day 1 Schedule

26 Nov 2024 Day 3: Conference Day#1			
From	**To**	**Duration**	**Venue:** Conference Hall 2, Conference Centre
08.15 AM	09.15 AM	01.00	***Registration & Networking***
09.15 AM	09.45 AM	00.30	**Inauguration: Inaugural Address** Academic Patron: Prof Devendra Jalihal, Director, IITG Industry Patron: Mr Anup Mathew, ILCE Chairman Mr Kaezad Karanjawala, Secretary-General, ILCE
09.45 AM	10.15 AM	00.30	**Keynote Address 1 - Chief Guest** Speaker: Mr Raj Chakrabarty, Special Commissioner & Spl. Secretary to the Govt. of Assam, Public Works (B & NH) Deptt.
10.15 AM	10.45 AM	00.30	**Keynote Address 2 - Guest of Honour** Speaker: Prof K.N. Satyanarayana, Director, IIT Tirupati
10.45 AM	11.00 AM	00.15	Q&A Session - Moderator: Dr Laishram Boeing Singh, Professor, IIT Guwahati
11.00 AM	11.30 AM	00.30	***Tea Break, Networking & Poster Display***
11.30 AM	11.50 AM	00.20	**Invited Speech 1: Advancing Lean and Sustainable Construction: Godrej Construction's Circular Economy Approach to Concrete Waste Recycling** Speaker: Mr Abhijeet Gawde, Business Development, Marketing, Strategy and Innovation, Godrej Construction
11.50 AM	12.10 PM	00.20	**Invited Speech 2:** Lean in Large Engineering Projects Speaker: Dr Pawan Pandey, Adjunct Professor of Practice, IIT Delhi
12.10 PM	12.30 PM	00.20	**Invited Speech 3: AI for Automating MEP Clash Resolution on BIM** Speakers: Prof Anjana Gupta, Professor, Applied Mathematics & Artificial Intelligence Delhi Technological University (Formerly DCE) Architect Nitin Gupta, Director, ARCOP ASSOCIATES
12.30 PM	12.50 PM	00.20	Q&A Session - Moderator:
12.50 PM	02.00 PM	01.10	***Group Photo & Lunch Break***
02.00 PM	03.30 PM	01.30	**Technical Session A1 (Venue:** Conference Hall 1**)** **Technical Session A2 (Venue:** Conference Hall 3**)** **Technical Session A3 (Venue:** Conference Hall 4**)**
03.30 PM	04.00 PM	00.30	***Tea Break, Networking & Poster Display***
04.00 PM	05.15 PM	01.15	**Panel Discussion (Lean + Education): Lean Construction Education for the Next Generation of Students and Construction Professionals** Speakers: (1) Prof Parul Patel, Professor, Nirma University (2) Dr Venkatesan R, Professor, NICMAR University, Hyderabad (3) Dr Hemanta Doloi, Associate Professor, The University of Melbourne, Australia (4) Dr Laishram Boeing Singh, Professor, IIT Guwahati Moderator: Prof Koshy Varghese
05.15 PM	05.30 PM	00.15	***Concluding Remarks and Feedback***
07.00 PM	10.00 PM	03.00	***Conference Day Cultural (Main Auditorium) + Dinner***

Conference Day 2 Schedule

27 Nov 2024 Day 4: Conference Day#2			
From	**To**	**Duration**	**Venue:** Conference Centre
08.15 AM	09.00 AM	00.45	***Registration & Networking***
09.00 AM	10.45 AM	01.45	**Technical Session B1 (Venue:** Conference Hall 1**)** **Technical Session B2 (Venue:** Conference Hall 3**)** **Technical Session B3 (Venue:** Conference Hall 4**)**
10.45 AM	11.00 AM	00.15	***Tea Break & Networking***
11.00 AM	12.30 PM	01.30	**Technical Session C1 (Venue:** Conference Hall 1**)** **Technical Session C2 (Venue:** Conference Hall 3**)** **Technical Session C3 (Venue:** Conference Hall 4**)**
12.45 PM	01.15 PM	00.30	***Valedictory*** *Announcement of Best Paper and Poster* *Announcement of Next ILCC 2025*
01.15 PM	02.30 PM	01.15	***Lunch Break***

Track A1 Schedule

Nov 26, 2024 (Track A1)					
S. No.	**Paper ID**	**Authors**	**Paper Title**	**From**	**To**
1	2	Suvankar Bhattacharya and Yash Saraiya	OPTIMIZING WORKSPACES IN AVIATION PROJECTS THROUGH 5S IMPLEMENTATION	02.00 PM	02.15 PM
2	4	Ajay Handoo and Raspreet Singh Nayyar	LEAN CULTURE AND BEHAVIOUR – DELAYS IN CASTING CONCRETE	02.15 PM	02.30 PM
3	20	Santhosh Loganathan, Murali Jagannathan, Venkata Santosh Kumar Delhi and Debopam Roy	SUSTAINING LEAN CONSTRUCTION IMPLEMENTATION IN ORGANISATIONS	02.30 PM	02.45 PM
4	69	Dr. Shobha Ramalingam, Lavina Pothen and Kaezad Karanjawala	"MEETINGS THAT MATTER" - ASSESSING THE EFFECTIVENESS OF BIG ROOM TEAM MEETINGS	02.45 PM	03.00 PM
5	61	Purna Chandra Rao, Ashish Saxena and Mohan S	A CASE STUDY AND APPLICATION OF LEAN PRINCIPLES IN STRUCTURAL STEEL PROJECT FOR EFFICIENT PROJECT OUTCOME.	03.00 PM	03.15 PM
6	26	Tushar Jaiswal, Erawati Kadam and Ann Francis	GREEN SUPPLY CHAIN MANAGEMENT THROUGH LEAN CONSTRUCTION PRACTICES- AN INDIAN PERSPECTIVE	03.15 PM	03.30 PM

Track A2 Schedule

Nov 26, 2024 (Track A2)					
S. No.	**Paper ID**	**Authors**	**Paper Title**	**From**	**To**
1	6	Aakar Garg and Koshy Varghese	COMPARE AND SELECT DATA ACQUISITION DEVICE FOR COMPUTER VISION BASED CONSTRUCTION PROGRESS MONITORING	02.00 PM	02.15 PM
2	10	Yadhnesh Udas, Sagar Kanade and Swapnil Pophale	STREAMLINING RECONCILIATION PROCESS: THE IMPACT OF WEB-BASED SYSTEM ON REINFORCEMENT STEEL WASTAGE THROUGH LEAN PRINCIPLES	02.15 PM	02.30 PM
3	34	Sreelakshmi S and Ashwin Mahalingam	TO UNDERSTAND THE ROLE OF CHANGE AGENTS IN PROMOTING BIM ADOPTION	02.30 PM	02.45 PM
4	56	Rakesh Sai, Ajay Prabhas Mvn and Prasad K V	INTEGRATING AUGMENTED AND VIRTUAL REALITY FOR SUSTAINABLE LEAN CONSTRUCTION PRACTICES	02.45 PM	03.00 PM
5	59	Madhura Pansare, Trupti Pakhale and Tejasvi Pahilwan	REAL-TIME OBJECT DETECTION USING ANDROID	03.00 PM	03.15 PM
6	33	Asmita Gupta, Kshitij Joshi, Govind Rathore, Namrata Bagdare, Pandiaraja M and Jitendra Bhatt	INSTALLATION OF A 3D PRINTED OFFICE BY IMPLEMENTING LEAN PRINCIPLES	03.15 PM	03.30 PM

Track A3 Schedule

Nov 26, 2024 (Track A3)					
S. No.	**Paper ID**	**Authors**	**Paper Title**	**From**	**To**
1	27	Naresh Bhakal, Yadhnesh Udas, Shashank Pundir and Surya Prakash Saini	IMPROVING DIAPHRAGM WALL CONSTRUCTION USING VALUE STREAM MAPPING: A CASE STUDY OF JAIPUR UG METRO PROJECT	02.00 PM	02.15 PM
2	41	Kaezad Karanjawala, Sagar Karnik, Rahul Ruikar, Vinayak Salvi and Jitendra Bhatt	IMPROVEMENTS IN VERTICAL TRANSPORTATION PEB WORKS	02.15 PM	02.30 PM
3	38	Mohit Lakshminivas Karesia, Ahmad Alothman and Aneetha Vilventhan	IDENTIFICATION OF WASTE AND IMPROVEMENT OF PRODUCTIVITY USING VALUE STREAM MAPPING FOR UNDERGROUND METRO PROJECT- A CASE STUDY	02.30 PM	02.45 PM
4	29	Prasanna Venkatesan Ramani, Neha Malipatil and Yuvraj Singh	IMPROVING PRODUCTIVITY THROUGH GEMBA WALK AND 5S – CASE OF PREFABRICATION AND CAST-IN-SITU ENVIRONMENTS	02.45 PM	03.00 PM
5	42	Kaezad Karanjawala, Sagar Karnik, Rahul Ruikar, Vinayak Salvi and Jitendra Bhatt	IMPLEMENTATION OF LEAN TOOLS ON KHALAPUR NORTH CAMPUS PROJECT	03.00 PM	03.15 PM
6	76	Ragavi Prabaharan and Mukesh Kumar Duraisamy	ENHANCING 5S IMPLEMENTATION AT A CONSTRUCTION SITE THROUGH THE RACI MATRIX: A CASE STUDY	03.15 PM	03.30 PM

Track B1 Schedule

Nov 27, 2024 (Track B1)					
S. No.	**Paper ID**	**Authors**	**Paper Title**	**From**	**To**
1	39	Dhairya Joshi, Aritra Roy, Amogh Shrivastava and Parul Patel	PROPOSED FRAMEWORK FOR INTEGRATION OF LPS AND LBMS IN THE CONSTRUCTION PROJECTS	09.00 AM	09.15 AM
2	43	Vikrant Pachouri and Prafull Kothari	INTEGRATING LEAN CONSTRUCTION WITH SUSTAINABILITY: OVERCOMING CHALLENGES OF GREEN MILESTONE FOR PREFABRICATION	09.15 AM	09.30 AM
3	48	Rohini A. Thool, Swarali Nimje, and Kiran Nalawade	5S – INTRODUCING SCORE BASED MONITORING APPROACH	09.30 AM	09.45 AM
4	49	Mathan Kumar Balasubramanian, Renuka S M and Akash A R	CURRENT CHALLENGES IN SCM IN CONSTRUCTION AND MITIGATING ITS RISK BY ADOPTING LEAN PRINCIPLES	9.45 AM	10.00 AM
5	37	Sachin Kanase , Indranil Sangle , Parth Lad and Shivakumar Gajji	SAILING THROUGH CONSTRAINTS: A CASE STUDY OF WITHSTANDING PERIODIC INCONSISTENCY	10.00 AM	10.15 AM

Track B2 Schedule

Nov 27, 2024 (Track B2)					
S. No.	**Paper ID**	**Authors**	**Paper Title**	**From**	**To**
1	70	Raja Sekhar Mamillapalli, Venkatesan Renganaidu, Dillip Kumar Bera and Prasad K V	TRAINING MODULE FOR IMPLEMENTATION OF LEAN CONSTRUCTION IN INDIAN SMALL-SCALE REAL ESTATE COMPANIES	09.00 AM	09.15 AM
2	71	Madhusudhana BP and Ganti Shanmukh	INTEGRATED LEAN AND BIM PROCESSES FOR HIGH RISE CONSTRUCTION	09.15 AM	09.30 AM
3	72	Shyam Kumar Inturi, Venkatesan Renganaidu, Raja Sekhar Mamillapalli, Kamma Ravindranadh Chowdary and V Pramadha	COMPUTATIONAL FLUID DYNAMICS ANALYSIS OF CERAMIC-COATED ROOF SHEETS FOR SUSTAINABLE CONSTRUCTION	09.30 AM	09.45 AM
4	94	Vismaya K and Senthilkumar Venkatachalam	EXPLORING MACRO BIM ADOPTION USING ACTIVITY THEORY: PROSPECTIVE LEAN PRINCIPLES	9.45 AM	10.00 AM
5	97	Hemanta Doloi and Koshy Varghese	DATA-DRIVEN DIGITAL MODELS FOR PLANNING AND DEVELOPMENT OF LEAN AND RESILIENT RURAL INFRASTRUCTURE	10.00 AM	10.15 AM

Track B3 Schedule

Nov 27, 2024 (Track B3)					
S. No.	**Paper ID**	**Authors**	**Paper Title**	**From**	**To**
1	45	Anchal Sharma, Shivam Gupta, Ashwini Kumar and Sparsh Johari	IDENTIFICATION OF HOUSING FACTORS AFFECTING WORKER'S WELL-BEING ON CONSTRUCTION SITES	09.00 AM	09.15 AM
2	57	Pranali Jadhav, Jitendra Musale and Amruta More	EFFORTLESS E-WASTE DISPOSAL GUIDE TO SUSTAINABLE ELECTRONICS RECYCLING	09.15 AM	09.30 AM
3	55	Swathi C, Prasad K V and Vasugi V	ENHANCING QUALITY IN PROJECTS WITH LEAN CONSTRUCTION- A SYSTEMATIC REVIEW	09.30 AM	09.45 AM
4	67	Puravi Priyadarsini Maharana, Ritesh Pathak and Swetapadma Panda	THE INTEGRATION OF LEAN AND RESILIENT INFRASTRUCTURE PARADIGMS A SYSTEMATIC REVIEW IDENTIFYING PRESENT AND FUTURE RESEARCH ASPECTS	9.45 AM	10.00 AM
5	95	Aneev Ansari, Vijayan Warrier, Gauresh Zarbade, Ashwini Nilgar and Jitendra Bhatt	DEVELOPING LEAN CULTURE – LEAN PRINCIPLES IN STRATEGY LIFE CYCLE MANAGEMENT	10.00 AM	10.15 AM
6	23	Vidya Khanapure	EXPLORING THE INTERPLAY BETWEEN LEAN CONSTRUCTION AND SUSTAINABILITY MATURITY IN HIGH-RISE RESIDENTIAL PROJECTS.	10.15 AM	10.30 AM

Track C1 Schedule

Nov 27, 2024 (Track C1)					
S. No.	**Paper ID**	**Authors**	**Paper Title**	**From**	**To**
1	16	Monika Gupta and Dr. Parthasarathy M K	RISK IDENTIFICATION AND MITIGATION METHODS IN PROCUREMENT OF SPECIALIST PACKAGES	11.00 AM	11.15 AM
2	17	Amit G Singh, Koshy Varghese and Rahul R Marathe	ANALYSIS OF VENDOR PERFORMANCE AND FACTORS CAUSING DELAY IN SUPPLY OF MATERIALS	11.15 AM	11.30 AM
3	18	Ayush Kumar Mishra and Koshy Varghese	ENHANCING CONSTRUCTION SEQUENCING THROUGH CONSTRAINT-BASED OPTION GENERATION	11.30 AM	11.45 AM
4	19	Velma Sumana Sree, Koshy Varghese and Rupashree Baral	GENDER DIVERSITY IN THE INDIAN CONSTRUCTION INDUSTRY: CURRENT AND STRATEGIES FOR IMPROVEMENT	11.45 AM	12.00 PM

Track C2 Schedule

Nov 27, 2024 (Track C2)					
S. No.	**Paper ID**	**Authors**	**Paper Title**	**From**	**To**
1	88	Pravin Thirwani, Bhushan Raisinghani, Prashant Gawade and Jitendra Bhatt	ADOPTION OF LEAN AND GREEN IN PRE-STRESSED PRECAST CONCRETE ROADS IN INDIA	11.00 AM	11.15 AM
2	93	Pandiaraja M, Aneev Ansari, Gauresh Zarbade and Jitendra Bhatt	4D IMPLEMENTATION IN LEAN PROJECT PLANNING AND MONTORING OF INDUSTRIAL PROJECT	11.15 AM	11.30 AM
3	74	Parul Patel, Rudrik Raval and Dhairya Joshi	APPLICATION OF VALUE STREAM MAPPING FOR ASSEMBLY LINE OF PRECAST ELEMENTS 1	11.30 AM	11.45 AM
4	62	Samyuktha Ganesan and Suresh Kamal	IMPLEMENTING WATER NEUTRALITY INITIATIVES IN CONSTRUCTION SITES USING LEAN TOOLS	11.45 AM	12.00 PM

Track C3 Schedule

Nov 27, 2024 (Track C3)					
S. No.	**Paper ID**	**Authors**	**Paper Title**	**From**	**To**
1	96	Parmarth Saini and Santu Kar	IDENTIFYING DYNAMIC HAZARDOUS ZONES & VISUALIZING SAFETY PLANS BY INTEGRATING CONSTRUCTION SCHEDULE AND BIM MODEL	11.00 AM	11.15 AM
2	78	Harshal Tikam and Chirag Kothari	ADVANCING POLICY INSTRUMENTS FOR WASTE MANAGEMENT: NEXUS OF LEAN CONSTRUCTION, CIRCULAR ECONOMY, AND WASTE MANAGEMENT PRACTICES	11.15 AM	11.30 AM
3	52	Vighneshkumar Rana and Vishal Singh	LEAN BUILDING PERMIT SYSTEM: A CATALOG-BASED PERMIT MODEL FOR PRODUCTIZATION IN THE BUILT ENVIRONMENT	11.30 AM	11.45 AM
4	44	Rohit Sahu and Sparsh Johari	IMPROVING CONSTRUCTION WORKFORCE SKILLS ECOSYSTEM IN INDIA	11.45 AM	12.00 PM

TRACK A1

Paper ID- 2

OPTIMIZING WORKSPACES IN AVIATION PROJECTS THROUGH 5S IMPLEMENTATION

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ABSTRACT

Turner strategically transformed a North India aviation project site using the 5S methodology Sort, Set in Order, Shine, Standardize, and Sustain. This initiative was crucial for optimizing processes and ensuring safety in an active project environment. Key actions included the establishment of designated zones to effectively integrate and maintain these practices. The process began with comprehensive staff training and zone-wise audits, which led to workspace reorganization for better access to tools and materials. Regular cleaning schedules and standardized procedures were implemented, enhancing productivity, safety, and morale. Turner's application of 5S not only reduced housekeeping time before work but also demonstrated a commitment to sustainability and continuous improvement. This approach set a high standard for future projects by creating safer, more efficient environments through the principles of visual management and waste reduction.

KEYWORDS
Process, Standardization, Sustainability, Safety, Visual Management and waste.

Paper ID- 4

LEAN CULTURE AND BEHAVIOUR – DELAYS IN CASTING CONCRETE

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OSHA-30, Lean Champion, Turner Project Management India Pvt Ltd, India

ABSTRACT

Concrete is intended to be poured immediately, after the mixing of cement, aggregate, water and admixtures. When concrete is mixed and ready to be used it has a limited window of time during which it remains workable. The workability of the fresh concrete greatly diminishes with time; too long of a delay may cause the concrete to be unfit for use. The key factors contributing to concrete delays before placing can happen for numerous reasons like inappropriate methods of handling concrete, workforce management issues, coordination lapses between various teams, hostile environmental conditions and break down equipment. Nowadays, in construction sites, the practice is to use ready mixed concrete where the delay time is mainly determined by the site location from the batching plant and by the traffic conditions on the road, apart from other site management issues at the site. Now this results in the huge costs to be incurred for the wastages involving time loss and delays in the Project. This demands efficient planning with site management and third-party (Ready mix concrete) vendors. By introducing Lean Processes like bottleneck analysis using the 5 WHY technique, Gemba walk at site, collaboration with concerned staff, 5S, we can analyze the waste, risks, manage time and cost variations and improves quality to deal with the delays, thereby enhancing the efficiency in concrete casting operations and awareness of Lean culture among the team.

KEYWORDS
Planning, Management, Lean Processes, Time, Cost, Waste, Lean Culture.

Paper ID- 20

SUSTAINING LEAN CONSTRUCTION IMPLEMENTATION IN ORGANISATIONS

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ABSTRACT

Lean construction processes and practices positively impact the performance and delivery of projects. While the factors inhibiting and enabling lean construction adoption are studied well, organisations must focus more on sustaining and diffusing lean practices. Previous research in this context highlighted the two predominant approaches, including the carrot and stick approach or the combination of both for adopting and sustaining lean practices. While the carrot approach is enabled largely by motivating parties by highlighting benefits through lean champions and success stories of lean implementation, the stick approach uses policies, laws, or contracts to enforce lean implementation. In the combination of approaches, carrot-stick or stick-carrot are utilized by organisations to sustain lean practices. The present study analysed the data gathered from nine industry experts involved in implementing lean practices in organisations across different projects. The analysis reveals the themes of lean practices' sustenance, complementing the carrot-or-stick approach or combining both. Lean sustenance practices include continuation of lean implementation by lean champions in further projects, top management commitment and deputing project managers as lean mentors, formulation of lean teams at the organisation and project level, organisation-wide lean implementation standards (SOPs) and guidelines, allocating a budget for lean implementation, lean implementation annual awards at the organization level, and continuing lean education and training provided at the organization level. The study also indicates the need for organisation-specific lean maturity model development. Ultimately, the study brings out challenges in lean sustenance and diffusion in organisations and ways they can overcome them.

KEYWORDS

Lean construction, lean sustenance, lean diffusion, lean practices, Indian construction

Paper ID- 69

MEETINGS THAT MATTER" - ASSESSING THE EFFECTIVENESS OF BIG ROOM TEAM MEETINGS

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ABSTRACT

The Big Room team meetings, co-locates various stakeholders to reduce delays in communication and decision-making process. Big Room approach is diligently practiced in projects where Last Planner System (LPS) is implemented. While Planned Percent Complete (PPC) measures the effectiveness of LPS, the effectiveness of communication exchanged in the Big Room is often not assessed which in turn leads to delay. Literature has informed of measures such as Big Room Effectiveness Index to assess meeting effectiveness. However, they do not account for individual and team level parameters or motivate teams to implement the tool. To this end, a study was conducted to assess the effectiveness of Team meetings during LPS discussion in the Big Room on a project for the construction of an industrial manufacturing plant. Assessment was dual-fold, which was done both by the teams (total 8 #) as a self-assessment and through a researcher as a neutral member / third party observer of the project. The parameters included 3 broad categories such as: a) Meeting structure, b) Team competencies and c) Individual commitment. Each of this category comprised of further sub-factors such as time bound meeting & adherence to project timeline in a), clarity of scope & issues resolved in b) and attendance, awareness & active participation in c). Data was collected for 7 meetings during the Big Room discussions on LPS implementation and PPC assessment of the project. Following an action-based research approach, the findings showed that the Execution Team rated the highest score in team meeting effectiveness assessment, followed by the Senior Management Team and the Design Team whereas the Procurement Teams scored the least. Quantitative analysis was supported by qualitative survey to capture the team's perception on the tool. An exit survey towards the end of the exercise highlighted member's increased awareness for the need to structure team meetings for an effective output. Further, involving team members for assessing the Big Room effectiveness was sought as a welcome change that enhanced the culture of Big Room meetings. This study demonstrated that such practices can help practitioners to bring in a positive culture in LPS implementation and enhance productivity. Further research along these lines can bring in a framework to motivate and implement a structure in meetings that matter.

KEYWORDS
Big Room Meeting, Meeting Effectiveness, Meeting Matrix, Last Planner System

Paper ID- 61

A CASE STUDY AND APPLICATION OF LEAN PRINCIPLE IN STRUCTURAL STEEL PROJECT FOR EFFICIENT PROJECT OUTCOME

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ABSTRACT

This study investigates the implementation of Lean principles in a commercial project in Bangalore (India), aiming to enhance operational efficiency, reduce waste, and improve project delivery performance. Key Lean tools such as Value Stream Mapping (VSM), 5S, Just-in-Time (JIT) delivery, and the Last Planner System (LPS) were employed to optimize the workflow for structural steel works, comprising 25% of the project's value and totaling approximately 4500 MT. The process of fabrication and erection of structural steel members involves a great deal of stakeholder management. Multiple stakeholders collaborate at different stages to form a seamless ecosystem. In the real world, having an efficient ecosystem with so many collaborators with individual goals and objectives is difficult and requires efforts to bring all the stakeholders under one roof. Effective communication and collaboration among these stakeholders are critical to overcoming challenges, optimizing workflows, and achieving project goals. Lean principles often facilitate this by promoting transparency and continuous improvement among all parties involved. This case study emphasizes the effectiveness of Lean construction principles in streamlining structural steel works, highlighting the importance of systematic waste reduction, continuous improvement, and stakeholder collaboration. It offers valuable insights and practical strategies for construction professionals looking to adopt Lean methodologies, ultimately leading to improved efficiency and favorable project outcomes.

KEYWORDS

Lean Construction, Structural Steel Erection, Efficiency Improvement, Value Stream Mapping (VSM),5S Principles, Just-in-Time (JIT) Delivery, Last Planner System

Paper ID- 26

GREEN SUPPLY CHAIN MANAGEMENT THROUGH LEAN CONSTRUCTION PRACTICES – AN INDIAN PERSPECTIVE

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ABSTRACT

Lean construction concepts prioritize optimizing project value while minimizing waste and unnecessary resources. This theory also applies to the critical domain of supply chain management. Construction projects can gain substantial enhancements in efficiency and cost management by incorporating lean technologies such as Value Stream Mapping (VSM), 5S, and Just-in-Time (JIT) delivery. By implementing VSM, 5S methodology, and JIT practices, construction projects can achieve improved transparency and management of their supply chains. The VSM methodology enables the identification of flaws and chances for improvement, whereas the 5S methodology assures an organised and efficient flow of materials. JIT delivery reduces inefficiency and improves inventory control. Construction projects can assess the efficiency of their lean supply chain processes by tracking key performance indicators (KPIs) such as lead times, inventory turnover, and rework rates. By utilising a data-driven strategy, it becomes possible to consistently enhance and pinpoint areas in which the supply chain may be further reinforced. This research aims to conduct a systematic literature evaluation and case study application to assess the efficacy of lean technologies in promoting sustainability in the construction supply chain. The results suggest that implementing lean principles such as VSM, 5S, and JIT can significantly enhance and optimize the green supply chains of construction projects. By employing these techniques, construction projects can effectively achieve sustainability, enhance project efficiency, and complete projects within the designated timeframe and budget.

KEYWORDS

Construction supply chains, Green Supply Chain Management, Lean construction practices

TRACK A2

Paper ID- 6

COMPARE AND SELECT DATA ACQUISITION DEVICE FOR COMPUTER VISION BASED CONSTRUCTION PROGRESS MONITORING

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ABSTRACT

The effective monitoring of construction progress is essential for completing projects on time and within budget. Manual Progress Monitoring (PM) methods are prone to error and include significant waste in the process. Computer Vision-based Construction Progress Monitoring (CV-CPM) has emerged as a promising solution for automating this process and minimizing the waste. Despite the potential of Computer Vision (CV)-based solutions in automating progress monitoring, selecting the most suitable data acquisition device for CV-CPM remains challenging due to diverse options and project-specific requirements. This study addresses this challenge by developing a structured decision-making framework for comparing and selecting CV-based data acquisition device based on project requirements and required level of PM. Implementation of the framework on an ongoing construction project validates its effectiveness, employing two devices: Leica BLK360 G1 and iPad Pro. This work offers stakeholders a systematic approach for selecting data acquisition devices tailored to project needs and PM levels.

KEYWORDS

Process Automation, Computer Vision, Automated Data Acquisition, Technology Selection, Progress Monitoring

Paper ID- 10

STREAMLINING RECONCILIATION PROCESS: THE IMPACT OF WEB-BASED SYSTEM ON REINFORCEMENT STEEL WASTAGE THROUGH LEAN PRINCIPLES

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ABSTRACT

In the construction industry, numerous factors influence monitoring of project, with the reconciliation process and wastage control measures being significant contributors for monitoring of lean implementation. The reconciliation of reinforcement steel wastage due to its wide usage in construction is critical due to its substantial impact on project costs. It is essential to reconcile and implement corrective measures promptly when wastage exceeds established corporate norms. To facilitate effective reconciliation of reinforcement steel within the organization, an internal web-based reconciliation system has been developed and implemented. This system extracts data directly from the SAP system with minimal human inputs to avoid any manipulations and rework. This system calculates wastage quantity, its percentage, and the corresponding cost impact automatically. This system enables concerned departments to closely monitor reconciliation at each project. Whenever wastage percentages surpass the set corporate norms, the system aids in identifying the issues. Accordingly, the root causes to mitigate the issues can be appropriately taken for implementation. The web-based system resulted in time savings of 50% for reconciliation preparation at project with minimum resources and analysing the reconciliation and addressing root causes by concerned department effectively.

KEYWORDS

Lean, reconciliation, reinforcement steel, corporate norms, web-based system, SAP system, root cause.

Paper ID- 34

TO UNDERSTAND THE ROLE OF CHANGE AGENTS IN PROMOTING BIM ADOPTION

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ABSTRACT

The construction industry is plagued with many problems, and digital technologies such as Building Information Modelling (BIM) have been found to be helpful in aiding the management system in solving some of the problems. Studies have identified benefits of BIM, such as enhancing coordination and reducing rework, which aligns perfectly with lean thinking. Several researchers have also investigated the impact of lean practices in enabling BIM adoption. However, studies on how organizational actors induce change endogenously in construction firms due to digital technologies have been explored less. To address this gap, we try to work on understanding the various strategies incorporated by the different actors involved in the BIM adoption journey. We employ a qualitative case study approach considering two construction contracting firms. Through in-depth, open-ended interviews with the personnel involved in BIM implementation, we unravel the journey and understand the strategies they used to bring about the change. It is understood from the study that the change is not brought about by a single entity but by a collective of actors. It can also be noted that actors from different levels of the hierarchy were influential in bringing about the change, not just actors from the top management. This study suggests that practitioners attempt a bottom-up approach with more involvement of players at different hierarchical levels than only coercing or regulating the workforce to adopt new practices to bring about a transformation due to the use of BIM.

KEYWORDS
BIM, digital transformation, change agents, qualitative case study, bottom-up approach

Paper ID- 56

INTEGRATING AUGMENTED AND VIRTUAL REALITY FOR SUSTAINABLE LEAN CONSTRUCTION PRACTICES

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ABSTRACT

The construction industry faces increasing demands to improve efficiency reduce waste and achieve sustainability, lean construction which emphasises values maximisation and waste minimisation, combined with sustainable practises offers a Sturdy framework for addressing these challenges. Augmented reality and virtual reality technologies provide innovative solutions to further enhance these goals. This research investigates the application of a AR VR technologies to support sustainable lean construction practises focusing on their potential to improve resource efficiency, reduce environment impact, and enhance project delivery. This research systematically exposes the integration of AR-VR in key lean construction methods such as value stream mapping(VSM), Last planner system (LPS) and just-intime (JIT) delivery, with a particular emphasis on sustainability. Using a series of case studies the research demonstrates how AR can be used to visualise energy efficient designs optimise material usage, and provide real-time data for sustainable decisionmaking similarly, VR is leveraged for immersive training sessions that promote sustainable building techniques and safety protocols, reducing resource consumption and enhancing workers.The integration of AR-VR significantly contributes in reducing the carbon footprint of the construction projects by optimising material logistics and minimising rework. AR can be used on a side guidance which ensures position in material placement and reduces waste while VR based simulations enhance stakeholder collaboration and support the adoption of green building practices. Challenges such as technological adoption high initial cost and the need for specialised training are also addressed by overcoming these barriers this research provides insights into the potential of AR-VR to drive sustainable lean construction practises presenting a pathway for the industry to achieve greater efficiency cost effectiveness and environmental responsibility.

KEYWORDS

Lean construction, AR, VR, Waste, Sustainability

Paper ID- 59

REAL-TIME OBJECT DETECTION USING ANDROID

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ABSTRACT

Object detection and recognition are vital tasks in numerous computer vision applications. This paper presents the development of an Android application using Eclipse IDE. The application is designed to identify and describe objects in images captured by a camera, based on their color, shape, and unique characteristics. The image is processed using the HSV color space to enhance color detection. Circular shapes are identified with the Circular
Hough Transform, while other shapes are detected using additional methods tailored to the HSV color space for improved accuracy. In the developed Android application, local features are utilized to match an object in one image with another scene image. The methodology of the proposed detection algorithms is detailed, and the application's interface is demonstrated based on test results. The application is capable of identifying eleven different colors and recognizing two-dimensional geometric shapes, including circles, squares, triangles, and rectangles. It can accurately match distinct features between object and scene images under various conditions.

Keywords
TensorFlow Lite, Machine learning, Computer vision, Object recognition, Android, smartphone, eclipse IDE, android studio

Paper ID- 33

INSTALLATION OF A 3D PRINTED OFFICE BY IMPLEMENTING LEAN PRINCIPLES

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ABSTRACT

Construction 3D printing technology in combination with good planning tools can revolutionize building practices, offering rapid, cost-effective solutions in areas with significant housing needs, and promoting eco-friendly commercial establishments. This paper talks about how lean philosophy was deployed and a 48 sqm. 3D printed office 'Cocoon' at Khalapur, Maharashtra was installed and fully functional in under 40 hours. Effective team collaboration integrated with project planning tools like Building Information Modelling (BIM) and Lean Construction methods enabled the construction of Cocoon in an impressive time frame. BIM modelling played a significant role in the sequencing. Big room meetings with vendors along with factory visits to streamline the process, on the day of the installation, GEMBA/ Toolbox meeting with all stakeholders, labours etc. was done and the plan was explained in detail. Roles and responsibilities were clearly shared with them before commencing the installations. Application of Lean Design principles in the engineering phase, helped the project to be designed to promote efficiency in operations and construction. Contractors applied design-to-value principles to reduce total costs. Efficiency was also increased through the standardization and modularization of parts and segments. Prefabrication and offsite production were used to shorten the project completion time, reduce costs, and improve safety.

KEYWORDS

Lean Methodology, Big Room Meetings, BIM Modelling, Lean Tools, Micro Scheduling

TRACK A3

Paper ID- 27

IMPROVING DIAPHRAGM WALL CONSTRUCTION USING VALUE STREAM MAPPING: A CASE STUDY OF JAIPUR UG METRO PROJECT

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ABSTRACT

Developing a lean culture and fostering continuous improvement necessitates the early adoption of lean tools in a project's lifecycle. This study, conducted at the Jaipur Underground Metro Project in its initial phase, aims to enhance the diaphragm wall (Dwall) process and identify associated waste using the lean tool Value Stream Mapping (VSM). The project encompasses 132 D-walls, with nine constructed till date. Employing lean tools facilitates better planning and execution of processes. To achieve this, actual construction data from five consecutive diaphragm walls were collected and analyzed. The data analysis revealed two major types of lean waste: 'non-utilized talent' and 'waiting,' which contributed to increased lead time. The activity ratio in the Current State VSM showed an improvement of approximately 14% in the Future State VSM, indicating a significant enhancement in the D-wall process.

KEYWORDS

Lean tools, Value Stream Mapping (VSM), Diaphragm Wall (D-wall), Waste, Lead time, Activity Ratio.

Paper ID- 41

IMPROVEMENTS IN VERTICAL TRANSPORTATION: PRE-ENGINEERED BUILDING WORKS: ENHANCING EFFICIENCY WITH INNOVATIVE METHODS

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ABSTRACT

This paper explains the innovative approach adopted to expedite the construction process at the site, from conceptualization to implementation organization carrying out manufacturing operations in its Industrial sheds in Maharashtra, spanning 82 acres of land. The project involves the construction of over 13,000 Metric Ton of Pre-Engineered Building structures, which will form the foundation of a massive 70,000 Square Meter, factory footprint and 13.2 lakh Sq. ft. of area. Being a Heavy Engineering Project, with Erection height up to 29 m, there were significant challenges in Safety, Quality, Constructability as well as adherence to Committed Timelines. Big room meetings and daily visit rounds facilitated effective communication and process streamlining. A GEMBA/Toolbox meeting aligned all stakeholders, ensuring everyone was informed and engaged. Deployment of Lean Design principles in the engineering phase promoted efficiency in operations and construction. This project demonstrates the power of innovative construction practices, offering rapid, cost-effective solutions while improving quality. By adopting Lean Principles and collaborative approaches, the industry can revolutionize building practices, ensuring efficient, safe, and sustainable solutions.

KEYWORDS

Stakeholder Commitments, Design, Engineering, Planning, Lean Culture, Respect, Safety

Paper ID- 38

IDENTIFICATION OF WASTE AND IMPROVEMENT OF PRODUCTIVITY USING VALUE STREAM MAPPING FOR UNDERGROUND METRO PROJECT- A CASE STUDY

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ABSTRACT

Large-scale projects often face challenges in finishing on schedule and within budget. Lean tools help identify and reduce waste, decrease lead-time, and eliminate non-value-added activities. This leads to improved productivity and timely project completion. This paper aims to identify the waste and improve productivity through case studies of the underground metro project. Lean tools such as value stream mapping (VSM) and 5S were used. Activity observed was the Ring Building Process using a Tunnel Boring Machine in an Underground Metro Project. Process Flow of the activity was studied, and the Current state map was plotted. The critical activity was identified, and the cause of delay was identified using root cause analysis. Waste such as Transport, Waiting, Over Processing, Unutilized Talent Identified. Based on lean principle future state Map was Plotted. 35% Saving in Time was Suggested. Improvement Suggested and Future State Map was suggested.

KEYWORDS
Lean Construction, Value Stream Mapping, Current State Map, Lean Tools, 5S.

Paper ID- 29

IMPROVING PRODUCTIVITY THROUGH GEMBA WALK AND 5S – CASE OF PREFABRICATION AND CAST-IN-SITU ENVIRONMENTS

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ABSTRACT

This paper explores the application of Lean tools including Gemba walk and 5S methodology to enhance construction productivity by reducing the time consumption of non-value adding activities. This paper implemented Lean practices at two sites: a school construction project and a precast concrete manufacturing plant. To understand and identify the activities and their time consumption, work-sampling method was used, where two observations were made every day 30 minutes each, for a period of one month. These observations helped to identify the non-value adding activities. Based on data analysis, areas for improvement and development were identified. To achieve waste reduction, profit increment and quality improvement, Lean tools such as Gemba walk and 5S methodology were used. In the precast concrete manufacturing plant, a profit increment of Rs.34,000 and in the school building project, a profit increment of Rs.9,300 were observed.

KEYWORDS
Productivity; Gemba walk; 5S; Prefabrication; Cast-in-situ.

Paper ID- 42

IMPLEMENTATION OF LEAN TOOLS IN KHALAPUR NORTH CAMPUS PROJECT

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ABSTRACT

Lean implementation at construction projects helps all stakeholders such as customers, management, vendors, suppliers and most importantly the project teams made up of engineers, safety officers, supervisors, and workmen who toil relentlessly with the single-minded goal of getting the project completed as per customer committed timelines, zero safety, quality and statutory non-compliances. This paper talks about building a Lean culture among project teams to make them more resilient by use of Lean principles such as partnering, collaboration to overcome various challenges faced by project teams such as labour shortage, rework, productivity losses, delayed decisions etc. The Khalapur North project being a massive undertaking, A green field Project involving the construction of two Plant Factory buildings, ancillary structures, and infrastructure development. The project's scope being so vast and streamlining it to ensure timely completion was a significant challenge. The project aimed to relocate two major units, Godrej Aerospace and Godrej PES divisions, from Vikhroli campus to Khalapur by 2025 with more than 13.2 Lakh Sq.ft of Area of Construction with 68 Nos of Cranage Provision, overall weight of PEB more than 16,500 Metric Ton with a focus on quality, safety, and timely completion. To address the challenges, the project team implemented Lean concepts, including: Last Planner, Value Stream Mapping (VSM), Push vs Pull methods, Work Sampling etc. By implementing these Lean tools, the project team achieved remarkable results till date: Completed the KN1 plinth work & Sub structure on time, a significant milestone in the project & Achieved 13500 MT of KN1 & KN2 PEB erection before deadlines, demonstrating the project's pace and efficiency. The Khalapur North project demonstrates the effectiveness of Lean implementation in managing complex projects. By adopting Lean concepts and tools, the project achieved timely completion, quality, safety, and efficiency. This case study showcases the potential of Lean principles in optimizing resource allocation, reducing waste, and enhancing collaboration in construction projects.

KEYWORDS

Lean implementation, Stakeholder Commitments, Engineering, Collaborative Planning, Meetings, Last Planner, Value stream mapping

Paper ID- 76

ENHANCING 5S IMPLEMENTATION AT A CONSTRUCTION SITE THROUGH THE RACI MATRIX: A CASE STUDY

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ABSTRACT

Implementing and sustaining the 5S methodology in construction presents unique challenges, particularly on dynamic and cluttered sites common in major infrastructure projects. This paper examines a redevelopment project in Bhubaneswar, India, where disorganization and a lack of accountability obstructed effective 5S practices. To explore these challenges, open-ended interviews were conducted with key site personnel, including execution engineers, supervisors, and labourers. The interviews revealed common responses such as, “I wasn’t aware of this,” “I wasn’t told to do this,” and “This is not my job,” reflecting a culture of non-accountability and blame. In response, the authors developed a 5S framework integrating a RACI matrix to define roles and responsibilities clearly. The framework's implementation, comprising six stages, led to significant improvements in site organization. Post-implementation, 5S audit scores increased from 11.3% to 55.1% in one area and 16.42% to 56.9% in another, demonstrating the approach's effectiveness. These findings underscore the potential of 5S to foster a Lean culture in construction. Future research should assess the long-term benefits of continuous 5S training for site personnel.

KEYWORDS

Lean Construction, 5S, Lean Culture, Continuous Improvement, RACI matrix, Indian Construction, Infrastructure.

TRACK B1

Paper ID- 39

PROPOSED FRAMEWORK FOR INTEGRATION OF LPS AND LBMS IN THE CONSTRUCTION PROJECTS

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ABSTRACT

Combination of the Last Planner System (LPS) and Location-Based Management System (LBMS) has been studied and proven to be effective as project management tools. While LBMS takes care of master scheduling and planning of milestone, LPS provides clarity on disintegrating the milestones into small achievable units and takes an approach to achieve them over a defined interval. To integrate both the tools the workflow from master scheduling, phase scheduling, look ahead planning and weekly planning needs to be defined and there should be a monitoring framework available which encompasses both the planning and execution team's input. The framework also must be able to capture various inputs from relevant stakeholders along the process of planning to execution of activities finally providing a clear picture on actionable points. The goal of this research is to propose a comprehensive chain of templates making the workflow easy to comprehend and achieve more effective project monitoring.

KEYWORDS

Last planner system (LPS), Location-based management system (LBMS), Integration of LPS-LBMS, Bottleneck Identification, 5-WHY Analysis, Fishbone Diagram

Paper ID- 43

INTEGRATING LEAN CONSTRUCTION AND SUSTAINABILITY: OVERCOMING CHALLENGES OF GREEN MILESTONES FOR PREFABRICATION

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ABSTRACT

Examining the Integration of Lean Construction and Sustainability in Prefabrication: The Notable Challenges and Practical Solutions. Industry professionals were highly aware of LC and sustainability principles, however, due to workforce gaps with respect to skills, managerial inefficiencies, unpreparedness toward changing norms, and supply chain disruptions, the practical implementation remained hindered. This research used SPSS for a quantitative survey. In this context, relevant data was collected from 17 purposively selected participants, in addition to an expanded sample of 150 respondents with relevant industry experience.

The findings put forth particular prefabrication challenges in terms of logistical complications, unsynchronized workflows, and inefficiencies in supply chains. The study claims instant practical solutions like specific targeted training programs, agile project management, real-time tracking systems, and predictive analytics to make processes more streamlined. Advanced planning tools such as digital twins should take up the risks, thereby enhancing performance.

This research fills the particular lacuna of literature with data-driven views on incorporating LC sustainability into prefabrication. Thus, it gives defined steps to the actual practitioners and policymakers to use for fine-tuning lean and sustainable practices in order to optimize both the efficiency of projects and outcomes of the environment. Conclusion This work concludes that the adoption of these strategies will advance the construction industry toward meeting sustainable development goals while overcoming inherent barriers in prefabrication.

KEYWORDS

Lean Construction (LC), Sustainability, Environmental-friendly, Prefabrication, Supply Chain Managers

Paper ID- 48

5S – INTRODUCING SCORE BASED MONITORING APPROACH

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ABSTRACT

It is observed in the construction industry, though the initial implementation of certain lean principles are somewhat easy but the same fails to sustain unless monitored systematically and modified according to changing work requirements. 5S as a lean tool has been adopted in several projects in SP E&C but as the tool itself suggests, it requires periodic reviews to remain meaningful and effective over time. In a broader sense the mechanism also may help an organization to develop a culture to promote and exercise 5S principles across its span of operation. This study aims at defining a location-based project audit approach, developing guidelines including existing checkpoints and applicable location specific norms, an audit mechanism to review and validate the implementation of 5S principles. The goal is to arrive at a standardized scoring system for construction projects of various types and sizes. By deploying the dedicated scoring system, we enforce the 5S measures creating healthy competition among projects across the organization, and by increasing sustainability of the 5S implementation at the projects making all the aspects tangible. The research is done by developing audit guidelines, checklists and conducting a Gemba walk which includes site observations, in-person interviews of the personnel, recording the observations and improvement plans. These activities provided a comprehensive understanding of the site's adherence to the 5S principles and paved the way for a sustainable approach to nurture the practices and continual improvement.

KEYWORDS

5S Principles, Lean 5S Techniques, 5S Audit Framework, 5S Scoring Mechanism, Sustaining 5S, Gemba, Kaizen

Paper ID- 49

CURRENT CHALLENGES IN SCM INCONSTRUCTION AND MITIGATING ITS RISK BY ADOPTING LEAN PRINCIPLES

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ABSTRACT

The Indian construction industry is one of the largest in the world, driven by urbanization, industrialization, and infrastructure development. The sector is expected to grow at a compound annual growth rate (CAGR) of around 6-7% in the coming years. The construction supply chain in India faces several challenges that impact the efficiency, cost, and timely completion of projects. In any EPC project, procurement is the most important function, and it contributes heavily to both the top and bottom lines. Contributing more than 70% of the company's sales through SCM. This manuscript will focus on the challenges that are being faced during the Global sourcing of materials and services for Indian EPC projects and similar challenges faced during Local sourcing and propose risk mitigation measures by adopting Lean principles such as Identifying and eliminating wasteful activities that do not contribute to the final product/service, such as excessive inventory or unnecessary transportation. Reducing Inventory levels, streamlining procurement to ensure timely delivery, reducing lead times and improving responsiveness to project needs. The conceptual framework focused on this study aims to influence the use of Lean principles like Value stream mapping (Identifying value-adding activities and eliminating non-value-adding activities, JIT (Just in time delivery), Pull based production unlike forecast based as in Manufacturing, achieving real-time adjustments to project scheduling. This framework shall also help to maintain clear and open communication channels and ensure timely information flow, quick resolution of issues for achieving better supply chain effectiveness.

KEYWORDS
Construction Projects, Lean construction, Supply chain, Procurement.

Paper ID- 37

SAILING THROUGH CONSTRAINTS: A CASE STUDY OF WITHSTANDING PERIODIC INCONSISTENCY

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ABSTRACT

In the construction sector the principal contractor organizations play a crucial role in completion of projects. However, there are scenarios where contractors face challenges when unavoidable constraints arise from the customer's side. There are possibilities of negotiation, deliberations or contractual termination of the project which may ease out the situation for the contractor. But considering the brand reputation and other important factors such as receiving multiple orders or other ongoing projects with the same customer make the situation tricky. In such cases the only option the contractor is left with is to continue the project without incurring losses or minimizing the financial impacts as much as possible by optimizing resource deployment and regulating the construction speed. Thus, a balance between input cost by contractor and revenue from the project get to an equilibrium yielding desired output from the project. Here the customer's interests must be taken into consideration through having required course of engagements and an amicable construction programme must be worked out by the contractor safeguarding its own financial aspects and brand reputation. This study aims to analyse a project where inconsistent payment and release of GFC drawings by clients posed a significant challenge to SP E&C as the contractor. The challenge was mitigated by adopting various approaches e.g. regulating resource mobilizations, work balancing, effective supply chain management and value stream mapping. The progress was regulated matching with revenue projection, thus working out an amicable progress plan both for the customer and SP E&C.

KEYWORDS
Delay Analysis, Risk Register, Lean construction, Supply Chain Management, Value Stream Mapping

TRACK B2

Paper ID- 70

TRAINING MODULE FOR IMPLEMENTATION OF LEAN CONSTRUCTION IN INDIAN SMALL-SCALE REAL ESTATE COMPANIES

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ABSTRACT

Due to the success of the lean production system in manufacturing, the construction industry has adopted lean techniques to eliminate waste and increase profit. The main goal of this paper is to suggest a training module for the labourers working at the site based on the activities that are either ongoing or about to be executed in the upcoming days. A field study was conducted to evaluate the effectiveness of some lean construction techniques including Work Standardization, increased visualization, daily huddle meetings, Lean Accounting, the 5s process, and In-Station quality control. The data collection methods included direct observations, interviews, questionnaires, and documentary analysis. Most of the lean construction tools selected for the project are either ready to use or are recommended with some modifications. A summary of the results is provided, and future research needs are outlined.

KEYWORDS

Lean construction, Implementation, Training Methodology.

Paper ID- 71

INTEGRATED LEAN AND BIM PROCESSES FOR HIGH RISE CONSTRUCTION

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ABSTRACT

Phoenix P-25 Triton is a high-rise, fast-track project where optimizing time and efficiency is paramount. Initially, the project relied on conventional communication and approval methods for submittals involving clients, consultants, contractors, and subcontractors. This traditional approach led to significant inefficiencies, including increased cycle times due to frequent miscommunication, and rework caused by unclear directives between the general contractor and stakeholders. To address these inefficiencies, we implemented a solution by integrating Building Information Modelling (BIM) into the project's site operations through digital workflows. At the P-25 site, BIM integration employs a Common Data Environment (CDE) via the Autodesk Construction Cloud platform, ensuring a single source of truth for all stakeholders. This digital strategy has streamlined communication, reduced errors, and significantly minimized the potential for rework, aligning with lean principles of reducing waste and enhancing value. BIM has also been leveraged for site progress monitoring, augmented reality (AR) visualization of complex areas, preparation of site Logistics simulation for project planning, and safety management, particularly in fall protection systems critical to this high-rise environment. This innovative approach to data flow, distinct from traditional methods, has yielded substantial quantitative and qualitative benefits. By adopting BIM-based process, the project has achieved a remarkable reduction in time consumption by 70-80% compared to original workflows and has substantially decreased potential rework costs. This transformation not only eliminates waste and optimizes time management but also provides actionable insights for decision-making, ensuring deadlines are met and budget constraints are adhered to, embodying the core principles of lean construction.

KEYWORDS

Building Information Modelling (BIM), Common Data Environment (CDE), Site Logistics Simulation, BIM for Safety, Last Planner System (LSP), Value Stream Mapping (VSM), Lean Construction.

Paper ID- 72

COMPUTATIONAL FLUID DYNAMICS ANALYSIS OF CERAMIC-COATED ROOF SHEETS FOR SUSTAINABLE CONSTRUCTION

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ABSTRACT

The construction industry significantly contributes to global carbon dioxide (CO2) emissions, primarily due to the extensive use of materials like cement. To address this environmental challenge, this study proposes the adoption of ceramic-coated metal roof sheets as a sustainable alternative for both residential and commercial applications. Using CATIA software, the roof metal sheet was meticulously designed and subjected to comprehensive analysis using ANSYS software, comparing uncoated steel sheets with those coated with alumina, titania, and zirconia ceramics. The ceramic coatings aim to enhance corrosion resistance, increase thermal barrier properties, and prolong the life of steel structures, thereby reducing the need for frequent maintenance and replacement. Substituting these traditional construction materials like concrete with ceramic-coated metal roof sheets, significant reductions in CO2 emissions can be achieved, as cement production is a major source of environmental pollution. Numerical investigations conducted using ANSYS software revealed that the zirconia-coated metal sheet exhibited superior thermal barrier properties compared to other materials. This finding underscores the potential of ceramic-coated roof sheets to mitigate environmental impact while offering enhanced durability and energy efficiency performance. This study advocates for the widespread adoption of ceramic-coated metal roof sheets as a sustainable solution to reduce CO2 emissions in construction activities leveraging advanced coatings and innovative design techniques, can usher in a new era of environmentally conscious building practices that prioritize sustainability without compromising on performance or safety. Ceramic-coated roof sheets provide a practical option that decreases the need for cement and other environmentally detrimental products, thus reducing CO2 emissions and promoting a more sustainable construction industry. This study examines the design, analysis, and performance evaluation of metal roof sheets coated with ceramic.

KEYWORDS

Ceramic-Coated Sheets, Sustainable Construction, CO2 Emissions Reduction, ANSYS, Numerical Analysis

Paper ID- 94

EXPLORING MACRO BIM ADOPTION USING ACTIVITY THEORY: PROSPECTIVE LEAN PRINCIPLES

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ABSTRACT

The Construction industry plays a major role in economic growth but due to the fragmented nature of the sector, there exist numerous complexities and coordination challenges. Hence, it is required to have strategic planning and management to drive higher productivity of the sector. Building Information Modelling (BIM) is an innovative development which uses the digital model to improve the construction and life cycle management of any asset. Despite growing innovation, macro level BIM adoption strategies vary across different countries. Hence, a structured approach must be established for analyzing this. The current study explores the macro-BIM adoption in different contexts using the lens of activity theory, further the prospective lean principles focusing on identifying value stream, elimination of waste and continuous improvement. The study involves an interpretive comparative analysis of macro level BIM adoption in the context of two leading BIM adopters. The study's implications suggest that activity theory offers a structured approach for analyzing macro level BIM adoption across varying contexts in conjunction with prospective lean principles.

KEYWORDS
BIM, Activity Theory, Lean Principles, Value Stream, Continuous Improvement

Paper ID- 97

DATA-DRIVEN DIGITAL MODELS FOR PLANNING AND DEVELOPMENT OF LEAN AND RESILIENT RURAL INFRASTRUCTURE

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ABSTRACT

With over 40% global population still living in rural conditions, the role of rural infrastructure in supporting the growth and development of this community is an important consideration. While the general topic of urban infrastructure is well published, there are limited publications on rural infrastructure due to a lack of interest and actions especially among the rural enterprises. In the advent of climate change and global warming and also rapid urbanisation trend among rural communities globally, rural infrastructure is certainly a topic of interest among researchers and policymakers especially in developing countries where a vast majority of the rural communities are confined. Rural infrastructure faces some unique challenges including limited resources, geographic isolation, and vulnerability to environmental and socio-economic disruptions. To address these issues, the integration of data-driven digital models has emerged as a transformative approach to planning and developing lean and resilient rural infrastructure. Lean principles focus on optimising resources, minimising waste, and ensuring cost-effectiveness, while resilience emphasises the capacity of infrastructure systems to withstand and adapt to external shocks, such as natural disasters or economic shifts. This paper explores the role of advanced digital models especially data-driven and context-specific bottom-up planning in revolutionising rural infrastructure planning. In this research, the significance of lean construction supported by data-driven planning is demonstrated for supporting resilient planning and the development of rural communities under the auspices of Smart Villages. Based on a case study conducted across 37 villages in the river island Majuli in Assam located in the northeastern part of India, the research highlights the functionalities and efficacies of a Smart Data Platform used for evaluating real-time data analytics and supporting context specific planning and development of a large area comprising 2500 plus households.

KEYWORDS

Data-driven planning, lean construction, resilient development, smart villages

TRACK B3

Paper ID- 45

IDENTIFICATION OF HOUSING FACTORS AFFECTING WORKER'S WELL-BEING ON CONSTRUCTION SITES

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ABSTRACT

Construction worker housing (CWH) plays a crucial role in the construction industry, providing temporary accommodation for construction workers. However, CWH often lacks adequate health, safety, and well-being for its residents. The contractors in India do not give much importance to the condition of housing they provide to their labour workforce. Therefore, the primary goal of this study is to find the factors that influence the well-being of construction workers to improve their living conditions on-site. The study employs a quantitative approach, utilizing a questionnaire survey to identify the critical factors affecting construction workers' well-being due to poor housing conditions. The findings identified the significance of managing waste disposal areas effectively, using natural ventilation, drainage management, and efficient space utilization, preventing unpleasant odours or smells, enhancing electrical infrastructure, efficient amenities, and adequately furnished facilities for improving their productivity and overall well-being. The study concludes with recommendations for construction companies to adopt these strategies along with the lean construction principle to make the site and housing environment friendly and to reduce waste, ensuring their workforce a better quality of life.

KEYWORDS
Construction Sites, Construction Worker Housing, and Passive Strategies.

Paper ID- 57

EFFORTLESS E-WASTE DISPOSAL GUIDE TO SUSTAINABLE ELECTRONICS RECYCLING

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ABSTRACT

The rapid advancement of technology has led to a significant increase in electronic waste (e-waste) generated worldwide, posing environmental and health hazards. To address this issue, an E-Waste Facility Locator has been developed as a vital tool to facilitate responsible e-waste disposal and recycling. This innovative digital platform harnesses the power of technology to connect individuals and businesses with nearby e-waste facilities, thereby promoting sustainable practices.The E-Waste Facility Locator offers an intuitive search feature, enabling users to find conveniently located facilities based on their geographical preferences. Users can access comprehensive information about each facility, including its name, address, contact details, accepted items, hours of operation, and drop-off guidelines. Additionally, the platform provides insights into the recycling processes employed at these facilities, emphasizing the environmental benefits of proper e- waste disposal.The integration of maps and directions simplifies the journey to the chosen facility, enhancing user convenience. Inclusion of user reviews and ratings allows for community driven feedback, helping others make informed decisions. Moreover, the platform educates users about the detrimental impact of e-waste on the environment and the importance of recycling through informative resources. The E- Waste Facility Locator serves as a pivotal tool in fostering a sustainable approach to managing e-waste. By connecting users withresponsible disposal options and raising awareness about the significance of recycling, this platform contributes to minimizing the adverse effects of e- waste on our planet. It empowers individuals and organizationsto take concrete steps towards a cleaner, greener future.

KEYWORDS

E-waste, Recycling, Environmental Impact, E-Waste Facility Locator, Responsible Disposal, Environmental Benefits, Technology, User Convenience, Awarenesss, Recycling Processes, Green Future.

Paper ID- 55

ENHANCING QUALITY IN PROJECTS WITH LEAN CONSTRUCTION- SYSTEMATIC REVIEW

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ABSTRACT

Quality is an important factor in construction projects since it directly affects the longevity, safety, and performance of the completed project. Nonetheless, sustaining high-quality standards in construction is faced with numerous challenges. Studies have reported that the costs of poor quality in construction amount to $1 Trillion globally and the rework in projects can account for 5% to 12% of the total project costs. The present study intends to highlight the contribution of lean construction towards improving the quality of projects. Through a systematic review of the studies from the Scopus database, the present study intends to summarize the various means and methods through which Lean Construction has helped projects all over the world in improving the quality of projects. The study shall significantly contribute towards the awareness, and adoption of lean construction practices, reduce the rework and contribute to sustainability.

KEYWORDS
Lean construction, Quality, Variability, Waste, Sustainability.

Paper ID- 67

THE INTEGRATION OF LEAN AND RESILIENT INFRASTRUCTURE PARADIGMS: A SYSTEMATIC REVIEW IDENTIFYING PRESENT AND FUTURE RESEARCH ASPECTS

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ABSTRACT

Integration of the lean and resilience infrastructure paradigms has attracted increasing attention among scientists and practitioners. In diversified world, the need to be resilient involves increase readiness to deal with risks from both outside and inside an enterprise, while implementation of lean emphasizes on maximizing value while minimizing waste. The combination of these requirements has been the catalyst for a move towards lean–resilience infrastructures. The results of the paper trace the growth of lean–resilience research from its infancy to its present advanced state. To address any deficiency incurred in past research, a concept map is developed to provide guidance on the topic, identify gaps and inconsistencies in the literature, understand the state of development and suggest future research directions. The results are used to identify four dominant streams: application, compatibility, integration, and impact assessment in the context of the supply chain, conceptual development and operational research of various organizational and industry sectors. Further topics for investigation are recommended in the form of research questions. The proposed concept map is intended to assist researchers and practitioners to develop knowledge about the integration of lean and resilience infrastructure paradigms in new contexts and formulate more effective deployment strategies.

KEYWORDS

Lean; resilience; supply chain; conceptual development; operational research; systematic literature review

Paper ID- 95

DEVELOPING LEAN CULTURE – LEAN PRINCIPLES IN STRATEGY LIFE CYCLE MANAGEMENT

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ABSTRACT

Project Lifecycle Management and Lean Construction Methodology are usually applied in context of construction projects. The application of these principles could be extended to managing a business holistically. The benefits of collaboration and waste reduction that are desirable for any project are that much more important for a business to be successful. Horizontal Deployment of this principle was applied to the Strategy Lifecycle Management of a large organization in the Real Estate and Construction Material business. This paper seeks to demonstrate the applicability of the Lean principles to business and thereby elevate the discussion of the potential of the methodology from individual projects to overall business. A limited perspective would be to consider the utilization of a tool for benefit, however a broader perspective is that of the Lean Construction Methodology, when appropriately applied, having the ability to change organizational culture to one that is more collaborative, agile, with lesser “blame games", and thereby better prepared to address the needs and challenges of the future. Application of Lean principles in Strategy Lifecycle Management has helped the organization deliver consistently on all commitments to all stake holders which is reflected in its financial and non-financial results.

KEYWORDS
Lean Culture, Collaboration, Lean Principles, Look Ahead Planning, Failure Analysis, Strategy Lifecycle Management

Paper ID- 23

EXPLORING THE INTERPLAY BETWEEN LEAN CONSTRUCTION AND SUSTAINABILITY MATURITY IN HIGH-RISE RESIDENTIAL PROJECTS

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ABSTRACT

Real estate is one of the crucial sectors of the Indian economy. Due to rapid urbanization, there is significant demand for high-rise residential projects. Thus, the inclusion of sustainable practices during high-rise residential construction becomes a top priority for India to progress sustainably. In the current economic context, real estate companies need to adopt a competitive posture by making their processes more efficient to maximize profit. In this regard, much effort has been devoted to lean and sustainable construction initiatives. The application of these philosophies seeks to reduce waste by enhancing process efficiency.

This study aims to analyze the complementary relationship between lean and sustainable construction concepts using assessment tools that show the maturity indicator of companies involving both approaches. This includes analyzing the lean and sustainability implementation maturity levels of the firms. The present study adopts an exploratory qualitative research approach by using case studies of high-rise residential projects. The results support the similarities and complementarities between the two approaches. The study concludes that any firm or project on a sustainability enhancement journey should consider lean to boost their sustainability outcomes. On the other hand, a lean implementation should ensure that adopted practices contribute as much as possible to making processes more sustainable.

KEYWORDS

Lean construction, sustainability, Lean-sustainability maturity level, Lean-sustainability integration, Sustainable high-rise construction

TRACK C1

Paper ID- 16

RISK IDENTIFICATION AND MITIGATION METHODS IN PROCUREMENT OF SPECIALIST PACKAGES

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ABSTRACT

The construction industry's complexity involves multiple stakeholders, including subcontractors and specialized vendors. In the construction industry, specialized packages within Engineering, Procurement and Construction (EPC) contracts are managed by agencies that assume comprehensive responsibility from design to construction. Due to the specialized nature of these packages, their procurement involves significant risks. This research paper delves into the primary risks associated with the procurement of specialist packages and offers mitigation strategies to address these challenges. This research combines critical literature reviews, case study data collection, and cross-case analysis to uncover inherent risks and their mitigations. By analysing three detailed case studies, seven core risks are identified: financial, social, resource, natural, technical, managerial, and institutional. The study proposes two phases for risk mitigation: Contract Phase as Preventive Techniques, used before project initiation to manage anticipated risks, and Execution phase as Remedial Techniques, applied during project execution upon occurrence of risks. Key findings highlight the necessity of increasing client involvement at both phases in specialized packages, making it mandatory during all project review meetings for specialized packages. From the contractor's end, it is found that traditional cost-based bidder selection may not yield results in highly specialised packages, contract-type alignment, design team involvement irrespective of the presence or absence of design scope, assessment of the specialist bidder execution strategy before selection, among other things. Specialized package procurement experts validated the results. The study concludes with limitations and suggests directions for future research, contributing to the ongoing improvement of risk management in specialized packages procurement.

KEYWORDS

Specialised Package, Subcontractor, Trade contractor, Construction, Procurement, Risk management, Risk Identification, Risk Mitigation

Paper ID- 17

ANALYSIS OF FACTORS CAUSING DELAY IN SUPPLY OF MATERIALS ON CONSTUCTION PROJECTS

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ABSTRACT

The successful delivery of the construction projects involves the collaborative efforts of several stakeholders such as the owner, client, consultants, architects and vendors. Organizationally, the role of Vendor/Supplier is not well defined in most organograms. However, vendors play a critical role in the project's success. Considering the importance of supplier's role in construction supply chain, periodic evaluation of the supply chain process is crucial to ensure project objectives are met. The primary focus of this paper is to report the analysis and findings related to factors causing delays in material supply to construction projects. Based on data gathered on over 10,000 purchase orders, reasons for delay in supply are analyzed and categorized into factors associated with various stakeholders. The extent of delay caused by each factor is then identified and hypothesis tests to assess the specific patterns in the delay are carried out determine if there are any specific policy issues that need to be implemented to improve the efficiency of the process.

KEYWORDS

Vendor, Performance Evaluation, Supply chain, Rating, Delay, Construction, hypothesis, material

Paper ID- 18

ENHANCING CONSTRUCTION SEQUENCING THROUGH CONSTRAINT-BASED OPTION GENERATION

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ABSTRACT

Construction scheduling is crucial for project timelines and resource allocation. However, traditional techniques like CPM focus solely on activity duration and interdependency, often leading to delays and cost overruns by overlooking resource and material availability. The complex nature of construction projects involves numerous independent and interdependent activities, necessitating multiple sequencing options to optimize time and cost. However, manually creating these options is resource-intensive and time-consuming. The strategies like parallel and interleaved sequencing enhance resource utilization, streamline timelines, and optimize cost management, demonstrating the efficacy of modern, flexible scheduling in construction. In traditional CPM scheduling, the objective is to create a schedule by breaking down the project into individual tasks with precedence logic and durations, repeated to form a single schedule. In contrast, the proposed framework starts by defining all relevant information, including task inputs, durations, material and labour requirements, and costs. It then automatically generates fully resource-loaded schedules and graphical representations based on assigned sequence logic. Unlike traditional approaches that focus primarily on activity duration and interdependencies, this framework considers all three constraints simultaneously, offering a more holistic view of construction scheduling. The paper first highlights the limitations of existing methods in handling multifaceted constraints. It then introduces a constraint-based approach that dynamically sequences tasks and efficiently allocates resources. By considering all constraints together, the framework aims to optimize resource management and minimize project timelines and costs. Validation of the framework involves generating multiple sequences for a spread multi-storey building. The results demonstrate significant improvements in scheduling efficiency and flexibility, showcasing the benefits of the proposed framework.

KEYWORDS

Automated Construction Scheduling, Generative Scheduling Framework, Precedence Constraints, Resource Constraints, Advanced Computational Techniques, Dynamic Project Management, Constraint-Based Scheduling

Paper ID- 19

GENDER DIVERSITY IN THE INDIAN CONSTRUCTION INDUSTRY: CURRENT STATE AND STRATEGIES FOR IMPROVEMENT

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ABSTRACT

The Indian construction industry, a vital contributor to the economy, generates significant employment but faces notable gender disparities. With women constituting only 12% of the workforce and even lower representation in white-collar roles, the industry remains predominantly male-dominated. Inclusivity and respect for people is a key concept in Lean Management. This study explores the challenges women encounter in the construction sector, including societal biases, workplace discrimination, and the demanding nature of the industry. Employing a systematic literature review and qualitative analysis of interviews with women professionals, the research identifies key barriers to gender equality and career progression. The findings highlight the critical role of organizational support, flexible work policies, and robust mentorship programs in fostering a more inclusive environment. This study underscores the need for strategic interventions to address gender-specific challenges and promote diversity in the construction industry, ultimately contributing to improved organizational performance and innovation.

KEYWORDS
Construction industry, challenges, career growth, initiatives.

TRACK C2

Paper ID- 88

ADOPTION OF LEAN AND GREEN IN PRE-STRESSED PRECAST CONCRETE ROADS IN INDIA

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ABSTRACT

Road networks are critical as they serve as the economic corridors for business and as emergency road network for military or disaster management services. India has the land area of about 3.287M.km2 with 6.33 L.km as road network which can benefit from implementation of lean and green approach for road construction. This paper aims to demonstrate the application of pre-stressed precast concrete roads through a pilot project of 52m length at Vikhroli, Mumbai. The off-site manufacturing of road panels reduces the wastage of concrete, carbon footprint of concrete mixers and green concrete used for the road. The advantage of high durability was also achieved as the tension force gets negated in the panels due to pre-stressing. The road patch was constructed in 18hrs and open to traffic in 36hrs against the conventional concrete road construction method that requires minimum 14 days of curing and takes about 30days to open to heavy traffic. However, due to lack of PwD specifications and Indian standard for precast road construction the application faces a constraint. The performance evaluation and the use of recycled products in the road panels for durable, sustainable and lean construction in India and especially in the busy cities like Mumbai.

KEYWORDS
Lean construction, Precast roads, Sustainable construction, Green construction

Paper ID- 93

4D IMPLEMENTATION IN LEAN PROJECT PLANNING AND MONTORING OF INDUSTRIAL PROJECT

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ABSTRACT

The objective of this paper is to present a methodology for how 3D/4D modeling, simulation, and visualization of project structures support lean construction planning and monitoring in the development of industrial project campuses. The paper also discusses the integration of new technologies into existing systems without disrupting their ecosystem. Furthermore, it outlines the current planning and progress update processes that serve as a foundation for 4D implementation. The paper examines how the level of detail in the schedule and 3D models is defined based on available inputs, and how microlevel detailing is developed following detailed engineering. It also explores the different stages of detailed engineering, where various stakeholders contribute, and how this collaboration enhances project vision and informs further development. Finally, the paper covers project monitoring using 4D scheduling and control methods, with a focus on Lean tools such as Big Room meetings and the Last Planner System.

KEYWORDS
Lean construction, BIM, visualization, planning, sequencing.

Paper ID- 74

APPLICATION OF VALUE STREAM MAPPING FOR ASSEMBLY LINE OF PRECAST ELEMENTS

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ABSTRACT

Precast construction technology is a cutting-edge technology used in many construction projects to eradicate the challenges of quality control and project delays. The precast elements manufacturing is done in a yard and processes are carried out cycle by cycle. The manufacturing processes face issues related to delays in time and overprocessing too. Lean principles are now being adopted in the construction industry to reduce waste and overprocess to improve productivity. Value Stream Mapping (VSM) is one of the lean tools to identify and eliminate waste. In this paper, the whole assembly line of precast production, from manufacturing in the casting yard to the erection of components at the construction site was observed to identify the different waste using VSM. A total of 40 cycles were observed for the production, dispatch, and erection of the precast elements. Intricate information like process steps, cycle times, wait times, type of wastage, and the time & reasons for overprocess in the assembly line operations were meticulously collected. The "Current State Map" was prepared to understand a comprehensive and complex blueprint of the existing operational process. The "Future State Map" was prepared to outline the operational process to achieve an overall economy in the process cycle. A fishbone diagram is portrayed to identify the critical causes of the time delay. The Precast assembly line showed significant savings in lead times and production costs as well as increases in productivity after implementing VSM. The results suggest an improvement in the "Production process" of about 6.62 percent, while 35.42 and 17.71 percent improvements in the "Dispatch process" and "Erection process" respectively.

KEYWORDS

Pre-cast Assembly line, Lean, VSM, Current State Map, Future State Map, Fishbone Diagram

Paper ID- 62

IMPLEMENTING WATER NEUTRALITY INITIATIVES IN CONSTRUCTION SITES USING LEAN TOOLS

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ABSTRACT

This paper explores the implementation of comprehensive initiatives that shall be taken up in construction sites to achieve water neutrality, aligned with lean principles. A multi-faceted strategy was adopted to enhance water efficiency and reduce consumption, with each initiative correlated to an individual lean tool. The installation of a Sewage Treatment Plant (STP) with flow meters to facilitate the reuse of treated water was guided by Value Stream Mapping (VSM), identifying and eliminating waste in water management processes. Showers and low-flow water taps with aerators in offices and workmen habitats, along with modular bathing stations, were organized using the 5S methodology, ensuring a systematic and efficient arrangement to reduce water use. Sedimentation tanks for recycling and reusing water, equipped with measurement systems, were implemented following Kaizen principles, fostering continuous improvement in water recycling methods. Borewell water usage was monitored using IoT-enabled water meters, while purchased water was measured with a weighbridge, employing Just-In-Time (JIT) principles to optimize water resource allocation precisely when needed. Behavioural interventions, such as turning off running taps when not in use, were enhanced through Poka-Yoke techniques to mistake-proof water-saving actions. The lean approach ensured these measures not only conserved water but also reduced waste and increased efficiency. This paper presents the current challenges of existing practices and methodology, and outcomes of implementing these initiatives, demonstrating their effectiveness in achieving water neutrality and promoting sustainable construction practices.

KEYWORDS

Water Neutrality, Lean Principles, Value Stream Mapping (VSM), Sewage Treatment Plant

TRACK C3

Paper ID- 96

IDENTIFYING DYNAMIC HAZARDOUS ZONES & VISUALIZING SAFETY PLANS BY INTEGRATING CONSTRUCTION SCHEDULE AND BIM MODEL

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ABSTRACT

The objective of the study is to identify the dynamic hazardous zones, develop the safety plan, and quantify the safety budget in building construction using 4D simulation for different tasks. The simulation will illustrate the safety equipment and tools required during the project construction phase. The simulation can also identify the hazards that may happen and inform safety strategies before the execution of the task with the help of a 4D BIM model. To illustrate the study's proposed methodology, excavation work is considered which is the initial work for most of the construction works. The Hazards related to excavation activity are listed out with the help of a literature study, the 3D model is developed with the help of BIM software Revit, and the construction schedule is prepared with the help of Synchro Bentley 4D simulation software. The demarcation of safety protocols will be depicted through a 4D simulation. The similar methodlogy can be developed for other activities and hazards like brickwork, laying of services, fall of materials, etc. The study would contribute to efficient planning and budget allocation for safety and also help to visualize the safety plan in construction.

KEYWORDS
Construction phases hazard, Safety Budget, BIM, 4D simulation

Paper ID- 78

ADVANCING POLICY INSTRUMENTS FOR WASTE MANAGEMENT: NEXUS OF LEAN CONSTRUCTION, CIRCULAR ECONOMY, AND WASTE MANAGEMENT PRACTICES

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ABSTRACT

The construction industry is evolving towards a comprehensive approach to waste management, addressing not just materials but also workforce, time, and equipment to enhance productivity and sustainability. This shift underscores the importance of integrating Circular Economy (CE) and Lean Construction (LC) principles to advance sustainability. This research addresses existing gaps by integrating Circular Economy (CE) and Lean Construction (LC) principles with Construction and Demolition Waste Management (CDWM). It focuses on developing comprehensive policy instruments that align these principles with CDWM best practices and policies, emphasizing circularity and resource efficiency throughout the building lifecycle. The study investigates key factors influencing productivity and waste generation, along with critical success factors and implementation mechanisms, incorporating formal and informal methods. These insights encompass the formulation of effective collaborative CDWM policies. The policy instruments are categorized into targets, laws and regulations, technical standards, economic instruments, and capacity building. The instruments are interactive and interconnected, forming an integrated approach essential for achieving sustainable CDWM and improved productivity. The policies aim to foster stakeholder engagement, optimize waste-tracking systems, and stimulate innovation through R&D partnerships. Emphasizing continuous adaptation to local conditions and stakeholder perspectives, the research underscores the importance of flexibility for successful policy implementation.

KEYWORDS

Lean construction, Circular economy, Policy instruments, Construction and Demolition Waste Management, Sustainability

Paper ID- 52
LEAN BUILDING PERMIT SYSTEM: A CATALOG-BASED PERMIT MODEL FOR PRODUCTIZATION IN THE BUILT ENVIRONMENT

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ABSTRACT

Lean principles are widely recognized for reducing waste, increasing efficiency, and improving outcomes across industries. However, the building permit process in urban construction remains inefficient, leading to delays, higher costs, and burdensome operational bottlenecks. This research aims to apply lean principles to improve the permit system, enhancing flexibility and customer satisfaction. The current building permit process locks in detailed designs early, which requires detailed design submissions at the start of the permit process, preventing modifications and changes in later stages. Finer nuances of the design become clearer as the design execution and realisation start and clients and users seek modifications in the design submitted. The early lock-in of the design reduces flexibility and constrains the variety available to the user in the built-environment products. This research proposes a framework that integrates productization, delayed differentiation, and catalogue-based design. Utilizing pre-approved architectural designs and standardized catalogues creates a library of certified built-environment products. This approach delays design differentiation, transitioning from a case-by-case review to a more modular and flexible system. Additionally, it shifts permit-related responsibilities from homeowners to manufacturers, simplifying the process for end users while ensuring regulatory compliance. The proposed framework enhances flexibility in design choices by relying on pre-certified designs, reduces manual intervention, and minimizes delays. It shifts the burden of permit compliance to manufacturers, making the process more efficient and customer friendly. By integrating lean practices through productization, catalogue design, and delayed differentiation, the framework modernizes the building permit process, fostering a more efficient, adaptable, and user-oriented System.

KEYWORDS
Lean principles, Building permit, Product Catalogue, Standardization, Design lock-in, Delayed differentiation.

Paper ID- 44

IMPROVING THE TECHNICAL SKILLS OF CONSTRUCTION WORKERS IN INDIA

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ABSTRACT

It is crucial to enhance the workforce's skills to increase productivity and quality in construction. Although India is aggressively working towards a skilling workforce, it needs more trained workers from the existing capacity. While numerous studies on construction worker skills exist, only a few focus on the institutional training necessary to enhance workforce skills. To address this gap, the study aims to analyze the existing organizational and program framework in India, highlighting the barriers that hinder efficient skill development among workers and emphasizing the urgent need for localized worker training across India. The study also seeks to assess the limitations of current training systems and suggest improvements. Moreover, it examines China's comprehensive skill development initiatives to boost employment and draws lessons that can be applied to India. Following a thorough analysis of the current institutional setup and programs, the study concludes with recommendations for promoting collaboration between central and local governments for effective policy implementation, leveraging ICT for policy monitoring, and enhancing the quality of training mechanisms.

KEYWORDS

Construction, skill development, training, and vocational education

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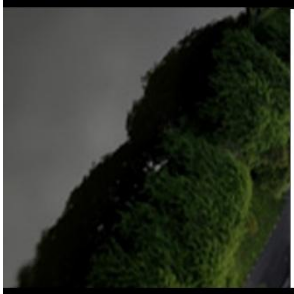

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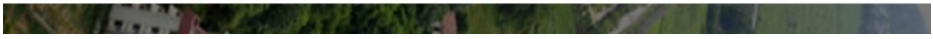

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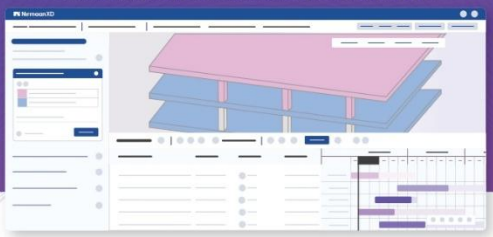

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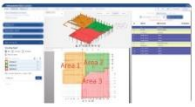

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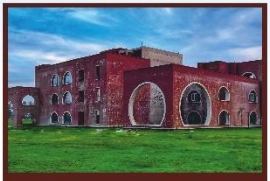

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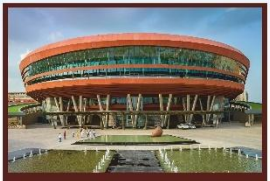

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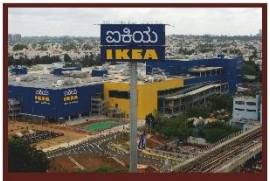

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