iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 11 **Issue:** V **Month of publication:** May 2023

DOI: https://doi.org/10.22214/ijraset.2023.53388

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 11 Issue V May 2023- Available at www.ijraset.com

Study of Lean Technique in Construction

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Abstract: ***The objective of this analysis is testing the*** *1.* ***usefulness of some lean construction tools, particularly, all those tools which may be utilized in medium size construction firms. Because of the results of the lean manufacturing process in*** *2.* ***production, the building business has taken lean techniques to eliminate waste as well as increase revenue. This analysis offers a*** *3.* ***historical past of evolution of philosophies and production*** *4.* ***practices through the building sector from the standard methods*** *5.* ***to present lean production. The variations in production concepts, the limits of theirs, plus the impacts of theirs in the building business may also be assessed. A field study is performed to assess the usefulness of some lean construction methods such as last planner, improved visualization, daily huddle meetings, first run reports, the 5s process, as well as fail protected for highly effective project management and site implementation.. The information collection techniques included direct observations, questionnaires, interviews, and documentary analysis. The usefulness of the lean construction equipment is examined from the lean implementation measurement standard & performance requirements. Results confirmed that by using lean construction reduced the amount of stages in the entire project by 57 %. The non-value extra decreased from 81 % to 14 % within the duration of the project. The entire cycle time on the project was lowered by 75 %.***
Keywords: Lean Construction, Last Planner, Implementation Framework.

I. INTRODUCTION

A. Lean Construction History

The lean building structure at first arrived on the scene immediately after the other World War as "lean "Toyota or manufacturing system" system". Japan was defeated within the fight, which triggered a loss in financial, physical and human online resources as a result leading to the superiority of American small businesses due to the car industry more than Japanese companies by a thing to consider of 10 cars in production.

B. Lean Construction Definition

Lean development supplies a coherent synthesis of the greatest means of getting rid of waste materials along with supplying considerable continuous enhancement of cost, time period, quality and safety all at once. Within truth, lean development has several definitions: "a task shipping and delivery system based on the lean production managing process, mainly produced through the Toyota Motor Company that is focused at improving importance by satisfying boosting efficiency.

C. Impact of Lean Construction

Lean building offers crucial benefits as well as its impacts are as follows: • It offers much more value on the consumer with a lot less misuse of time and resources.

1) It is going to help contractors enhance total project delivery as well as processes.
2) It gets better efficiency by enhancing preparation.
3) It helps accommodating alter.
4) It reduces price, speeds up delivery, and also raises equally quality and safety.

D. Lean Construction Principles

Lean development consists of the following 5 principles::

1) Value

The very first and much essential lean idea as provided within lean believing is worth. Focus on the worth might only be diagnosed through the supreme customer as well as merely considerable when it is conveyed in problems of a particular unit (a terrific, or perhaps an enterprise, and quite often each during once) which fulfils the customer' s needs at a particular price as well as specific period.

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2) Value Stream

The other lean approach as offered within lean believing is benefit stream, emphasize the worth stream might only be diagnosed by certain chores important to layout, purchase as well as supply a specific unit from concept to discharge, purchase to delivery, raw content in to the hands and wrists within the client.

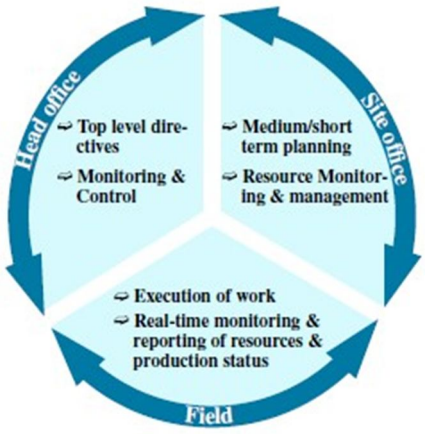

Fig. 1.1 Communication loop between locations in a project.
Source-(Oguntona O A, 2018)

3) Flow

The third concept is flow, subsequent to all the poor pursuits are eliminated, the rest of the great additional methods have to' flow'. Conceptually organizations have a tough period placing past internal departments. Genuine integration of functions and departments inside a company into merchandise teams structured over the importance stream enables and in addition promotes flow of information and materials. Hence building process consists of 2 distinct types of flows:

Material functioning which make up of the passes of material into the web site, including processing as well as assembling on-page.

Work tasks of building teams. The temporal and spatial flows of creating teams on website which are often really associated with the information processes

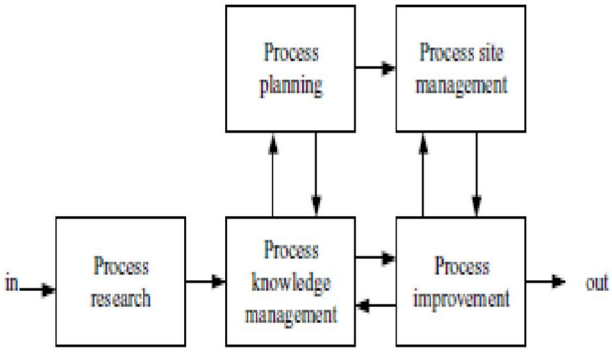

Fig 1.2: Flow chart of process management
Source-(S N Kalidindi (2009))

E. Reduction

1) Non-Value Added Activities Reduction

Lowering the share of non-value-added pursuits is an essential rule.

Lowering the share of non-value added pursuits is an essential guideline. Encounter implies that non benefit additional pursuits take over extremely processes; typically simply 03 % to 20 % of measures combine worth, as well as the share of theirs of the whole cycle period is negligible, through 0.5 to 5 %

You will find 3 primary reasons because of the existence of non-valueadded pursuits:

a) *Construction Management:* Non valuation additional tasks are been around by conventional control. Every time a task is classified directly into 2 subtasks carried out by a number of professionals, this particular outcomes within a development of non-value extra things (such as: examining, waiting around …etc).
b) *Ignorance:* Especially, it prevails within the administration of building. The quantity of non-value added activities is not assessed. This requires calling using a task manager with an extensive expertise in dealing with the use of lean tools
c) *Seven wastes during construction:* You'll find mistakes inside the spot or perhaps defects within supplies.

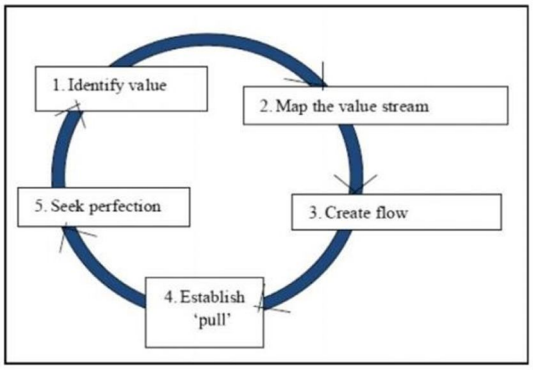

Fig 1 4. Barriers to the Implementation of Lean
Source-(Vienazindiene, M. (2014))

2) Increase output value through systematic consideration of customer

This is considered the following requirements. Since worth included is attained based upon consumer's demands without any exaggeration. Finding, for example the company businesses are clients within the consultant. The advisor engineer's office should try to make the look without any blunders, the amount of bidding offer together with the layout, the length of task is smart. Studying the proprietor is a contractor's customer, whom seeks to purchase a building, complied with specification of bidding, precious time timetable as well as fees as inside the understanding.

3) Variability Reduction

This is considered the 3rd criteria "the decreasing of variation has to be regarded as a crucial aim". As a result, essentially pressured to figure out the sources within the deviation as well as run on lessening it might be completed by standardization. It's fantastic computing the pace of standardization of work per hour or day. Therefore this may produce ideal routine for computing the % program total (PPC) as well as hunt for the energy sources of disappointment. Furthermore, PPC similarly enables you to lessen the variation.

4) Cycle Time Reduction

The cycle period is going to be enough time time needed for executing the process traverse the building flow. The cycle time period is used to compute the flow methods also it is a far more helpful when compared with cost and quality. It might be represented as follows:

Cycle period = Processing period + assessment period + wait period + shift period The brand new building viewpoint seeks to compress the cycle period, which brings about the lessening of assessment, action as well as wait period.

Together with the forced elimination of waste materials, compression of whole cycle period supplies the coming benefits: a lot quicker shipping and delivery into the customer, reduced need pulling in forecasts regarding later on needs, decreasing of interruption on the construction pastime as an outcome of replenishes orders, simpler managing since you are going to find much less client orders to maintain monitor of.

The concept of cycle period compression has different fascinating implications:

a) From point of view of command, it's crucial the cycles of correction and deviation detection be fast.
b) In design and planning, you are going to find a great deal of receptive finished pursuits that enjoy the advantages of an iterative hunt for successively of higher quality (if not optimal) strategies. The smaller the cycle period, the a lot more cycles are very economical.

c) From point of view of advancement, every amount inside an organizational hierarchy improves the cycle period of errors modification as well as issue fixing. This particular simple fact provides the brand new structure philosophy 's motivation to lessen organizational amounts, therefore empowering the people functioning directly inside the flow.

5) Simplify by minimizing the number of steps and parts

The man energy to deal with intricacy is restricted. This particular intricacy of a products enhances non benefit added pursuits. Complexity just indicates the development on the quantity of phases within the generation operation. Cutting on the volume of measures leads to a lessening of price along with a heightened reliability inside the production operation. Simplification is generally often known as, lessening of the quantity of components of an item, together with decreasing of the quantity of phases inside a components or perhaps information flow. Simplification is generally recognized, on a single hands, by getting rid of non-benefit additional things coming from the generation procedure, plus additionally however by reconfiguring great additional components or perhaps measures. Organizational modifications likewise can supply regarding simplification. Vertical and horizontal division of work generally comes approximately non worth additional activities

6) Increase output flexibility

Flexibility have to be restricted throughout the moment of building. We're competent to talk about it from measurements of the job, for example, by making use of standardization of capabilities, we're in a position to add the quantity of property to reduce enough time, despite the fact that the modification inside the physical exercise negatively impacts the venture.

7) Increase Process Transparency

Inside a theoretical feeling, transparency would suggest a sorting out of the device of information as well as additionally the hierarchical framework of purchase providing, that within the classical business principle are the exact same. The target is thus to substitute self-control for proper management as well as associated information gathering.

8) Focus Control On The Complete Process

You are going to find two factors of segmented flow control: the flow traverses different products within a hierarchical business along with crosses through an organizational border. Within equally instances, there is a risk of sub seo. You are going to find no less than two prerequisites for concentrating command on total processes. To begin with, the whole process should be measured. Next, there's to a controlling specialist for the whole phone system. Lots of alternatives are currently used.

9) Build Continuous Improvement Into The Process

The effort to be able to reduce waste as well as additionally to improve great is an internal, incremental, as well as iterative pastime which could and also additionally needs to be done constantly. There are lots of essential techniques for institutionalizing constant improvement

10) Balance Flow Improvement With Conversion Improvement

Within the development of prosperous jobs, equally passes & sales be addressed; however, the issue is exactly how these two alternatives should be healthy and balanced. For almost any generation technique nonetheless, inside a situation within what techniques are overlooked for numerous years, the chance for flow enhancement is commonly higher when compared with product sales improvement. On an additional hands, flow enhancement can be started with cheaper investments, but typically requires a significantly greater the time period when compared with a product sales enhancement.

11) Benchmark

In contrast to technical development for sales, the best flow methods are not sold to us; we have to discover the planet type jobs ourselves. Frequently benchmarking is an useful stimulus to obtain breakthrough improvement by way of major reconfiguration of procedures.

F. Tools of Lean Construction

The lean advancement aids which might be utilized on the structure tasks are:

1) Just in Time (JIT)

It is a point of view which works within the elimination of misuse wearing every one of the activities as well as routines. JIT merchandise is a model expense process inside the specified period for most effectiveness inside the project; efficiency which results to the growth of its minimizing the costs of its. It is an accounting expenses procedure inside a timely way, that operates on obtaining methods also and now take advantage of them tomorrow which additionally might be influenced by establishing period of components receipt at the minute we start utilizing it inside generation as well as establishing enough time of realization with period we sent to consumer.

2) Last Planner System

The last Planner will be the person or perhaps group accountable for purposeful preparation, that is, the structuring of merchandise design and style to facilitate improved job flow, and then paper device management, that is, the realization of certain things during the purposeful level of fitness. Within the prior planner procedure, the sequences of setup (master routine, Reverse Phase Schedules (RPS), 6 week seem to be ahead, Weekly Work Plan (WWP), % Plan Complete (PPC), restriction evaluation as well as variations evaluation). The goals of final planner are tugging activities by reverse stage scheduling through staff preparation as well as optimize resources within the long range. This product is comparable to the Kanban system as well as development levelling resources to come down with lean production.

3) Increased Visualization

The much better visualization lean gadget is all about speaking info that's crucial effectively towards the workforce via publishing various signs and labels over the construction location. Employees can readily always remember parts for instance workflow, general performance objectives, along with specific crucial tasks providing they imagine them This product is akin on the lean manufacturing program, Visual Controls, that's a regular enhancement pastime that relates to the process control

4) First Run Studies

Initially Run Studies are now being employed to redesign vital jobs, a part of frequent enhancement effort; and in addition feature productivity analysis in addition to evaluation work techniques by redesigning as well as streamlining the different jobs concerned. The experiments frequently consume videos scanned documents, photographs, or perhaps graphics to provide the process or perhaps illustrate the effort instruction. The initial operate associated with a selected craft process should be examined with info, taking ideas and suggestions to check out alternative stands to try and do the job. A PDCA cycle (strategy, do, look at, act) is suggested creating the analysis: Plan provides select hiking procedure to learn, produce individuals, assess treatment stairs, brainstorm the means to eliminate measures, determine for reliability, quality and productivity. Do means to check suggestions over the initial run. Examination is describing as well as determines what truly happens. Activity provides reconvening the staff, as well as speaking the greater method and performance as the standard format in order to meet upwards with.

5) Daily Huddle Meetings (Tool-box Meetings)

Two-way correspondence is essential of the day time huddle conference process to have the ability to achieve worker participation. With comprehension of the job and also issue fixing participation combined with a bit of instructions that is furnished by various other online resources, worker pleasure (job meaningfulness, confidence, sensation of growth) grows.

6) The 5s Process (Visual Work Place)

a) Sort

The initial level of housekeeping was made up of separating materials by tools and guide as well as putting components in the efforts places with account of reliability & crane moves

b) Standardize

The following amount provided the setting up of a material layout style and design. The framework contained considerable information of each efforts activity above the job site. The noticeable place of work really helped locate inbound information, bring down crane moves, minimizing hiking distance for the crews.

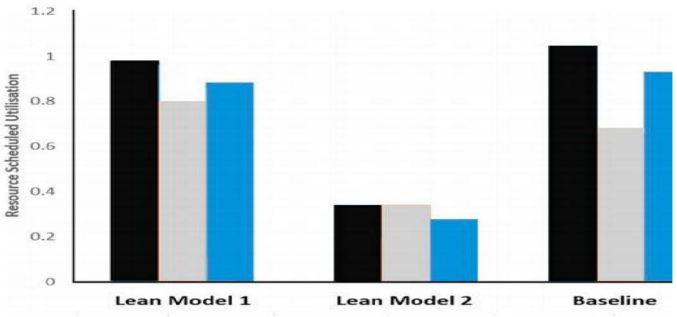

Fig. 1.5 Comparison of resource utilization rates
Source-(Pei, Z. J. (2014))

G. Scope of Project

The scope of the analysis work is usually to extent the implementation of lean building and also to examine the influencing factors of lean construction. Maturity models are a practical way to 'translate' complex concepts into organizational capabilities and to raise awareness for potential development. They provide guidance for action plans and allow organizations to monitor their progress

II. LITERATURE REVIEW

Aigbavboa and oguntona et al. (2018) (1) conducted a searching on "An Assessment of Lean Construction Practices within the Construction Industry". This particular evaluation seeks to read the use of LC methods to effectively enhance productivity and performance on the construction business. A well-structured questionnaire was administered, with construction experts as respondents. A quantitative approach to info evaluation was implemented utilizing the hostile item scores of the determined variables. Findings disclosed waste reduction, great administration of materials on site location, improved lifecycle expense, good task management, magnified protection on higher efficiency and also location as the six good issues with using LC habits. By switching to LC methods, effectiveness is enhanced as a result taking approximately useful delivery of building projects.

Saad Sarhan et al. (2018) (2) conducted a searching on "Institutional Waste inside the UK Construction Industry: An Exploratory Study". the Uk setting up industry is generally criticized to be reckless within comparability with any kind of some other industries, confrontational, as well as additionally for inadequate capability for comprehending in addition to enhancement. This specific evaluation was targeted to look at the institutional, industrial locations and procurement that involve the layout and also division of creating plans and present the consequential waste materials. A reflexive seated concept approach was implemented to look at the institutional elements influencing building procurement, and to facilitate a comprehensive understanding on the impact of prevailing building procurement plans on venture efficiency & outcomes. Information were definitely primarily gathered up through in-depth and iterative selection interviews with twenty four senior employees inside the Uk building business, such as an analysis of supporting documentations furnished by the interviewees. The end result indicate the entire construction process truly ought to be applied within an excellent plan and leadership through the initial stage onwards and therefore the institutional waste materials are lessened. K P Ramaswamy as well as Satyanarayana N Kalidindi et al. (2016) (3) conducted a searching on "Waste wearing Indian Building Construction Projects". The Indian structure sector is recognized by issues including lesser efficiency, not plenty of skilled labour, precious time frame as well as price overruns and so on. The main objective on the evaluation is looking into misuse in Indian building segment, concentrating largely on creating tasks. Six on going projects are consumed spot for the study and the wastes identified are quantified around terminology of project cost by gathering info by way of immediate observations, documents as well as utilizing tools like for instance job sampling. The last outcomes demonstrated that misuse because of non-value-added tasks by work & tools was drastically higher. David herranz limon et al. (2015) (4) examined the creating market in Norway pass at bay during a prior ten years a number of efforts inside the setup of lean methods. The techniques in which the business organizations are concentrated differ in addition to the altitude of set up as well as outcomes obtained; however with the omission of certain companies the setup is still restricted.

III. RESEARCH METHODOLOGIES

A. General

This particular analysis offers an introduction of essential Lean resources & pursuits which happen to have proven to give real benefits on the general functionality as well as division of setting up assignments.

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 11 Issue V May 2023- Available at www.ijraset.com

Each equipment is going to be developed & adequate info offered being aware of what it is, when and where to place it to make use of and also the connected advantages. A great deal of the materials within this report tend to be used in isolation to be able to simply help resolve a specific matter and even producing an enhancement. Nevertheless, the materials give biggest benefit just in case they are being utilized throughout a Lean end-to-end project distribution strategy as well as approach to improvement for constructing businesses to better the individuals of theirs, the source chains of theirs as well as improving overall performance.

Because of the literature survey observing sorts of waste materials is set on any sort of construction tight as well as the issues is solved using lean techniques belonging in this specific investigation, they are as follows:

1) Transportation: needless action in addition to management of goods
2) Inventory: terrible planning and control of listing bringing about too many stocks, shortages and others Motion: excessive or unnecessary pastime of people when carrying out delivers the results. This may be because of terrible page layout of equipment, items, grow and so on at work
3) Motion: in which materials (people as well as plant) are nonproductive awaiting information, materials, people or perhaps entry etc
4) Over-production: manufacturing a lot more than will become necessary or even in advance, that could bring waste due to outof-sequence works out
5) Over processing: executing a lot more than is essential in order to meet design and style requires resulting in in excess of period in addition to price. For example, hanging out to cultivate a high quality of quality that is above necessary, two-fold management of products, supplies etc
6) Defects: non- right very first time' quality in need of reworks, introducing extra time and cost Skills misuse: the misuse of not correctly tapping within with the understanding and also knowledge of other individuals.

B. Research Methodology

This particular evaluation supplies exploration of a building task exactly where particular lean building components are analyzed on a centre sized development organization. Every & each strategy is analyzed around terminology of the effect of its on the performance on the venture. Largely according to the outcomes within the analysis, a completely new "lean evaluation tool" is recommended to learn the outcome of lean implementations via general performance managing framework.

The analysis will evaluate and assess 6 lean building sources for prospective enhancements. They are extremely final planner, enhanced visualization, regular huddle conferences, for starters operate scientific studies, the 5s procedure, and also be unsuccessful risk-free for quality. The info compilation methods belonging in this specific evaluation include things like direct observation, interviews and questions, as well as documentary evaluation, along with these three techniques are used to each one of many materials.

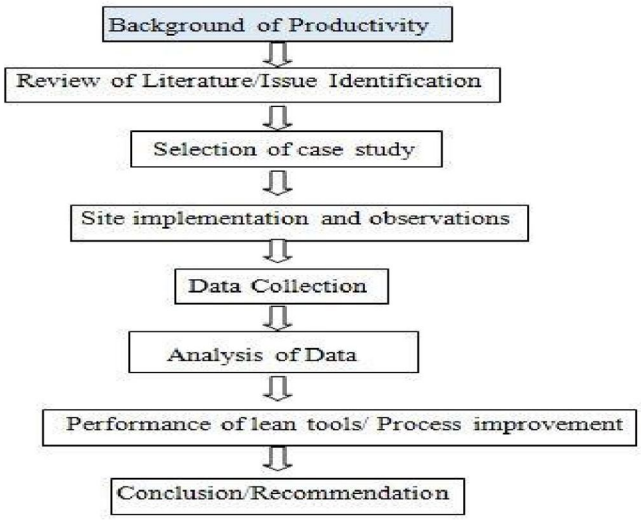

Fig. 3.1 Flow Chart Showing Research Structure
Source-(Own source)

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IV. RESULT & DISCUSSION

Following group of information will likely be utilized to evaluate as well as viewed.

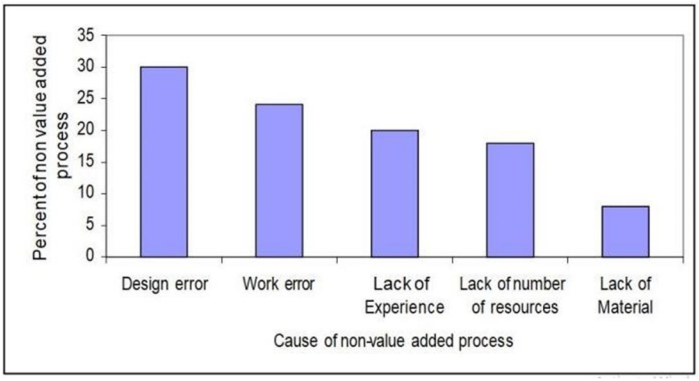


Figure 4.9 Comparing value added steps to value added time
Source: Own Calculation

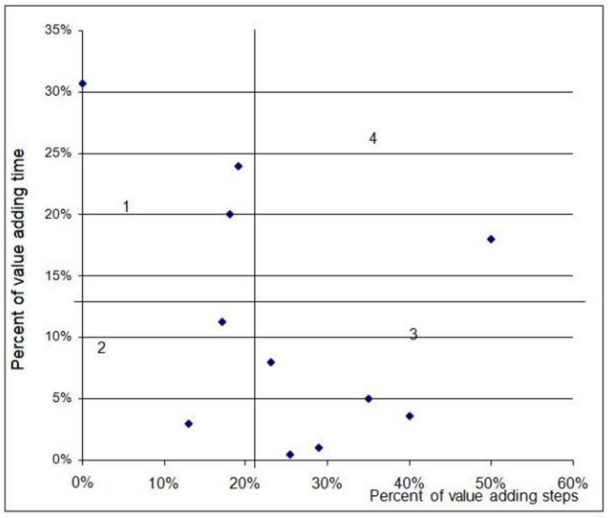


Figure 4.10 Cause of failure
Source: *Own Calculation*

V. SUMMARY AND CONCLUSIONS

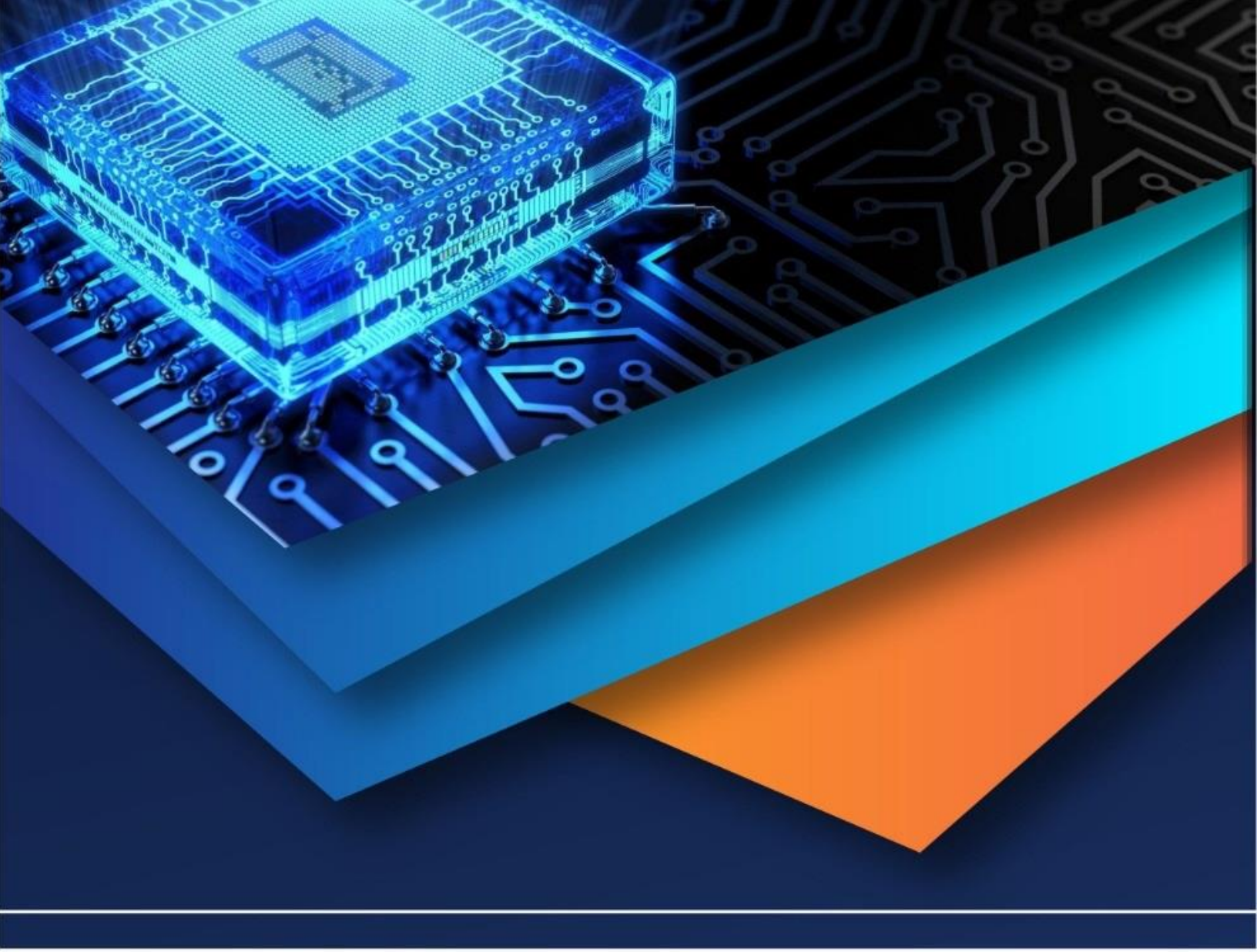
Lean construction and the implementation of lean principles has been researched, developed, and promoted in western nations for nearly three decades. Implementation of lean construction is becoming more common with many examples of integrated project delivery success. There has been significant literature published on the area, much of which has been summarized herein and through previous efforts and web-sites. While this activity is pervasive in the western world, there is limited application of lean construction in dynamic international markets, such as those in Dubai and the United Arab Emirates. Research was devised to identify barriers and causes of such barriers to implementation of lean construction principles.

1) Performed analysis, proposed and successfully implemented solutions during the realization of the "Baltic" investment in Poznan related to Lean Management methodology allows to draw the following conclusions:
2) Implementation of Lean Management was possible and was found by contract manager efficient on the analyzed construction site.
3) There exists actions and processes that are also affected by Lean Management, although it is very hard to estimate the level of influence and its cost reduction using systematic approach.
4) Applying sustainability in management of process and organizations gives equal attention to the quality of life to all stakeholders and the contribution of the process to the society and economy,

5) Lean construction techniques and principles have a potential to be used in reducing the effects of risk factors on time objective for construction projects in developing countries

REFERENCES

[1] Ogutona O A as well as Aighvbova Co (2018),an evaluation of Lean Construction Practices within the Construction Industry , International Conference on Applied Human Factors and also Ergonomics, 524? 534, Springer, Cham.
[2] Saad Sarhan (2018), Institutional Waste in the Uk Construction Industry: An Exploratory Study
[3] K P Ramaswamy as well as S N Kalidindi (2009), Waste in Indian Building Construction Projects, Proceedings of 17th Annual Conference of IGLC, three? fourteen.
[4] David Herranz Limon, A Performance Measurement Model Supporting The Implementation Of Lean Practices Within the Norwegian Construction Industry, A Thesis Of Department Of Production And Quality Engineering, Norwegian Faculty Of Science And also the Technology.



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