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Strategic Approaches of Project Managers to Enhance Cost Efficiency and Timeliness in Construction Projects

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Abstract: ***This paper explores the crucial problems of delays and cost overruns in the building industry, acknowledging that these problems are costly and can cause conflict. Four main reasons are found by looking through the literature: external factors, owner responsibility, contractor responsibility, and consultant duty. The article promotes the use of the Building Information Model (BIM) as a potent tool for effective project management in order to overcome these issues. The benefits of BIM—better estimating, collision detection, and integration, among others—are discussed, with an emphasis on how they help to lower delays and budget overruns. The article emphasizes the need of thorough project planning, control, and monitoring and suggests using modern computer technology to increase feasibility and transparency. To guarantee on-time payments and project completion, the significance of cash flow management and an expedited implementation process is emphasized. The conclusion exhorts technical departments and building companies to use contemporary technologies, offering centralized blueprints, comprehensive plans, and qualified labor for accelerated projects. In general, the paper advocates for a proactive strategy to surmount obstacles, enhance project results, and promote expansion within the construction industry.***

Keywords: Construction Sector, Building Information Model (BIM), Project Management, Project Life Cycle, Transparent Planning, Cash Flow Management.

I. INTRODUCTION

Starting from the start of the structure business, controlling undertaking time and costs has been quite possibly of the main issue. For a task to find true success, it is in this way important to stick to explicit timetable and monetary cutoff points as well as fulfilling quality result standards. Time and cost execution is basic prerequisites for the progress of any task [1]. Notwithstanding, defers in project consummation are normal in the development business because of incapable expense and timetable control [2]. Guaranteeing project finishing on time is the essential goal of cost and time control. This can be achieved by watching out for project improvements, assessing plans, and acting properly when required. The PMBOK (Undertaking The Executives Assortment of Information) loans extra belief to this, expressing that successful checking and the board of time and cost are fundamental for any task to accomplish its underlying goals. While overseeing development undertakings, time and cash are dependably the two main pressing concerns. But since they progressively include various gatherings from different disciplines, development projects are getting more confounded [3]. Most of task attributes that outcome in deferrals and cost overwhelms differ contingent upon the undertaking's temperament, scale, area, and extension. Huge scope, many-sided constructing projects is normally portrayed by high capital prerequisites and intricacy. Additionally, there are numerous branches within the construction industry, which means that a great deal of information on any given construction project is covered. This kind of information can serve as the fundamental basis for collaboration, procurement, and decision-making in a project and is highly significant [4]. Effective project management necessitates careful consideration of cost issues prior to project initiation, among other things. Quantification is the first step in cost control, and it's a laborious and time-consuming process. The process is typically carried out by hand with a significant probability of human mistake, which is especially likely to occur when creating estimates for intricate projects. Decision-making becomes more dependable when computer-related apps are utilized [5].

Numerous well-known projects that have substantial delays and cost overruns are prevalent in the construction business worldwide. For instance, it was discovered that, on average, time overruns in Saudi Arabia ranged from 10% to 30% and that, of construction projects, only 30% were finished by the projected completion dates [6]. Malaysia, a nation rapidly rising in Southeast Asia, is not exempt from this worldwide occurrence. Due to three months of delay, 17.3% of government contract projects in Malaysia were deemed unhealthy in 2005 and were subsequently canceled.

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The Malaysian building industry, however, is essential to the country's economic expansion. By constructing necessary socioeconomic infrastructure, such as offices, roads, homes, and schools, it increases employment opportunities and improves people's quality of life. Malaysia is also rapidly industrializing, and the building sector plays a crucial role in meeting the needs and aspirations of the country's people while also advancing this goal [7]. Regrettably, in Malaysia's construction business, delays and overruns are commonplace, resulting in higher project expenses.

It is trying to achieve proficient and powerful time and cost administration in Malaysia since the structure business apparently performs underneath assumptions. As per extra information from the Sanctioned Foundation of Building (CIOB), 2008 saw a high recurrence of shoddy time usage in development projects. A recent report by CIOB found that the development area has not stayed aware of mechanical progressions with regards to preparing, instruction, and expertise levels connected with time usage procedure use [8]. Hence, the presentation of elective methodologies is accepted to reduce the issues connected with project time and cost control. Moreover, it's accepted that the execution of the Structure Data Model (BIM) may support more prominent cooperation, which might prompt higher efficiency.

The Public BIM Standard (NBIMS) Venture Panel of the Structure Savvy collusion (2010) states that since BIM is a computerized portrayal of an office's practical and actual qualities, it shapes a trustworthy reason for choices all through the office's life-cycle from initiation ahead and fills in as a common information asset for data about an office. A structure data model (BIM) is a common computerized portrayal based on open guidelines for interoperability [9].

As an elective way to deal with building plan, this proposes the Structure Data Model (BIM), which gives all the data expected to any project before it is underlying expansion to working with computerized plan portrayal. Accordingly, the data reflected in BIM models can be utilized to further develop the cycles related with configuration, arranging, and development [10]. In addition, Bryde et al. (2013) state that as BIM is great for this sort of work, project supervisors need to consider using it as a device to help with overseeing development projects. Further exploration on this elective innovation in Malaysia is expected to demonstrate the way that BIM can meet the business' necessity for better command over expenses and timetable. It's additionally basic to do additionally explore on how BIM innovations might further develop time and cost control.

A. Project Time Control

Updating the timetable baseline and handling changes to it to keep on schedule with the plan are steps in the process of monitoring a project's progress [11]. We call this project time control. This approach lowers risk by enabling you to spot departures from the real plan and implement both preventative and remedial measures. For the majority of the stakeholders involved, the duration of a project is critical. On the other hand, delays in projects are commonplace globally, especially in developing and underdeveloped countries [12].

B. Project time control process

Info, apparatuses and cycles, and result are the three principal parts that influence project time control. The venture schedule, work execution insights, projects the board techniques, and hierarchical interaction resources are the sources of info [13]. Project time control instruments and approaches incorporate planning devices, asset streamlining strategies, demonstrating procedures, plan pressure, leads and slacks, execution audits, and task the executives programming. Project the board plan refreshes, plan projections, change demands, work execution information, project report refreshes, and authoritative interaction resource updates are normal consequences of these exercises [14].

C. Project Cost Control

Project cost control is essential to a project's success, according to Dalu (2012). The technique of tracking the project's progress by keeping track of expenses and controlling modifications to the cost baseline is known as project cost control [15]. This offers a way to identify deviations from the plan so that remedial measures can be taken to lower risk. This implies that employees who incur expenses must take corrective action in all businesses, regardless of size.

D. Project cost control process

With three principal boundaries — information, instruments and systems, and result — project cost control works in basically the same manner to time control. The imperatives that determine the cycle and the information sources that go into it are the venture funding necessities, work execution information, hierarchical interaction resources, and task the executive’s plan [16].

A portion of the devices and approaches used are procured esteem the board (EVM), estimating, project the executives programming, execution assessments, the to-finish execution file (TCPI), and hold examination. The result cycle's models incorporate work execution information, cost projections, adjustment demands, and updates to the undertaking the board plan, project archives, and authoritative methodology [17].

E. Causes of Delay and Cost Overrun in Construction Projects

In development activities, postponements and cost overwhelm are the most widely recognized issues, even with the huge swath of coordinated information spaces in project the executives. It is urgent to understand that the extension, time, and cost triangle decides the level of task achievement [18]. The reasons for these undertaking should deferrals and cost invades be examined. Delays are accordingly recognized as the most well-known, exorbitant, complex, and unsafe issue that creates in development projects.

Table 1: Causes of overspending and delays [19]

Causes of Delay and Cost Overrun	Sources
Political instability and insecurity, scope changes, payment delays, high capital costs, inadequate oversight, and poor control	Alinaitwe et al. (2013)
Customer organizations' nonpayment, contract modifications, financial difficulties, materials procurement, design modifications, personnel concerns, absence of operational equipment, inadequate supervision, construction errors, ineffective site coordination, specification revisions, and labor problems	Kaliba et al. (2009); Samarghandi et al. (2016); Olawale and Sun (2010)
Project planning, site management, change orders, and the contractor's insufficient experience	Gündüz et al. (2012)
Weather, customer requirements, designers, delayed delivery, site conditions, and financial circumstances	Al-Momani (2000)
Purchasing materials, seeing price increases for materials, handling contracts poorly, subpar technical performance, and issues with agencies' monthly payments	Frimpong et al. (2003)
The factors contributing to low labor productivity include sluggish decision-making, insufficient experience of the contractor, finance and payment, poor planning, and subcontractors.	Odeh and Battaineh (2002)
Inadequate design and planning	Hsieh et al. (2004)
Design modifications, inadequate planning, and worker productivity.	Sambasivan et al. (2007)
Unexpected ground conditions, a lack of decision-making agility on the part of the project team, inadequate site administration and supervision, and modifications in the project sponsors' scope of work	Chan et al. (1997); Chan and Kumaraswamy (1997, 2002)
Contractor financial difficulties, owners withholding payment to contractors, client or their agent design alterations made during construction, and the absence of professional construction and contractual management	Abd El-Razek et al. (2008)
Incompetent labor, slack deadlines, low cost estimates, ineffective designs, problems with the government, and money problems	Le-Hoai et al. (2008)
Ineffective contractor management, inadequate project planning, a lack of	Toor and Ogunlana (2008)
resources and labor, poor design, financial challenges, and change orders	
Weather, government regulations, and delayed material shipments	Ahmed et al. (2003)

Lack of supplies, modification requests, unpaid suppliers, inept site administration, and delayed drawing submission	Abdul Kadir et al., 2005; Ramanathan et al., 2012
Coordinating and financial concerns	Alaghbari et al. (2007); Shehu et al. (2014)
Issues with subcontractors, inadequate planning, labor supply, poor site management, delayed payment, and material shortages	Sambasivan and Soon (2007)
Low labor productivity, indecisiveness, inflation, late material supply, and inadequate equipment	Al-Tmeemy et al. (2012)
Inconsistency with antiquated construction techniques, ignorance of various established execution models, inadequate contract administration by consultants, ineffective government operations, errors in technical documentation, hold-ups in the creation of design documents, and hold-ups in the client's and consultant's evaluation and approval of those documents	Odeh and Battaineh, (2002); Faridi and ElSayegh, (2006); Assaf and Al-Hejji, (2006)

From the concentrate above, obviously the purposes behind postponements and cost overwhelms have pervaded the entire development area, hurting its standing for a long time [20].
Unfortunately, these causes actually emerge despite huge logical endeavors to diminish or totally annihilate their repeat as well as specialized leap forwards [21]. The use of BIM is accepted to tackle these issues since it consolidates every one of the significant partners from various disciplines in a task during navigation.

II. MAKING A MASTER PLAN

To make a typical focal arrangement for the facilitated execution of the development project, combination of all the fundamental creation and execution parts is required [22]. Security is the fundamental goal of creation process since it decreases the time spent on exercises, considers the expense and quality viewpoints expected for the task, and completely sticks with the models set by the originator and partners simultaneously.
The venture's persuaded execution joined with the central concern that different factors natural substances, devices, sorts of hardware or assignments performed [23]. The potential for project wanting to be executed all the more immediately was investigated in this review.

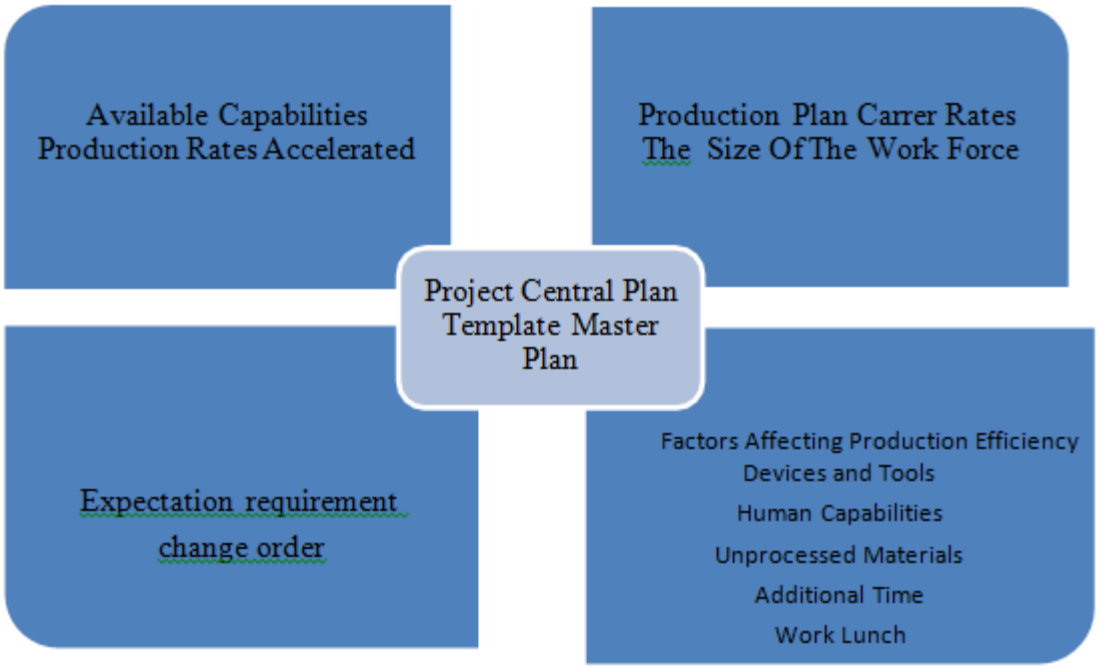


Figure 1: The primary plan's recommendation for the project's quicker execution [24]

The use of this model to the management's overall planning of the business will present chances to address the requirements that rely on the subsequent factors [25].

1) Alterations in the labor force's size.
2) Benefit from working overtime.
3) Include any work meals that are required.
4) Handling while enduring potential challenges.
5) Divide the workload by using subcontractors.
6) Being ready for the employer to provide change orders.
7) Allow for price fluctuations in the market to satisfy needs.
8) Benefit from any future advancement in technology.

III. IDEA BEHIND THE BUILDING INFORMATION MODEL (BIM)

The Project worker's Manual for Building Data Displaying characterizes BIM as the method involved with utilizing PC produced models to make and use coordinated plans, plans, developments, and tasks for an office [26]. A three-layered computerized model of an office that incorporates every single vital part and highlights is alluded to as a BIM in this unique situation. BIM is a procedure and practice of virtual plan development that fills in as a stage for partner joint effort and data sharing all through the office life expectancy [27]. It outlines the design components' numbers and characteristics, math, geographic information, spatial linkages, material inventories, cost projections, and execution schedule. It likewise unites a few pretty extreme plan innovation ideas [28].

Basically, BIM is a 3D PC portrayal of a structure. An office's whole life cycle can be communicated utilizing the model. The model is wealthy in information as a result of the volume of material included, the straightforwardness with which its properties can be gotten to, and the simplicity with which the extent of the necessary undertaking can be characterized and isolated from the model [29]. The model simplifies it to relate drawings, determinations, contract reports, acquisition data, and other development archives. In this manner, a bunch of strategies that work with the following of development and virtual plan practices and techniques all through a task comprise the center thought of BIM [30].

BIM levels were relegated numbers 0 through 3 by the BIM Business Working Gathering (BIWG) in 2011. In different regions, directed 3D is alluded to as Even out 2, while controlled computer aided design is known as Level 1 [31]. Unmanaged computer aided design is known as Level 0. Using web administrations consistent with the Global Structure for Word references (IFC/IFD) and impending Industry Establishment Class guidelines, the third level works as a completely open cycle and information combination framework supervised by a helpful model server [32].

A. BIM Equipment

Numerous advances have been created because of the BIM idea's extension to execute its different components [33]. Development project the executives is worked with by these instruments, a large portion of which are planned considering specific client needs, however others are likewise evolved with different purposes and data assortment as a primary concern. What sort of hardware to utilize relies upon the reason, the client, and the phase of purpose. BIM instruments work with 3D displaying and data the board [34]. All the utilization of these innovations makes BIM an intelligent framework that communicates with its constituent parts. The table beneath records some well known BIM devices alongside their names, creators, and capabilities [35].

Table 2: Information about the building and model [36]

Manufacturer	Tool	Function
Auto Desk [37]	Navigating through Navisworks	Overseeing collision detection and design using 3D models
Mercedes [38]	Bentley Explorer	Adaptive synchronization between disciplines and models
Vico Programs [39]	Vico Head Office	Different 3D models are analyzed for scheduling, coordinating, and estimating
Gehry Technology [40]	The Digital Project Suit	Complete suite with features for information management, design, and evaluation
Tekla [41]	Tekla Constructions	Threedimensional structural modeling and
Solibri [42]	Solibri Model Compiler	Regarding quality assurance and control (QA/QC)
Synchro Ltd. [43]	Synchro Expert	Planning simulations and scheduling systems

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IV. UTILIZING BIM FOR PROJECT MANAGEMENT

Since it joins accomplices and can be completed in a way like the Endeavor the Chiefs Gathering of Data (PMBOK) being developed task the board, Building Information Illustrating (BIM) is a critical contraption for convincing and capable endeavor the leaders [44]. BIM offers monster potential for controlling endeavor life cycles since it will in general be applied whenever in the errand's life cycle. It in like manner enables the joining of building models and things, and it enhances project association. It makes he's perception owner could decipher the undertaking's specifics more direct [45]. It is also used for project headway, examination, and plan by the arrangement bunch. The undertaking specialist moreover uses it to control the construction stage and the action, support, and decommissioning of the workplace the board.

BIM is seen as a significantly fruitful insight development since it gives a 3D virtual image of the workplace. Researchers and experts in the business have been embracing it as an elective technique for multidisciplinary information sharing of late since it gives buyers a sensation of the pragmatic and genuine pieces of the workplace in 3D portrayal [46]. The endeavor boss can aid the contribution with taking care of by giving likely specialists for enlist induction to the model's walkthrough, conveying, and course of action. A layout of the finished endeavor is given when the model is shown using BIM procedures [47]. By doing this, the need to combine the different 2D viewpoints on the prescribed dare to convey a 3D view is wiped out. The virtual models update composed exertion and correspondence since they license the owner and makers to see them during social occasions. The solicitation where orchestrating and improvement are done can be coordinated by the utility of the model part. The arrangement gathering and laborer for recruit can collaborate on the design's constructability focuses on more quickly and actually, diminishing bet and potential arrangement bumbles, because of the sensible virtual models [48].

Countless examinations have shown that doing BIM can additionally foster a motivator for resources. The Shanghai Disaster Recovery Center endeavor gave verification to their choices by displaying the possible benefits of streamlined cost-organized building exercises [49]. It was similarly found that suitability of the workplace could be checked at the arrangement stage, which will cut down the cost of help during an errand's life-cycle. BIM limits waste and lifts viability across the endeavor life-cycle by supporting composed project transport through a helpful cooperation [50].

Since it unites partners and can be carried out in a manner like the Task the executives Collection of Information (PMBOK) in development project the board, Building Data Demonstrating (BIM) is a significant device for successful and productive venture the executives. BIM offers huge potential for controlling task life cycles since it very well may be applied anytime in the venture's life cycle [51]. It additionally empowers the combination of building models and things, and it works on project organization. It makes the's comprehension proprietor might interpret the task's determinations more straightforward. It is additionally utilized for project advancement, investigation, and plan by the plan group. The project worker additionally utilizes it to regulate the structure stage and the activity, support, and decommissioning of the office the board [52].

BIM is viewed as an exceptionally compelling perception innovation since it gives a 3D virtual picture of the office. Specialists and professionals in the business have been embracing it as an elective method for multidisciplinary data partaking lately since it provides buyers with a feeling of the useful and actual parts of the office in 3D representation [53]. The venture administrator can assist in the offering with handling by giving potential project workers admittance to the model's walkthrough, delivering, and succession. An outline of the completed undertaking is given when the model is shown utilizing BIM strategies. By doing this, the need to join the different 2D perspectives on the recommended task to create a 3D view is taken out [54]. The virtual models upgrade joint effort and correspondence since they permit the proprietor and fashioners to see them during gatherings. The request where arranging and development are finished can be directed by the utility of the model part. The plan group and project worker can team up on the structure's constructability concentrates on more rapidly and effectively, diminishing gamble and potential plan mistakes, on account of the reasonable virtual models [55].

An enormous number of studies have shown that completing BIM can additionally foster a motivator for resources. The Shanghai Calamity Recovery Center undertaking gave evidence to their choices by showing the potential benefits of streamlined cost-organized building exercises [56]. It was similarly found that reasonableness of the workplace could be checked at the arrangement stage, which will cut down the cost of help during an undertaking's life-cycle. BIM limits waste and grows efficiency across the endeavor life-cycle by supporting facilitated project transport through a helpful communication [57].

Using BIM, which offers a non-redundant model of the endeavor's life-cycle information to streamline its strategies, eliminates unmistakable dullness that makes with regular frameworks [58]. Three basic advantages of using BIM are that it lessens alter during advancement and works on the idea of plan and improvement. AEC experts in Pakistan's improvement industry confided in this to be legitimate.

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Table 3: Applications of BIM [59]

Application of BIM	Source
Management Of Quality Compliance	Chen and Luo (2014)
Decrease In The Trash Produced By Information Exchange (IE)	Dubler et al. (2010)
Enhancement Of Facility Management Data Accessibility	Kassem et al. (2015); Liu (2010); Meadati et al. (2010)
Durability of project design and building functionality	Wong and Fan (2013)
Identification and synchronization of clashes	Azhar et al. (2008); Foster (2008); Young et al. (2009); Arayici et al. (2011); Lahdou and Zetterman (2011)
Automated platform for safety checks	Zhang and Gao (2013)
Analyzing constructability	Foster (2008)
Activities are shown visually and in order.	Tulke and Hanff (2007); Wilson and Koehn (2000); Ding et al. (2014)
Estimating material and quantity costs	Azhar et al. (2008); Hergunsel (2011); Sabol (2008)
Incorporation of principal stakeholders	Foster (2008)
Maximization of prefabricated building elements	Hergunsel (2011); Winberg and Dahlqvist (2010)
Risk evaluation of the facility's design element for preventive design	Kamardeen (2010)
Clarification of the scope	Bryde et al. (2013)

Table 3 demonstrates that all of the uses for BIM and their associated advantages are focused on reducing project time and construction costs [60]. This has demonstrated how significantly project time and expense are impacted by the usage of BIM in construction project management. Although there may be a significant upfront cost associated with BIM implementation, the business's profitability will eventually increase [61]. Utilizing BIM capabilities, such as quantity take-off, design, visualization, and clash detection, dramatically enhances construction project management. Inaccurate estimates, poor designs, and construction errors brought on by design conflicts are the most common causes of delays and overspending [62]. Investigators can minimize these issues because it has been demonstrated that using BIM offers benefits that solve these worries.

V. CONCLUSION

The study elucidated the principal causes of delays and cost overruns in the construction industry, which are costly, hazardous, and often give rise to disputes and litigation. There are four categories of causes, as per previous research: consultant duty, owner responsibility, contractor responsibility, and external variables [63]. It is believed that the Building Information Model (BIM) can assist in addressing these causes of delay and expense. Using BIM may have several benefits, such as improved estimating, collision detection, and integration, all of which can lower delays and budget overruns. These bullet points outline the overall planning for the project and emphasize how important it is to have planning levels that work in tandem with the tools for efficient execution. This includes thorough process management plans that take time, cost, and quality factors into account [64]. The regulatory process will be enhanced by the creation of a central plan model for rapid execution, which will set objectives, allocate resources, increase output, and ensure the project's realistic completion. The primary strategy for attaining efficient control over output levels is outlined as a tailored system for monitoring manufacturing processes [65]. To guarantee optimum feasibility, a model for procedures that set administration parameters, measure performance, analyze target and standard deviations, and apply suitable corrective actions must be developed [66]. It is possible to regulate both time and cost by utilizing modern computer technologies, such as linear programming. This technology improves the main plan's transparency by providing detailed explanations to investors or stakeholders [67]. It aims to expedite the critical activities of time- sensitive technological programs and project completion times at the lowest possible cost for effective control.

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The employer's provision of cash flow is emphasized as being crucial for on-time payments to project workers, material suppliers, equipment contractors, and others [68]. This ensures that the workflow proceeds according to schedule.

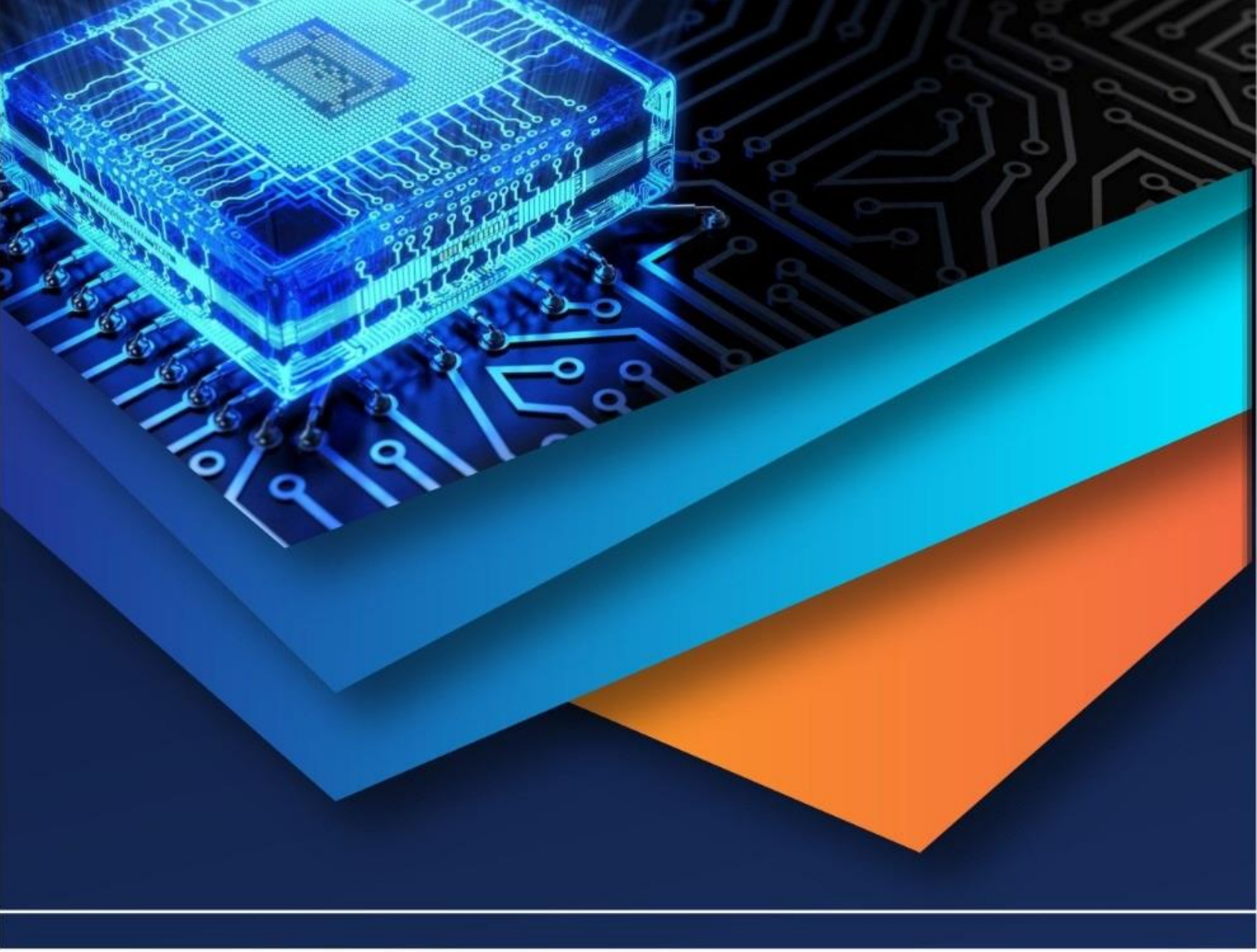
In the end of the article, it is recommended to use the accelerated implementation approach to finish the project in the allotted short amount of time. For projects of this nature, construction companies must supply the employer with comprehensive designs and central blueprints in addition to competent and efficient labor [69, 70]. When creating and executing expedited designs, it is recommended that government and private construction companies, along with technical department staff, make use of modern technology and software to cut expenses and save time. It is suggested that taking this action will improve and grow the performance of these companies.

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