.

The Role of Project Management in Fostering Creativity: Towards Successful Architectural Design Projects in India

Jassimar Singh Wahi

[1] Student , Bachelor of Architecture, Sushant school of art and Architecture, New Delhi , India

ABSTRACT

Construction Industry is an industry which is growing at a rapid pace in many developing countries like India. These countries will be home to many complex architecture and design in the near future Constructing these buildings has two parts designing and construction. While designing is relatively easy construction of these complex design projects is a big task for these countries. Developing nations have the man-force, The capital etc. but they lack in management. Here projects once started are not completed or take a huge time to get completed. Which slows down the development process and disturbs the relations between the architects and the stakeholders which will possibly result in less investment from big prominent firms around the world. This study will look at the various issues that the building industry faces, as well as the steps that may be taken to address these issues so that these countries can host a diverse range of interesting and sophisticated architectural and design forms. The major improvements can be done by managing the construction efficiently.

so, the purpose of this research is to identify the best practices for Project management in India and how they can make an impact on construction industry by doing literature review and comparing the case studies of buildings built in developed countries and buildings built in India and pointing out the problems faced by Indian construction industry. Further on the validity of the research was cross checked by doing an online survey from various architecture student's, Architects and Developers in India post that a small interview was conducted which further helped me identify the extent of the study. The combined findings, from studies and survey's (i.e., primary and secondary study) helped me to identify the role played by the Project manager's leadership approach, the project team characteristics, the team members' approach, and

their workflow structure which leads to a proper management for construction in India which further leads to a conclusion which help us identify the role of construction management in fostering creativity: towards successful architecture design projects in India

Keyword: - Construction industry, *India, obstacles, Project management, practice, public and private sectors, Architecture and design, Successful Construction*

1. Introduction

As construction industry has been the main driving force for the economy of many countries around the world so, Construction materials have become one of the most researched topics in past few decades. As we see emergence of newer materials in a span of every five years, we see newer and more complicated building designs coming up. To any successful Architecture projects there are two parts to it the designing part and the construction part. There is a very close relationship between design and construction. Where design is a method of describing something

through the use of comprehensive plans and specifications.
Construction is the process of determining the actions and resources needed to bring a design to life. Where most of the developed countries achieve the design and construction process conveniently due to the practice of managing the project efficiently. Many developing countries like India achieve the designing part but lack in the construction process sometimes the construction is unfinished or sometimes if it is finished the cost of construction may shoot up.

For example, the Dwarka express which was aimed to be completed in 2012 is still only half completed, whereas if see Burj Khalifa the tallest building in world was completed in 2009 in a span of only 5 years. Here the role of project management comes to play in completing the complex design projects efficiently by coordinating with the architect, the client or the funder of the project and the contractor of the project and also by utilizing man hours efficiently. The Indian construction sector has seen very few changes in terms of new technologies and innovative procedures over a lengthy period of time. (Ardit, Nayak, & Damci, 2017) However, given current advancements and the future interests of many international organisations, improved techniques of planning and execution of its many initiatives should be considered. This will establish new standards, give the industry a clear structure, and make it more efficient and productive.
Despite its global expansion, the Indian construction sector lacks formal project management and minimal planning for capability and professionalism. During the construction of much complicated Architecture and designs the role of the project manager is to ascertain and ensure that work is being performed in conformance with contractual documents and managing the work being done on the site and provide with methods which may help in reducing the cost or completion of project in the proposed timeline which can be a daunting task for the Owner and the Architect. (halpin , senior, & lucko, 2017) In India many infrastructure projects are started which sometimes never get finished or sometimes there is a huge cost overrun. By the end of this study, we will be able to figure out the cause of these problems and also understand the role of a Project manager in a project and also understand the solutions which were used by the developed countries which is still lacking in India. Which may lead to improvement in construction industry significantly

1.1 BACKGROUND OF THE RESEARCH

The Business environment in India is in constant transformation which results in several projects not attaining the planned aims effectively. Many practises are leading advances based on information technology or establishing new planning policies to address the problem (matar & georgy, 2010)
The field of project management provides the tools and procedures needed to improve the outcomes of building design processes Project management is widely used in the construction industry, but it can also be used to manage the design process because there is a scope, timeline, budget, resources, and activity management to coordinate within the firm. (HARRIS, MCCAFFER, BALDWIN, & EDUM-FOTWE, 2021)"The application of information, skills, tools, and procedures to project activities to achieve requirements" is what project management is defined as.
In architecture, project management is primarily concerned with the construction phase of the project. Considering the complexity of the development process till the client receives the final product.
The literature provides us with a variety of ways that can assist firms with tools and systems to complete the various activities associated with the profession, while also boosting knowledge and leading to better practices. The client seeks for the benefits and advantages of the building designed, “quality of work and performance are critically important to the success of a project”. Architects may

work producing excellent solutions through design, although the lack of adequate management of the process can deliver service with low quality.so managing the project with efficient technologies can help us in reducing the time, reducing the cost overrun while delivering the best quality of the project possible which can in turn benefit the client/stakeholder of the project.

1.2 Topic of the Research

"The Role of Project Management in Fostering Creativity: Towards Successful Architectural Design Projects in India," is the topic of this study. This study moves toward the spaces examining Project Management Success Factors in the Architecture field, as it pertains to the minimization of issues in the practices, taking into account the nature of the architecture business, the common issues and stakeholders' grievances in Architecture Practices, and the qualities of the Project Management field.

A Research Question was prepared to lead the research and grasp the aims and objectives in order to complete the dissertation. A literature review was conducted to have a better grasp of the topic, and then a research technique was established.

1.3 AIM OF THE RESEARCH

The aim of the research is to determine how Project management helps in successfully translating the architecture design in India. This research focuses on the factors affecting the success of the Architectural Design Process and outcomes from a Project Management's point of view, consequently does not intend to scrutinize the quality of the architectural design.

1.4 RESEARCH QUESTION

In order to explore the potentialities of the topic and the wide array of possibilities, the research question was developed to narrow down the process

RQ: Can Project management help in successfully creating architecture and design in India?

1.5 RESEARCH OBJECTIVES

1) To understand what is a project
2) To understand Construction management
3) To analyse the problems faced by construction industry in india 4)To find out why there is delay in construction projects in india 5)To find solutions for the analysed problems
6) To understand the techniques used by developed countries to complete construction efficiently
7) To understand how construction management helps in completing the construction efficiently
8) To understand how construction management helps in translating architecture and design successfully

1.6 SCOPE OF THE RESEARCH

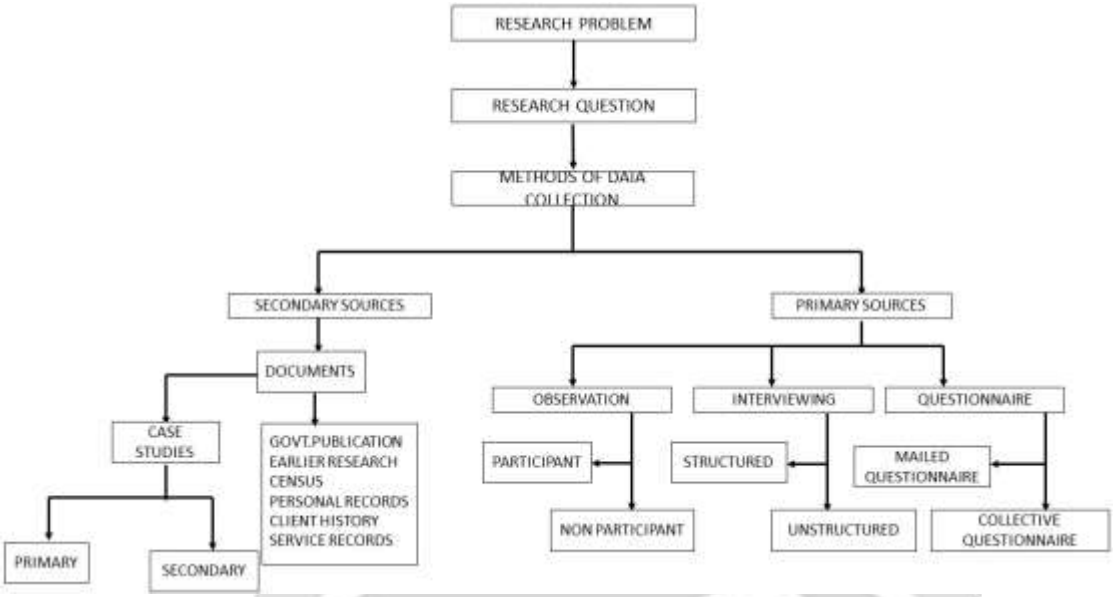
This study will develop the scope of understanding what is project management and how it can help the construction industry to be more efficient in completing an architecture project successfully in india.

1.7 LIMITATION OF THE RESEARCH

The conduction of a research can be limited by many factors. The researcher opted for questionnaire survey in order to collect significant responses within the time frame available as it is a college project and has a certain deadline to it. Due to covid pandemic personal interviews and offline surveys were avoided rather an E-survey was done and interview was done via email. The Research is only limited to India.

1.8 RESEARCH PLAN

The Research Design defines the methods for collecting data. It also lays down the framework by which the researcher got the data to further study on the topic and find the conclusion



1.8.1 : LITERATURE REVIEW/SECONDARY RESEARCH

In this section there has to research done from various sources available like articles, research papers and books that will form the bibliography of this research. The goal is to identify the problem faced by construction industry in India to comparing them with construction projects in developed countries and investigating the role of Project management in successfully completing the architectural projects and also understanding different strategies and different technologies which can help us in finishing the Architecture project more efficiently. Post that a certain amount of case studies was done of both developed and developing nations to understand the difference in techniques between the two and also validate the findings of the literature review

1.8.2 : PRIMARY RESEARCH

The primary study's goal is to validate the findings from the secondary research/literature review by conducting a survey and conducting interviews with architects, developers, and government agencies about the problems they face when concluding a project and possible solutions. An online poll was conducted with only architects, construction industry professionals, and aspiring architects as participants (currently students). Because this was a one-of-a-kind study, only a select group of people participated. We gained a good grasp of project management as a result of the literature review, and it also assisted us in recognizing some challenges and possible solutions. The major goal of conducting a poll was to validate this topic in the Indian context and to determine whether Indians have a basic understanding of project management and how it might be applied. Following the research, I discovered that

the majority of people have a basic understanding of project management but have yet to see it implemented in workplaces and on job sites. I conducted an email survey with some architects, developers, and stakeholders to validate the survey and gain a better knowledge of the various project management tools and methodologies they employ, as well as what changes need to be implemented in India to assist the Indian construction sector

1.8.3 : DATA ANALYSIS

The survey's findings were compiled and presented in the form of tables, charts, and graphs. In order to produce the results, all information provided by the respondents was gathered and analysed. The data from the quantitative survey was then organized into tables and graphs to make the results easier to see and understand. The interview was taped as a question-and-answer session. When combined with the information from the Literature Review, the analysis of the data acquired is supposed to provide an answer to the research question.

1.8.4 : CONCLUSION

This chapter presented the methods and methodologies that can be applied to carry out the research process. outline that the research process is based on reasoning using the theory and observations through data collection. The methods chosen by the researcher to answer the research question and achieve the objectives were explained and justified.

2.1 WHAT IS A CONSTRUCTION PROJECT?

• A project is a collection of related tasks that, when completed in the correct order, result in the project's completion. Projects are short-term endeavours that usually result in the creation of a physical product or result. A program, on the other hand, is a collection of interconnected initiatives that may be carried out repeatedly or constantly to support a continuing process.

• A construction project, sometimes known as a 'project,' is the systematic process of constructing, remodelling, refurbishing, or otherwise improving a building, structure, or infrastructure. The project process usually begins with a broad requirement that is fleshed out through a brief, feasibility studies, option studies, design, finance, and construction.

• The majority of construction projects are one-offs. That is, a project team, brief, and funding are assembled to create a one-of-a-kind design that results in a singular project. The team is disbanded once the project is over, and they may or may not work together again. As a result, it might be difficult to establish ideas or connections, and lessons learnt are sometimes not carried over to subsequent projects. Repeat developers, such as grocery chains and homebuilders, are the exceptions to this rule.

PROJECT PERFORMANCE DIMENSIONS

Scope, time, and resource are the three key dimensions that define project performance.
These variables are intertwined and interact with one another. An equilateral triangle is commonly used to depict the relationship.

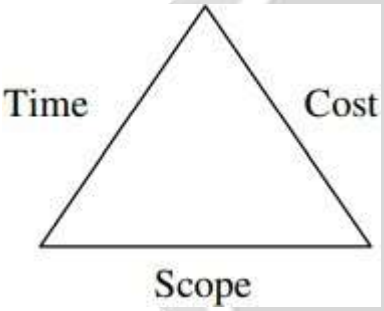


Fig -4 Time, Cost, Scope triangle (D., 2018)

It is self-evident that any change in one of the dimensions will have an impact on the others. For example, if the scope is expanded, the project will take longer to complete and the cost would increase. If time is saved, the scope and expense of the project must be decreased as well. Any change in cost would be reflected in scope and time as well. The achievement of set goals within the project's time and budget would be required for it to be completed successfully. (Mohammed & Jasim, 2015)A fourth component, stakeholder satisfaction, has been added to the project in recent years. The second school of management, on the other hand, contends that this dimension is an integral part of the project's scope, which sets the requirements to which the project must adhere. As a result, the degree to which these three characteristics (scope, time, and money) are met determines the project's success.

2.2 WHY ARE CONSTRUCTION PROJECTS CONSTRUCTED IN INDIA?

Projects are the basic building blocks of development for a developing nation like India. Development plans are nothing more than desires without successful project conception, preparation, and implementation, and emerging countries would stay static or regress. Building projects have been the principal instruments for grant, credit, loan, and technical aid to many developers in poor nations for the previous two decades.

The Economy of a country progresses due to the construction industry, As the construction industry helps in providing the country to develop the infrastructure like offices, spots for tourism, hotels, educational institutes police stations etc. The investment in the construction industry is of the two types -Government funded and private funded. (DASARI & RAO, 2019)The government funded developments is funded by the government of the country whereas the privately funded are funded by individuals or group of individuals these investors can be from the country and from outside the country as well.

India has been the first choice for many foreign Investors to invest from past 2 decades as they think that a developing nation like India would yield them much more profit. (Laskar & Murty, 2004) According to research it

is said that emerging economies are expected to grow 2 or 3 times faster than developed nations like united states. The individual funders are looking to make as much profit as they can so, there are some conditions which the funders consider to invest in India:
1)Availability of land
2)Cheaper land prices
3)cheaper labour than any of the developed countries
4)younger working population to work for them. 5)Governmental policies
These conditions help attracting a large number of funders to come to India and invest.

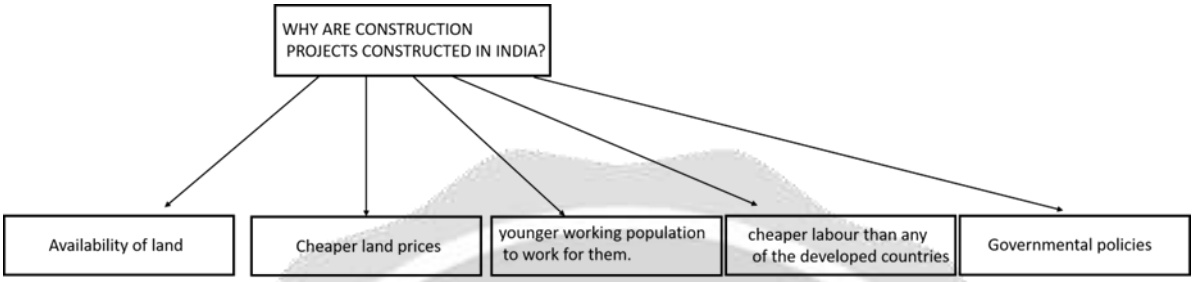


Figure 5: REASON FOR CONSTRUCTING PROJECTS IN INDIA

2.2.1 ARCHITECT'S ROLE IN BUILDING THE NATION?

Architecture Firms provide services to clients and for that it is of primordial importance the recognition of the commercial environment in which the firm is inserted and the value of consistent and efficient management of the design process, whereas "the challenge for the Client is not to impose restrictive managerial and administrative constraints on
creative individuals". The Architectural Practices are mostly based on clients seeking a building design solution, with a certain purpose and requirements, which is the foundation of the design and must be managed through life cycle accordingly in order to achieve expectations. (Stukharf, 1987)
The practice has to be concerned about managing client requirements, in order to achieve the conceived initial concept and to facilitate the project completion through its life-cycle, which benefits can be perceived positively on stakeholders In addition
to that, the practice has to develop the ability to turn away bad projects and improve its planning and management skills Development plans are nothing more than desires without successful project conception, preparation, and implementation, and emerging countries would stay static or regress. Building projects have been the principal instruments for grant, credit, loan, and technical aid to many developers in poor nations for the previous two decades.
Hendrickson and Au describe that "...design is the process of developing a description of a new facility, which is usually represented by comprehensive plans and specifications; construction planning is the process of determining the activities and resources needed to turn the design into a physical reality". From that premise, the dependency of the construction to the design is then justified, as the former must be accomplished in order to proceed with the latter. (Ardit, Nayak, & Damci, 2017)

2.3 ISSUES DURING CONSTRUCTING A PROJECT IN INDIA?

The most common issues in Architectural practices are regarding management problems. The stakeholders' complaints is related to delays on completing the building design project, due to poor calculation of project's duration; high expectations of clients with architects not giving adequate advice; Architects expecting to get paid for their mistakes, occurred due to lack of quality management and design management; lack of clarity on the contracts; conflicts of interests; and mostly common, communication issues, with Architects not informing clients about increasing costs, not answering to clients contacts, etc. It is also see`n that there are cases of unpredictable business environment i.e., regulations, corruption and general difficulties, culture and language issues, project management problems and a lack of skills and knowledge. (Ardit, Nayak, & Damci, 2017)

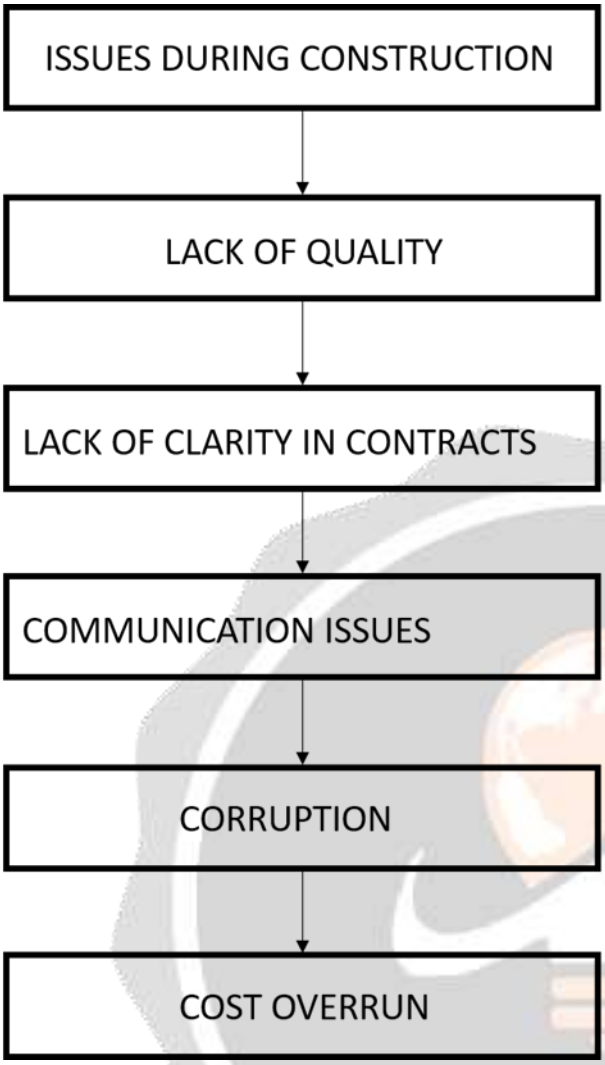


Figure 6: ISSUES DURING PROJECT IN INDIA

2.4 SOLUTIONS FOR THE PROBLEM

The main solution for the problem is having trust. People ask for help, communicate openly and honestly, take risks, accept new difficulties, and carry out their activities with less fear and stress when they have trust. Communication promotes project member trust and collaboration, according to the research, since it minimises mistrust and conflict of interest between the

project principle and the agent, resulting in improved project performance. Closer cooperation between assistance organizations, their field representatives, government authorities and consultants are required in supervision, control, and monitoring.

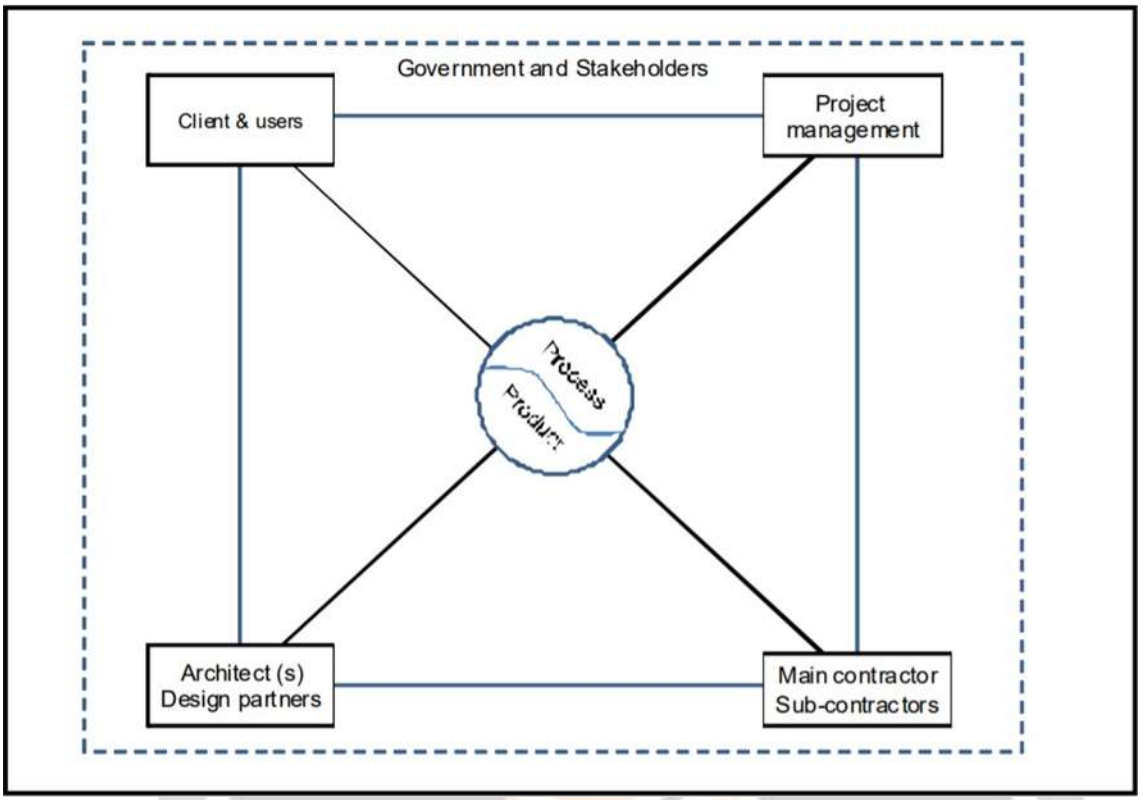


Figure 7: The connection between the architects, stake holders and contractors (auti & skitmore, 2008)

There is a need for a stronger emphasis on project implementation as a training mechanism for developing indigenous skills. Improved planning, administrative and technical capacity must be defined as project outputs. Finally, and most importantly, improvements in project management must be made with the needs of the ultimate "client" in mind. The introduction of BIM technology should be implemented on the planning stage to understand beforehand how the project will look so that there is no halt in the construction (Laskar & Murty, 2004).

2.5 PROJECT MANAGEMENT IN ARCHITECTURE

According to the PMBOK, a "project is a temporary endeavour undertaken to create a unique product, service, or result" (Al-Hashimy & YUSOF, 2021). Wysocki (halpin , senior, & lucko, 2017)describes project as a "sequence of unique, complex, and connected activities that have one goal or purpose and

that must be completed by specific time, within budget, and according to specifications''.

Larson and Gray's approach define a project as "a complex, non-routine, one- time effort limited by time, budget, resources, and performance specifications designed to meet customer needs", adding to the previous definitions that the main objective of a projects is to satisfy customer's needs. The following are the main features of a project: a specified goal, a life span with a beginning and an end, staff engagement, trying something new, and working under time, money, and performance constraints.

The Project Management discipline is responsible for ensuring that project objectives are met. Project management, according to the PMBOK, "is the application of knowledge, skills, tools, and techniques to project activities in order to achieve project requirements," which is accomplished through 47 processes divided into five categories: Starting, Planning, Executing, Monitoring and Controlling, and Closing are the steps involved in starting, planning, executing, monitoring, and controlling a project. (ahmed, Raymond , Tang , & Zheng, 2005)

The management of projects involves dealing with constraints. The relationship between cost, time and scope constraints is broadly known as "Iron Triangle", where changes in one variable result in another variable to balance the outcomes.

Project management in architecture firms is considered as the activity of coordination of design proposals and collaboration to integrate it with construction. Seeking to increase the Architectural value of a project, design managers and coordinators have to deal with the design processes of a project, at the same time as Project Managers and managers seek to reduce uncertainty and risks at the beginning of the design process**.**

2.6 DIGITAL TOOLS WHICH CAN BE USED TO HELP IN THE PROCESS

People in India still reject utilising digital and newer tools, preferring instead to use old software or older methodologies, but architects who treat their design practise as scientific study recognise the need of selecting the correct instrument for design research. It's the tool that lays down the rules for

constructing a new shape. We speak of various tools for digital modelling: algorithmic expansion, combinatorial set, mathematic modelling and parametric programming of computer environment where navigation is possible to obtain a shape that would be best fit for addressing the issue.

2.6.1 USING BIM AND GIS SOFTWARE

Figure 8: Showing the interdependence of BIM and GIS software (BIMCOMMUNITY, 2021)

Due to their varied individual features and capabilities, both BIM and GIS are powerful platforms widely employed in the construction industry; nevertheless, each platform lacks some of the crucial elements that the other platform offers. GIS, for example, provides topological data that may be used for 3D analysis, geographical analysis, and queries such calculating the distance between two points, calculating routes, and determining the best site. BIM, on the other hand, is incapable of such analysis, but it does give a rich database of object-oriented parametric information for the building and displays it in a 3D model, which GIS does not.

1) A comprehensive classification of construction waste has the advantage of increasing the likelihood of trash recovery.

Because of the pressing need for such tools, initiatives to incorporate BIM technology into construction management have intensified.

2) BIM and GIS can be used in tandem to improve visual monitoring of the construction supply chain.

3) BIM and GIS integration can also be utilised to determine where a crane should be situated on the job site.

4) BIM and GIS are designed to allow questions about walls in specific stories, determining if a specific room has heating system tools, determining the columns that intersect with a specific slab, defining the fire extinguishers positioned within a certain distance from a specific building component such as a window or a column, and so on.

2.6.2 BUILDING INFORMATION MODELLING

Building information modelling (BIM). It's a method for generating and managing data in building projects. A 3D building model, which digitally displays all characteristics of the developed object before it is really constructed, is one of the outcomes of this procedure. Through the information used in this method, it can continue to benefit the project even after construction

Advantages:

1. Maximized Efficiency

One of the most significant benefits of BIM is that construction projects have a shorter life cycle and are more efficient. It becomes easier to handle and complete all areas of the pre-construction and planning phases. Architects may use BIM software to create designs faster, and estimators can use BIM models to make more accurate estimates. (BIMCommunity, 2021) BIM plans also facilitate considerably greater collaboration and communication among the project's various stakeholders. It enables diverse experts to access BIM plans whenever they need them,

ensuring that everyone is working with the most up- to-date model possible. This helps to reduce errors and rework that come from using incorrect or inaccurate information.

2. Reduce Costs and Wastage

Contractors and designers can use BIM software to optimize their procedures before construction begins. This could result in substantial cost reductions and waste reduction. BIM assists contractors in making better material choices, streamlining construction work, and reducing human errors that may arise during the construction process. (BIMCOMMUNITY, 2021) BIM can assist contractors reduce the quantity of wasted resources by improving the planning stages. As a result, it may result in cost savings.

3. Improved Cost Estimates

Estimators can obtain significantly more accurate results when they use a thorough model. When you look at a 3D model instead of a 2D blueprint, you get a far more detailed plan to work with. As a result, cost estimates based on models are more realistic and precise. It also speeds up the estimating process by providing better access to information and tools. BIM can improve more than simply cost projections. Quantity take-offs are also made easier with BIM models since they provide a more detailed model to work with

4. Communication and Collaboration

BIM is a method that encourages collaboration. Everyone participating in the project can effortlessly cooperate and communicate thanks to cloud-based BIM tools. They have access to all of the information they require, as well as the most up-to-date models, at any time and from any location. This reduces the number of meetings and work bottlenecks. All project stakeholders can work on the complete scope of the project at any time. Estimates, models, and design notes

are all developed and saved in a single location. (DASARI & RAO, 2019) Architects may make quick modifications to designs, and contractors can make adjustments to the model even while they are not on site. A smoother, more efficient project is the consequence of improved communication and collaboration.

5. Better End Results

The application of BIM aims to improve the planning and building processes. This usually leads in a higher-quality build and finished product. Contractors can produce higher quality with better planning and more detailed insights. Because architects can visualize the building early, they place a larger focus on the building's aesthetics. As a result, BIM results in higher-quality assets.

2.6.3 GIS SOFTWARE BENEFITS

This helps to increase construction productivity, helping organizations to finish projects faster, with less headaches, ultimately saving time and money.

1) Real-time updates

Many challenges on construction sites can be traced to incomplete information and/or lack of communication. Real-time updates solve both. Lack of information causes delays, mistakes, and frustration GIS can be accessed via any web browser, meaning it's usable on any computer or mobile device. Real time updates help all project stakeholders - field teams, Project Managers, owners, and executives - to quickly understand a project's status: enabling effective communication, better decision making, and more efficient project management.

2) By connecting the field and the office, everyone gets access to the information they require when they need it. This saves rework and unnecessary data entry while boosting the likelihood of completing the project on time and on budget.

Massive amounts of data are generated during construction projects. A single project can produce terabytes of data in a variety of formats, including images, films, aerial surveys, spreadsheets, Shapefiles, and more. That much data in that many formats, all on different devices, makes storage, transfer, and management difficult. Having a single repository for project data has significant benefits. For example, teams can create as-builts as they work, streamlining future pay apps.Pay apps are a common source of disputes on construction projects. Owners and

contractors are often at odds, as both parties are at risk for significant financial loss. Usually, problems arise when what's reported in a pay app doesn't match the initial bid. (Venkateswaran & Murugasan, 2017)

Figure 9: COLLECTION OF DATA BY GIS SOFTWARE((B2B, 2017)

2.6.4 COLLABORATING SOFTWARE'S

In today's construction sector, many consulting teams, such as architectural consultants, interior consultants, lighting consultants, and landscape consultants, are all collaborating on a single project. In this situation, collaborating might be a time-consuming procedure that can cause the project to be delayed. Collaborative tools like as Smartsheet, Basecamp, Trello, Asana, and others can be extremely useful in this situation.

Some benefits of collaborative software's are:

1) Better communication: Collaboration software enables people from many locations to share content in the form of papers, messages, videos, and other formats. Efficient and quick communication should take the form of dialogue rather than emails, which are easily disregarded, build up, and are difficult to locate. (D., 2018)

- **Organizing discussions into channels to broaden communication**
- **Supporting phone and video calls**
- **Integrating with a variety of popular tools (Google Drive, Trello, Dropbox, and so on)**
- **Making document navigation simple**

Figure 10: BENEFITS OF COLLABORATIVE SOFTWARE (D., 2018)

2) ENHANCED PROJECT MANAGMENT

With improved project management collaboration software, it's much easier to coordinate project operations across diverse team members and teams. (D.,
2018) So that the management process is error-free, all information is available

on the same page, all papers can be shared, and deadlines can be set conveniently.

3) Improved remote working options

Remote Agile teams can operate more efficiently with collaboration software that allows them to schedule daily meetings to keep team members informed about current tasks, plan sprints, and receive rapid feedback and real-time data. The most popular technologies for facilitating remote team communication are Asana and JIRA.

4) Better scheduling

collaboration technologies, such as sharing public or personal calendars to keep track of all meetings and deadlines. With just one click, employees may arrange daily meetings, planning meetings, conferences, brainstorming sessions, and much more. Asana groupware, for example, gives users with their own calendar for easy and rapid planning. Employees can transfer due dates by dragging and dropping work to a new date if a specific day appears to be overburdened.

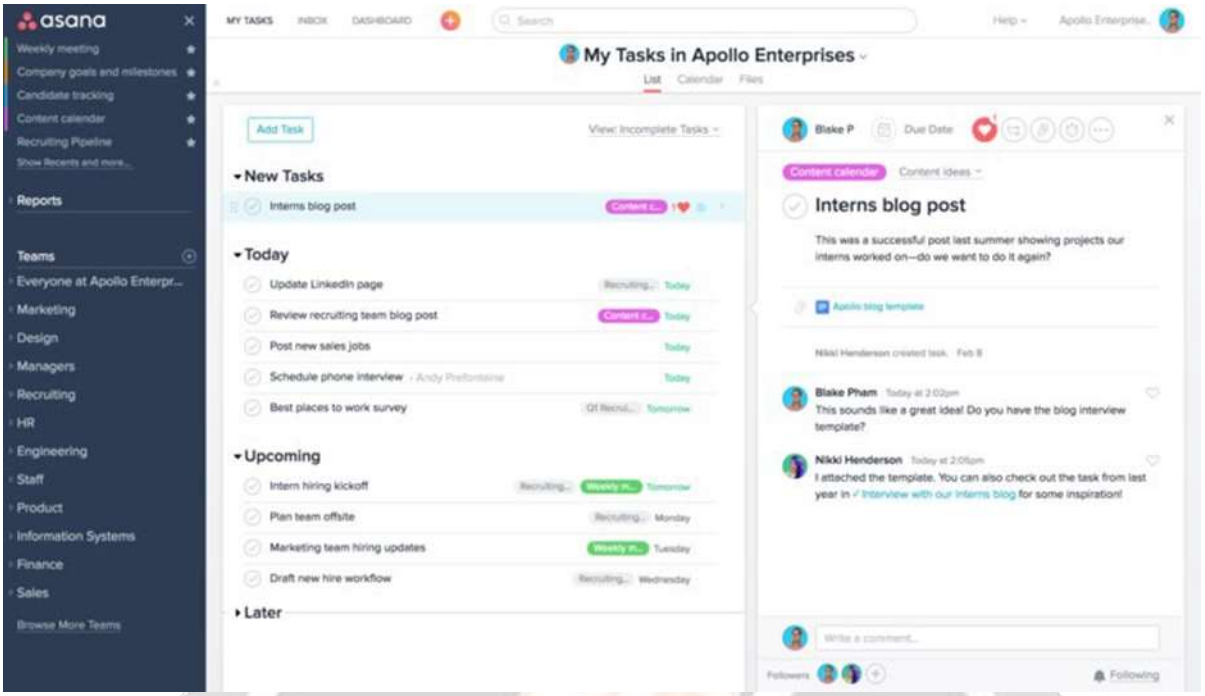


Figure 11: ASANA INTERFACE (D., 2018)

5) Workflow acceleration

Integrations with well-known and useful programmes such as Google Docs, Dropbox, Trello, and others help to speed up work. These interfaces allow employees to import and export documents directly from groupware. Additionally, with digital documentation, collaboration software eliminates paperwork and thus saves time.

6) Increased employee involvement and satisfaction

One of the most important functions of collaboration software is to bring colleagues from various places together in the most efficient way possible. This endeavour not only improves an organization's workflow, but it also boosts employee satisfaction and engagement.

Figure 12: ENGAGEMENT OF EMPLOYEE (D., 2018)

2.7: Factors which affect bim adoption in emerging Markets like India

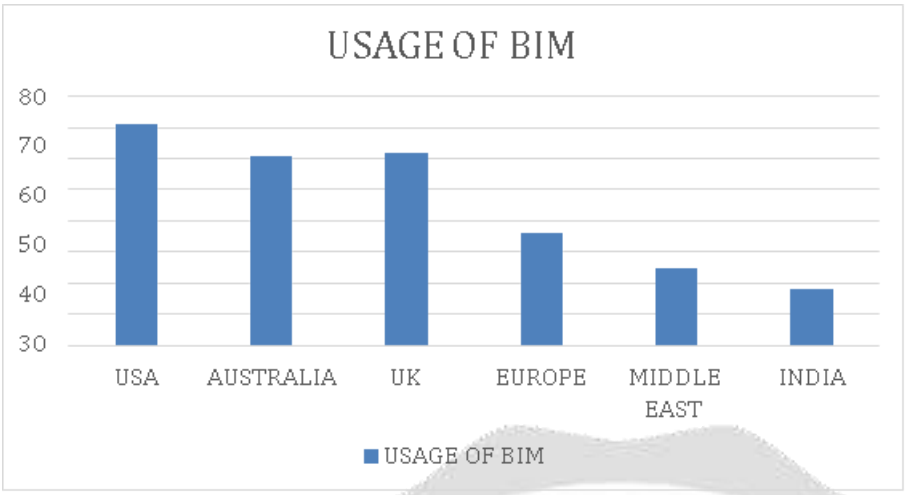


Figure 13: Usage of BIM in different countries

From the experience of developed nations like USA and Australia it is believed that there are lot of benefits from return on investment and could also increase the adoption of it applications.

THE MAIN CONSTRUCTS OF USING DIGITAL TOOLS ARE:

1)Compatibility 2)Complexity 3)Trialability
4)Top management support 5)Perceived cost 6)Expertness
7)Trade partner readiness 8)Client requirement 9)Regulatory support

DIFFERENT CHALLENGES OF USING BIM AND THEIR POSSIBLE SOLUTIONS

There are many challenges due to which BIM is not widely accepted in Indian Architecture firms. Figure 14, 15, 16 lists some problems faced in India with their possible solutions

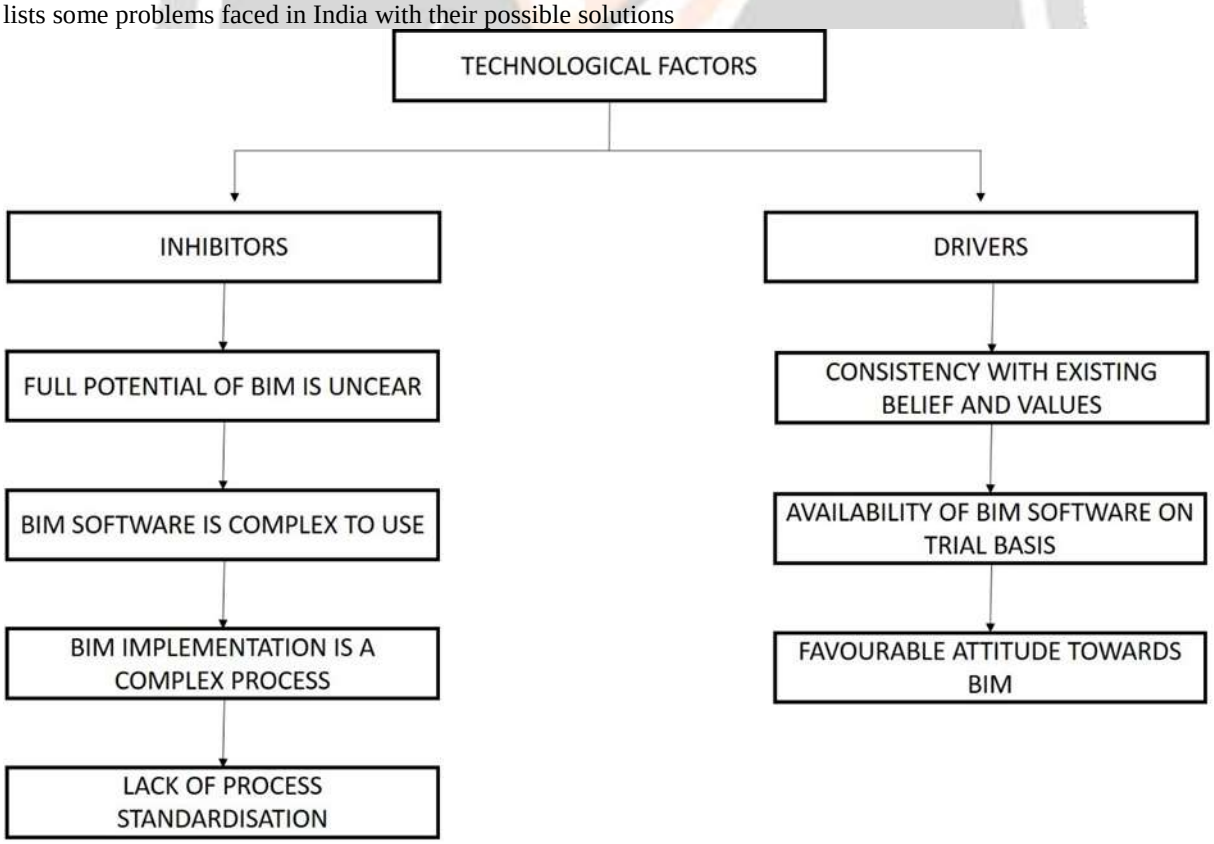


Figure 14: Technological factors which influence BIM adoption in india

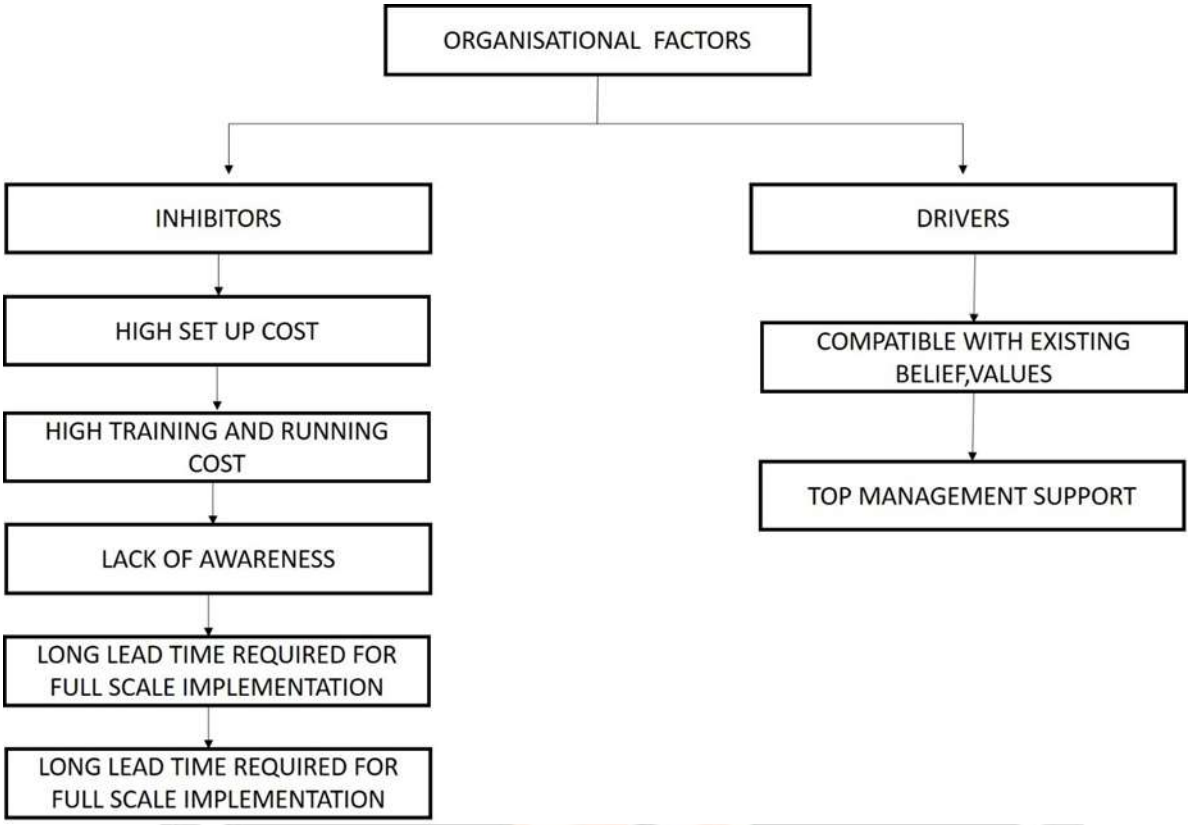


Figure 15: Organisation factors which influence BIM adoption in india

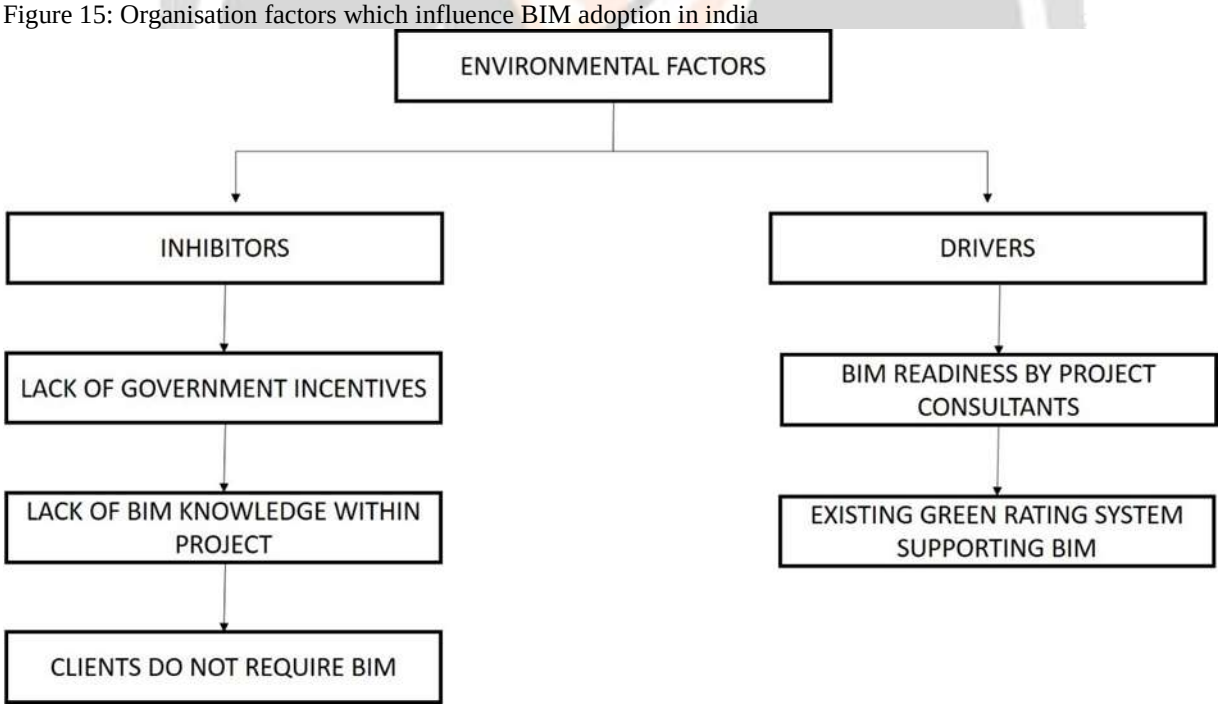


Figure 16: Environmental factors which influence BIM adoption in india

Taking a look at the difficulties, it is inferred that improvement of a BIM execution plan and an authoritative system for architecture, engineering and construction industry in India is required for the improved use of BIM in the area This would help with multiple ways, for example, giving rules to take on BIM (figure 14), proposing some normalization all the while
of execution (figure 14), spreading awareness, explaining the BIM-related processes and expanding top administration support (figure 15).

The rules would likewise achieve lucidity among customers (figure 16) and

among the partners on their individual obligations in a BIM-coordinated work structure (figure 16). BIM is a communitarian framework, and without collaboration of the relative multitude of advisors, such an intricate instrument can't be taken care of effectively. The need of BIM-ability among every one of the partners for its full use has been additionally, been recognized with regards to USA, China and Malaysia. The obstacle brought about by the intricacy associated with BIM reception is additionally noted in different nations like China.
Government-support and support have been proposed for other agricultural nations, similar

to Brazil. The Building and Construction Authority of Singapore has suggested that the public area needs to start to lead the pack in BIM reception, alongside administrative endorsement, motivators, capacity advancement and evacuation of hindrances. An execution procedure will likewise ideally make a motivator from the government for advancement of aptitude in BIM (figure 15 and figure 16).
BIM education could be consolidated as a piece of existing structural designing, engineering and associated streams, engaging more experts to be able to deal with BIM-incorporated development projects (figure 15 and figure 16).The outright need of a developed type of BIM preparing is perceived in a review in Brazil, while a review with regards to Singapore proposes the presentation of broader undergrad and postgraduate course-modules zeroed in on BIM. A public BIM training and examination plan can guarantee the making of an obvious authoritative BIM system. Further investigations and learnings from mature BIM markets can additionally help Indian Architecture, engineering and Construction industry to foster BIM execution methodologies.

2.8 : BOOK REVIEW SUMMARY

Title: Construction Management: From Project Concept to Completion Author: Paul Netscher
Publisher: PANET PUBLICATIONS

Copyright Date:2017

Summary

Many construction projects are doomed to fail long before construction even begins. They are the incorrect project, constructed at the incorrect period and in the incorrect location. The design is poor, the budget is incorrect, a bad team is chosen, and the investigations are incomplete. If your project isn't handled

properly, things can go wrong at any point! However, effective project management and planning will ensure that your project is a success. The book offers construction management advice and project management solutions. Each project phase in the construction project lifecycle contains vital information and insights to assist you in planning, monitoring, and managing each project phase to ensure that every construction project is a success.
From project inception, where the owner decides what they want, where they want it, and how much they can pay, to project planning, deciding what help you need, appointing the project team, project investigations, budgets, the design process, selecting the right contractor, preliminary project work, construction management, and finally, commissioning and project completion, the book covers the entire construction project lifecycle. Project scheduling, essential financial elements, and contractual arrangements are also included in the chapters.

Keywords

Successful construction management Project success
Concept Planning Development Main Ideas
Construction management: The main idea of the book which the author presents is on how we can manage a construction project efficiently from

beginning to end. The author in the book also talks about the short comings which happen at the start of the project due to which the project is not completed
Concept and planning

The Author in the book also talks about the concept and planning which is the most important part of the book which talks about the requirement of the project talks about permits and permissions and also availability of resources and also about alternate solutions of if anything does not go as per plan
The Designing

The Author in the book also talks about the designing stage in which he tells about the various responsibilities of the designer talks about various documents, He also talks about permits and approvals He also talks about design life safety of constructions and also teaches how to coordinate properly with the design team
Project Completion

There is a section in the book which only focusses on the project completion which helps to understand the final paperwork final payments return of deposits and return of hired equipment
What's the book's main message?

It does not matter whether the project is big or small. Construction projects are challenging to complete. The book gives the message of how to manage a construction efficiently it talks about various measures to manage construction. It tells various problems and give solutions to them by a number of case studies
to learn from. It also gives measures to reduce the cost of projects by efficiently

managing it. The book also Gives step by step measure to complete the architecture project efficiently.

2.9: PROJECT MANAGEMENT SUCCESS

Considering the context of Project Management, the definition of success for Kerzner (2013) "includes getting the job done within the constraints of time, cost, and quality". Success is an intersection area between time and cost around the quality or scope. "The application of appropriate knowledge, processes, skills, tools, and techniques" is essential for a positive impact on Project Success, as proposed by the PMBOK (Tekatel, Financial Performance Analysis (MBA project), 2019)

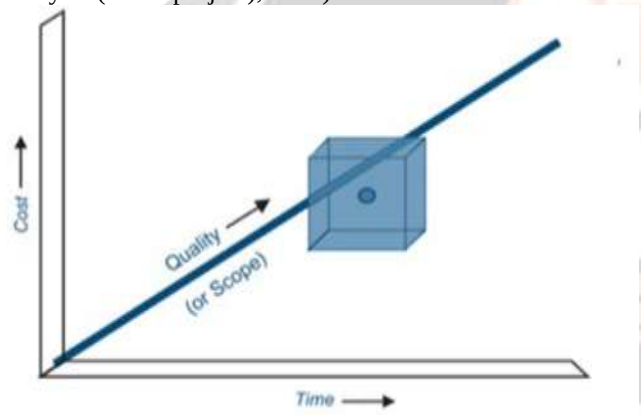


Figure 17 - Project Success. Source: Kerzner (2013, p.73)
Project management success also depends on building trust. If there is a lack of trust between the contractor, the architect and the stake holder the project will have a lot of hinderance in it. The gap between the stakeholder's view of the project's success and his expectations determines the stakeholder's happiness with the project. Issues such as the team's responsiveness to stakeholder requests, project communication, degree of collaboration and/or trust in the team, and so on can all influence a stakeholder's view of project success.

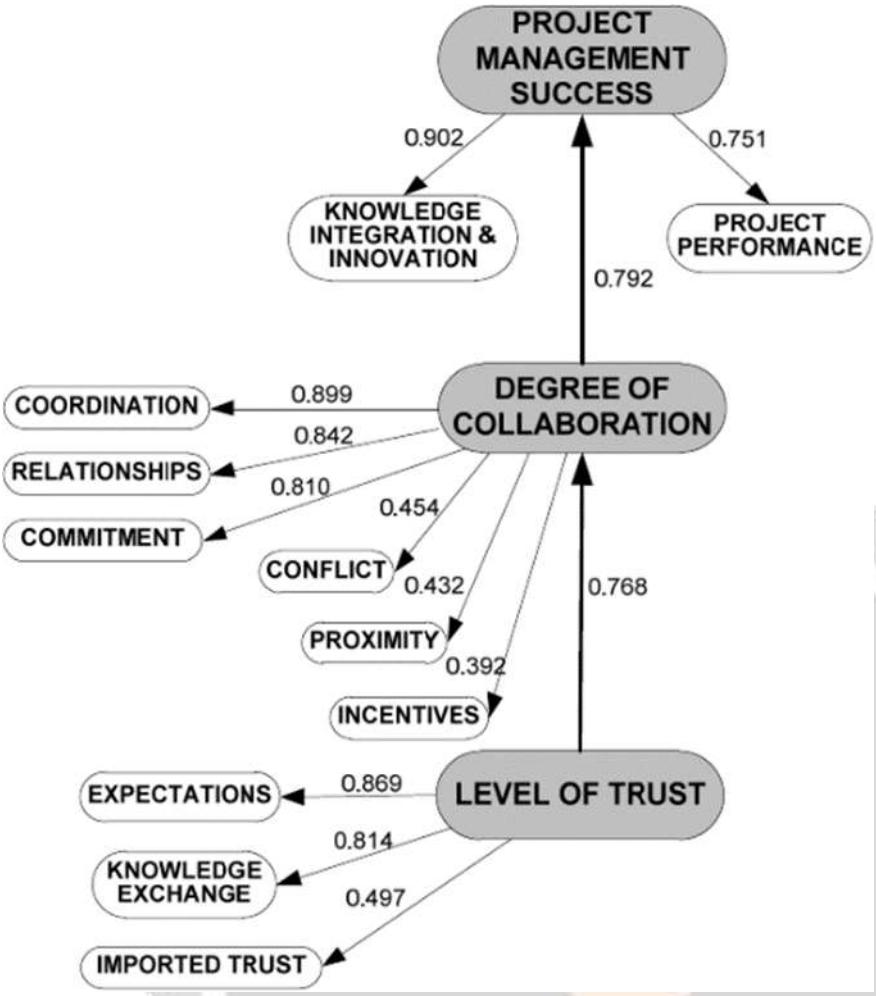


Figure 18 – The diagram shows how the level of trust can have a positive impact (B2B, Infrastructure Sector in India: Definitions; Growth and Infrastructure Linkage, 2017**)**

SUCCESS FACTORS

Primary	Secondary
• Within time • Within cost • Within quality limits • Accepted by the customer	• Follow-on work from this customer • Using the customer's name as a reference on your literature • Commercialization of a product • With minimum or mutually agreed upon scope changes • Without disturbing the main flow of work • Without changing the corporate culture • Without violating safety requirements • Providing efficiency and effectiveness of operations • Satisfying OSHA/EPA requirements • Maintaining ethical conduct • Providing a strategic alignment • Maintaining a corporate reputation • Maintaining regulatory agency relations

Figure 19 – Primary and secondary success factors (Kerzner, 2013,)

2.10 : CONCLUSION

In this section of the research main focus is done on project management success. Which happens when we identify the problems related to the construction industry and then finding out the solutions to overcome these problems .A project is completed by the collaboration of the architect ,the contractor and stakeholder the major factor combining them is communication

.when the lack of communication is resolved there is a factor of trust built them and if they have the trust it leads to the success of project .project management plays a major role in developing a sense of trust between the three .In

India the RERA(Real Estate Regulatory Authority) act was passed in 2016 but it only aimed at real estate industry for the benefits of the buyers so that they don't loose money after investing in a project that was good attempt but the Indian construction needs more laws like these to revive the construction industry .

3. CASE STUDY

3.1 Project -Burj Khalifa, Dubai

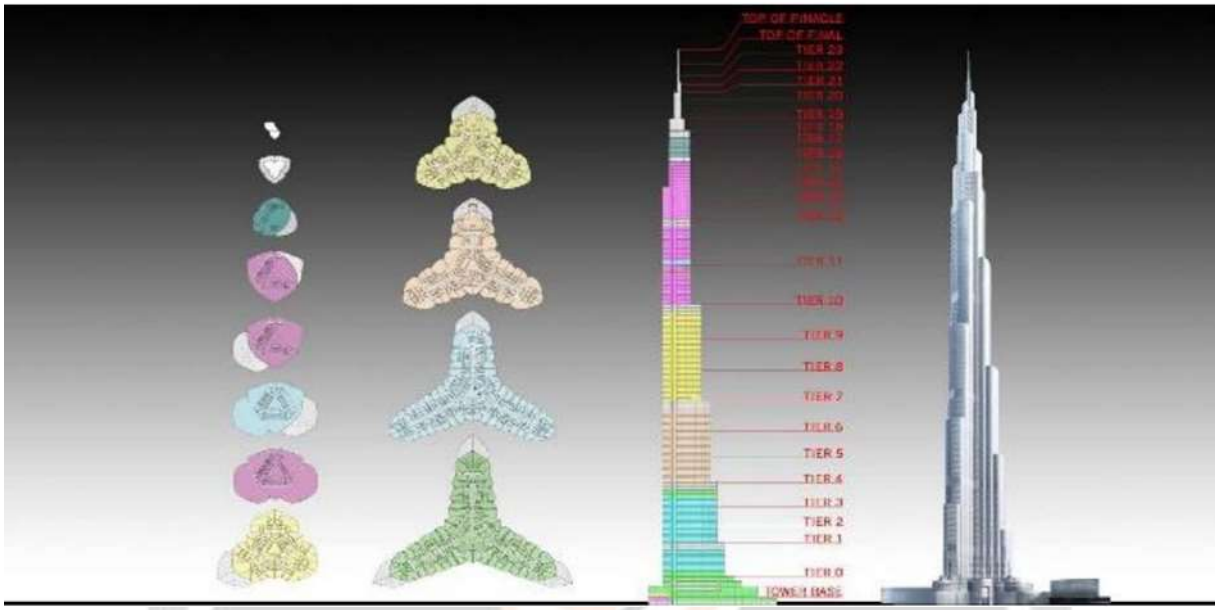


Figure 20 – BURJ KHALIFA CONSTRUCTION PROCESS (BIMCOMMUNITY, 2021)

- Architects: Skidmore, Owings & Merrill
- Area: 454249 m²
- Year: 2010
- Landscape: Cracknell Landscape Design LLC
- Lighting: Fisher Marantz Stone
- Geotechnical: Hyder International
- General Contractor: Samsung Corporation, Dubai Contracting Company LLC
- Structural Engineering: SOM
- MEP: SOM
- Interior Design: SOM
- Construction Manager: Turner International
- City: Dubai
- Country: United Arab Emirates

Phases of the Burj Khalifa Project Management Initiation

The goal of the Burj Khalifa was not simply to construct the world's highest structure. Previously, the United Arab Emirates' main source of revenue was gasoline. The decision to construct the Burj Khalifa was based on the UAE government's desire to diversify its economy from one focused on oil to one based on service and tourism. It was said that projects like the Burj Khalifa were required to be erected.
Execution

The ability to withstand Dubai's severe summer heat and the influence of wind pressures at a great height were crucial factors for this project proposal. The Structural Health Monitoring Program and Network (SHM) was used to assess the tower's long-term viability both during construction and after it was occupied. The structure was built to withstand the heat. There were multiple cameras deployed to detect the unsafety situation and the number of individuals within the building. The project adopted a new construction technology called the "3-day cycle", a method which aims to raise the entire construction one

story per every three days. During this time, the quality and safety control management of the project was greatly monitored and maintained.
The following processes were included in this:

- Implementing the building's tools and procedures
- Moving a huge amount of steel and concrete higher into the air
- Dealing with weather variations that might hamper the construction process
- Measuring and monitoring performance inputs in all departments
- Investigation of occurrences or accidents
- Risk Management
- Information System Regulation effect of wind and gravity load, especially during building stages

In order to achieve Project Success, the Project Management Framework demonstrates how critical it was for a project to determine the scope, time, cost, quality, human resource, communication, risk, and procurement processes. These nine major knowledge domains, as well as management's ability to integrate these cores and enabling project tasks, are critical for a timely and cost-effective solution that reduces profit while maximising quality on a project like the Burj Khalifa skyscraper building. (auti & skitmore, 2008)

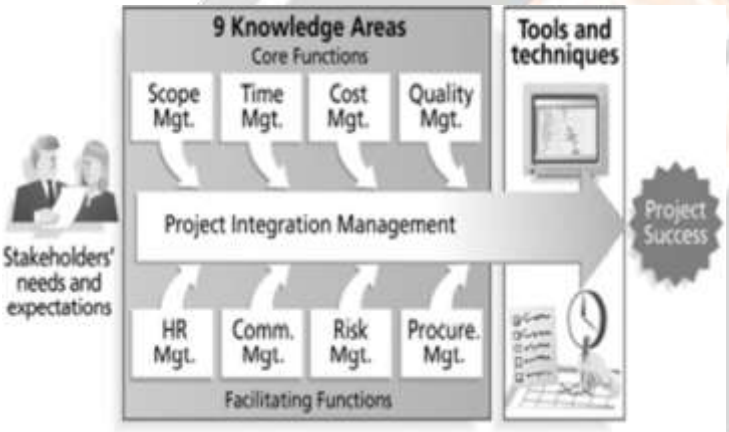


Figure 21 – 9 knowledge areas in project management (B2B, Infrastructure Sector in India: Definitions; Growth and Infrastructure Linkage, 2017)

Quality Management

The Burj Khalifa team stressed quality as one of the most important parts of this project. The key to constructing a skyscraper that outperforms all others in the globe was to use the best architecture, materials, and personnel available.
The Burj Khalifa project's quality planning technique involved identifying suppliers and contractors, as well as the method of construction, logistics, resources, and required training.
Communications Management

For this project, effective communication management was crucial. Through clear and constant communication, a company must establish a harmonious relationship with all levels and departments (vertical and horizontal). With over 65 different specialists and over 12 years of experience, Traditional walkie- talkies were used to communicate in and around the construction site during the outset of the Dubai Tower project. When the building reached thirty stories, however, issues with our communications system arose. The walkie-talkies got less and less dependable as the tower grew, causing delays and safety concerns. Construction will be delayed if communication is delayed. Samsung devised a wireless mesh network to address this problem, allowing for clear voice connections as well as real-time video broadcasts and surveillance. This wireless mesh solves a crucial communication issue, allowing construction to proceed safely and on time.
Procurement Management

Collaboration was another key ingredient for success. Early in the planning process, suppliers were brought in to integrate cutting-edge advancements in concrete design and pumping, jump formwork, and elevator technology. The third major component for turning the vision into reality was close and early involvement with government authorities, utility corporations, and other key stakeholders.

Figure 22 – Programme axonometric (B2B, Infrastructure Sector in India: Definitions; Growth and Infrastructure Linkage, 2017)

3.2 Project - Sidney Myer music bowl, kings domain, Melbourne

Figure 23 – Sidney Myer Music Bowl (Langston, 2014)

Originally opened in 1959, the Sidney Myer Music Bowl is a celebrated, rare

survivor of Melbourne's heroic post war period of architecture and is listed on the Victorian Heritage Register. Over time the Bowl was in need of significant restoration and upgrade

required to address its substantial functional deficiencies which made it inadequate to support performances. The upgrade required a change to sightlines, regarding of the grassy berm and flexibility in delivery of the project to avoid impacting the operation of key annual events, specifically the Royal Victorian Institute for the Blind's Carols by Candlelight.

The brief required an upgrade of all facilities to integrate back of house production, catering artist change and warm up, theatre infrastructure and technologies, commercially supportive facilities, hire-out function spaces and a café The use of Construction Management offered a flexible procurement method that supported the changing nature of the brief and the potential for the design to evolve (B2B, Infrastructure Sector in India: Definitions; Growth and Infrastructure Linkage, 2017)

KEY INITIATIVES TO PROTECT THE DESIGN QUALITY

1) Design advice early in the procurement process supported the management of design quality in contract and brief development.
2) An early understanding of the complexity and heritage sensitivities of the site.

3) Independent advice from the original architect Barry Patten.

4) An "open book" approach offered transparency with preliminaries and profits declared.

5) Use of Hooker Cockram asexperienced sub-contractors, as the Construction Management organisation.

CONSTRAINTS

1) The breakdown of the project into two separate stages to facilitate the continuity of use for the Royal Victorian Institute for the Blind's Carols by Candlelight.
2) Unexpected change to the brief for required patron sightlines to the stage area.
3) Unforseen industrial issues beyond the control of the client or Construction Management organisation.

4) A change in government halfway through the project

WHAT WORKED WELL

1) The flexibility of Construction Management as a procurement method supported the design changes required, including adjustment to audience sightlines, the need to raise the berm and additional fill.

2) Efficient and effective resourcing of the project by Hooker Cockram as the Construction Management organization.
3) Major Projects Victoria (MPV) acting as design champion

Figure 24 –SIDNEY MYER MUSIC BOWL (Yusof, 2001)

3.3 Project- SHANGHAI TOWER, CHINA

Figure 25 –Shanghai Tower, China (Ardit, Nayak, & Damci, 2017)

- Architects: Gensler
- Year: 2015
- Photographs: Gensler/Shen Zhonghai

- Architect of Record: Architectural Design & Research Institute of Tongji University (Group) Co., Ltd.
- Client: Shanghai Tower Construction & Development Co., Ltd
- Owner: Shanghai Tower Construction & Development Co., Ltd.
- Interior Designer: Gensler (Retail, Public Space)
- City: Shanghai
- Country: China

China has recently experienced an architectural revolution, particularly in the development of skyscrapers and stadiums. A mega tall tower's design and construction is an extremely challenging and complicated endeavour. Such initiatives necessitate skilled project management that can effectively coordinate the many teams. The tower is an excellent example of great management for a skyscraper of this type. (Stukharf, 1987)

Figure 26 –During construction of shanghai tower (Ardit, Nayak, & Damci, 2017)

The tower is a multi-purpose structure. It is divided into nine functional zones, each with seven structural systems and over 30 electrical, mechanical, and intelligent subsystems. It's a difficult structure that necessitates the collaboration of a big number of specialists and professionals from several fields.

Hence, the project employed more than 30 consulting companies in architectural structure, mechanical and electrical engineering, fire protection, and curtain wall design

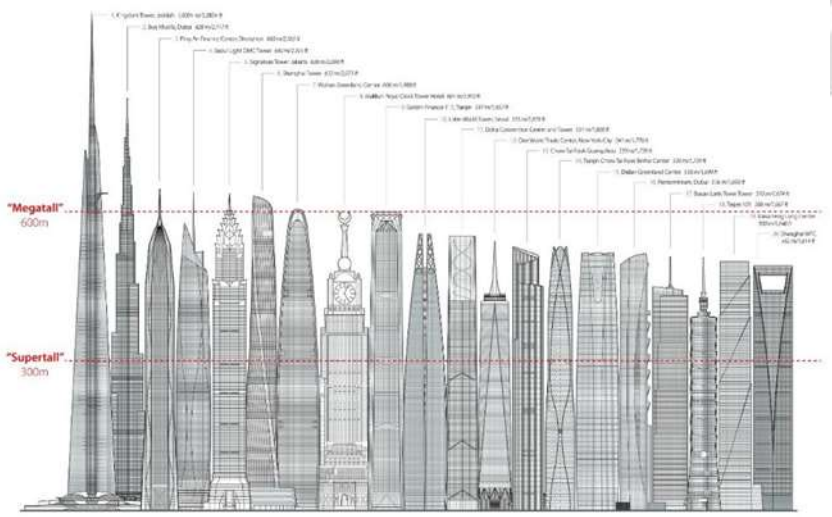


Figure 27 – comparison photo of shanghai towers (Ardit, Nayak, & Damci, 2017)

With such a large number of employees and specialists, project managers face a difficult task in devising an effective coordination system approach. They are looking for an effective information technology that allows all disciplines to work together in a flexible manner through a single unified platform. They used BIM technology to achieve this purpose. As we all know, BIM technology has recently shown to be quite useful in the systematization of various building projects, particularly in terms of cooperation, coordination, and data exchange. It unifies the platform for sharing design files across all disciplines. It's a useful information system that generates a database for all phases of design and construction. (BIMCOMMUNITY, 2021)

This database takes into account the building's DNA and can be used as a guide for future upkeep and development. As a result, Shanghai's Tower Construction & Development chose to use this technology to manage the tower's design, structure, and construction operations.

"We understood that if we tried to operate in a typical fashion, using traditional tools and delivery systems, it would be exceedingly impossible to complete this

project successfully," says Jianping Gu, the company's director and general manager.

Figure 28 –construction of shanghai tower (Ardit, Nayak, & Damci, 2017)

As a result, the BIM application system has been in place and operational since the project's first phase ended in 2008. For the design and documentation processes, Autodesk products were chosen, with Revit Architecture, Structure, and MEP software being used. The Autodesk Navisworks Manage software was utilised to help the staff coordinate their efforts. For environmental analysis, Ecotec Analysis was also used. Additionally, Autodesk Consulting set up an on- site BIM environment for the local team, as well as providing training and support. "By combining Autodesk's BIM technology with Autodesk Consulting's deep experience, we were able to move to BIM significantly more quickly." As a result, this project has established new benchmarks for the management of building project information in China.

Figure 29– BIM Modelling of shanghai tower (Ardit, Nayak, & Damci, 2017)

3.4 Project- Freedom Tower, USA

Figure 30– One World Trade Centre (Umar, 2013)

- Completion Date: 2013

- Height to Architectural Top:541 m (1,776 ft)
- Stories: 100Total
- Area: 320,980 sq. m (3,455,000 sq. ft)
- Architect: Skidmore Owings & Merrill LLP

The freedom tower was constructed in 2013 and the designing was done in 2005 post the terror attacks which happened in 2001

The building was a skyscraper and the main use of the building was of an office building

The Freedom tower dominates the New York skyline as the tallest building in New York.

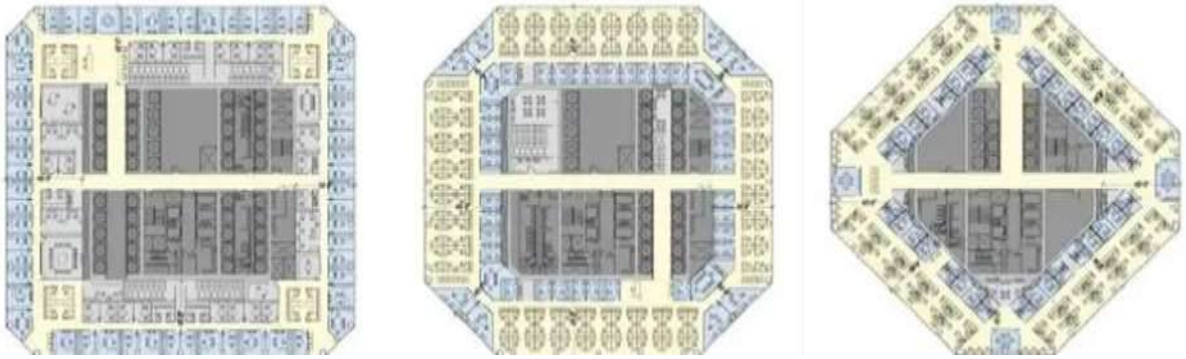


Figure 31– Different floor plans of the world trade centre (Umar, 2013)

Management of the project

Reconciling the engineering scheduling and procurement was done using a BIM software. The firm chose to document the complexities using a BIM software. The tool proved really helpful in modelling the entire tower. The

software also helped in compiling the Bid documents efficiently. The advantage of BIM software was that it helped in creating a close coordination between the (Writer, 2011)architect and the structural engineer. many new tools were found out
during the construction and those tools were later part of the subsequent

releases. The proper management of budget and a good coordination between the architect and the contractors helped the project to be completed within a span of only 8 years. (HARRIS, MCCAFFER, BALDWIN, & EDUM-FOTWE, 2021)

3.5 Project- Al Wahda Master Development

Figure 32– Al Wahda Master Development (HARRIS, MCCAFFER, BALDWIN, & EDUM-FOTWE, 2021)

The Al Wahda Master Development (AWMD) is a massive development in Abu Dhabi, United Arab Emirates.
The five-star Grand Millennium Al Wahda Hotel, with over 800 rooms and private suites, twelve conference rooms, business meeting spaces, and several great restaurants, is located on the property.
It also comprises the largest retail mall in Abu Dhabi, with approximately 400 businesses, a sports club, and other leisure and entertainment amenities.

Between 2005 and 2012, the project was developed and the facility was built, with a total cost of more than £400 million.
Team

Jonathan Mullan, a project manager with over 15 years of expertise in project management consulting, was in charge of the project.
The multinational team of varied personnel completed their multi-task tasks in the project development under his tight supervision.
Strategic Tasks

Design elaboration and verification, engineering workshops, and risk management were among EC Harris's development tactics.
The achievement of predetermined objectives was achieved by the tight categorization of working tasks and responsibilities, as well as the promotion and encouragement of communication within organisational units.
It aided in the development of team cohesion and the dynamic integration of the work process.
Risks

The global financial crisis of 2008 was the most significant risk on the route to a successful project delivery. It had a significant impact on the UAE's development, causing financial stagnation and delaying many of the country's ambitious construction projects.
EC Harris had cost-cutting issues in the purchase and supply of materials during the crisis.

EC Harris was able to overcome major negative influences on the construction process and make significant progress because to its early planning procedures.

Figure 33– Al Wahda Master Development M-FOTWE, 2021
Stakeholder Management
The organisation creates value for stakeholders by adhering to several ethical standards and principles of openness in business behaviour.
Furthermore, one of Arcadis' main corporate goals is to offer a healthy and safe working environment for all employees.
Risk management in the AWMD was aimed at preventing potential dangers and accidents while also taking into account the expectations and preferences of international personnel and clients in this way.
Multicultural Management

One of the most significant hurdles for the project's effective completion is the team's multiculturalism.
Open communication and clear coordination of staff members and stakeholders, on the other hand, aided the AWDN's managers in increasing operational efficiency.
Success

The AWMD project is now regarded as one of Abu Dhabi's most important and profitable businesses.
The focus on quality and rigorous restrictions in the application of cost, time, and scope management were key elements in the company's success.
Recommendations

The coordination of the worldwide work team, the generation of stakeholder value, and risk management were all important issues for EC Harris during the project development.
Managers must be able to recognize and adjust to cultural variations in the host country. The ability to operate effectively both inside and externally requires cultural transformation.
Risk management is one of the most important supervision techniques, and it entails goal-oriented activities aimed at reducing risk and increasing profitability in an uncertain economic environment. Many threats are known to emerge gradually; they are not immediate.
It is easier to uncover links between weak organizational locations and disadvantaged positions when risk management is carried out by a team.

Corporate values may encourage environmental conservation, civil rights protection, equality promotion, multidimensional development of local communities, infrastructures, and economies, among other things, as part of organizational culture.

3.6 Project- Palais Royale, Mumbai

Figure 34 – Image of construction of palais royale Mumbai (Abdellatif & Abdellatif, 2020)

Palais Royale is the most elevated Residential pinnacle in India which is arranged in worli, Mumbai. Licenses for advancement were permitted in 2005, and

improvement began in 2008. In 2012 the advancement was halted for this is a result of the issues in the height of the design. The 13 upper floors were unlawfully being intrinsic it. Close to the end the height was decreased. All through the construction the proportion of money was even extended to 3000 crores. The design was then completed in 2017 it required hard and fast 9 years to complete the development as it was halted on various occasions during its development. (matar & georgy, 2010)

3.7 Project- Dwarka Expressway, India

The Dwarka Expressway is a 27.6-kilometer highway that is still under construction. It is proposed to run from Delhi's Mahipalpur to Haryana's Kherki Daula Toll Plaza in Gurgaon. It is planned that a new connecting route between Delhi and Gurgaon be built. However, the expressway has been under development for a long period. (ahmed, Raymond , Tang , & Zheng, 2005)The highway was first proposed in 2006, and construction began in 2011.Because it was not considered a priority at the time, the bidding process was delayed due to inadequate management.

It took five years merely to complete the bidding and land distribution processes.

The project was expected to be finished by 2018, however barely half of it was finished in 2018. Following that, there was a dispute between the Delhi Forest Department and the NHAI, which caused development to be halted until 2020, when it was resumed in 2020 and is now expected to be completed by 2022. The project's deadline was pushed back by four years, which is a significant amount of time, and the project underwent many adjustments that cost more than the

original budget. If the project had been properly managed, it would have been completed on time and would have been a lifesaver for those who travel this road daily.

Figure 35 – Image for status of Dwarka expressway in October 2021 (Kang, Jin, Hyun, & Park, 2018)

3.8 CONCLUSION

As can be seen from the preceding case studies, five are from Developed countries and two are from India. In this we can see that buildings in industrialised countries had a faster construction timetable, spent less money, and had a higher quality. Despite the fact that Dubai was in the midst of a recession, they were able to complete the Burj Khalifa in just five years. The Palais Royale in India took 12 years from the time the proposal was suggested to the time the building was constructed, whereas the the construction time took 9 years and three years were just for the preparation for the initiation of the building. A city can grow if there is a development plan in place and a desire to build something that has never been created, as seen in the case studies of Dubai, China, and the United States. They attempted to execute the project

within a given time frame and under a certain cost estimate, allowing them to focus on several projects, however we have seen countless incidents of time and expense overrun in India. To increase the quality of construction, competent project management must be introduced, as in the case of industrialised countries, so that we can support complex designs that take longer to finish than they should take.

4. DATA COLLECTION

4.1 ONLINE SURVEY

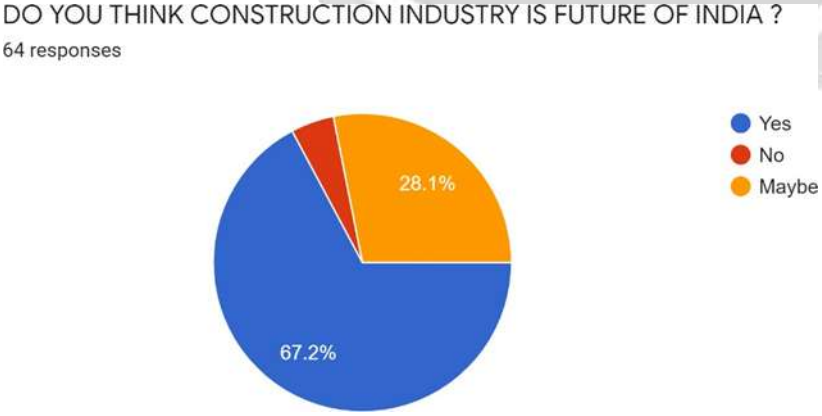


Figure 36– Do you think Construction Industry is future of India ?

About 67.2% of the respondents think and agree to the fact that the construction industry is the future of india and in future india will be home to many such complex architectural forms we see around the world

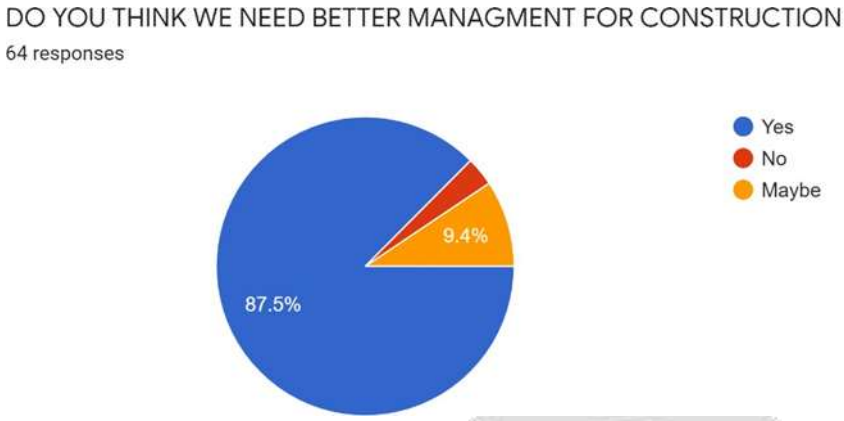


Figure 37– Do you think we need better management for construction industry in India?

About 87.5%of the respondents think that the present situation in construction industry is not upto the mark as projects started are never finished or they take a great amount of time or there is a cost overrun in it so, we need a better management in the construction industry,So that in future we can create complex architecture in india in minimal required time and save the cost in whatever way we can .

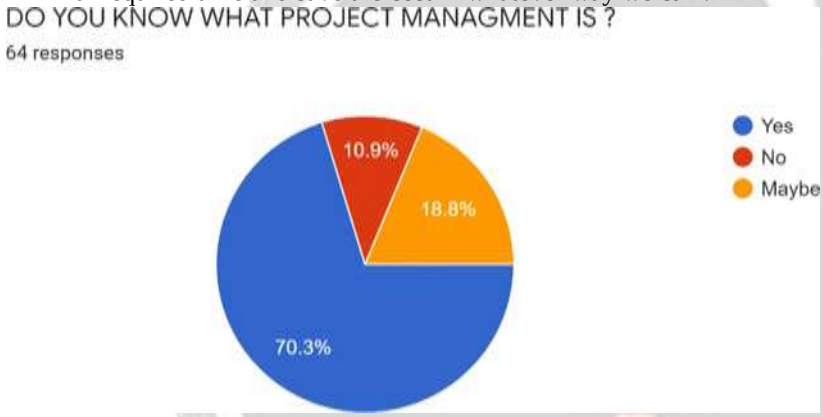


Figure 38– Do you know what project management is ?

About 70.3percent people knew what construction management is but still about 18.8percent people were unsure what it is and 10.9 percent didn't have any idea about it

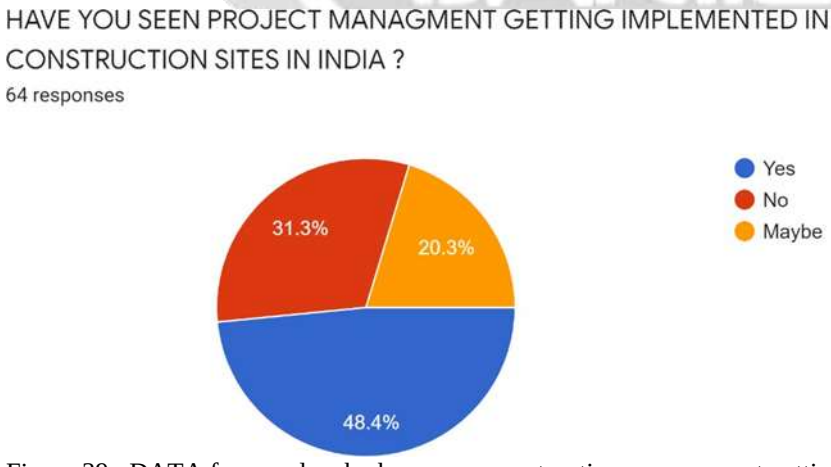


Figure 39– DATA for people who have seen construction management getting implemented in India

This was the most important question of the survey 48.4 percent people have seen it getting implemented it means that people know about it but still about

31.3 percent people havent seen it getting used in india. But the real question arises if it is getting executed then to what extent is it getting used

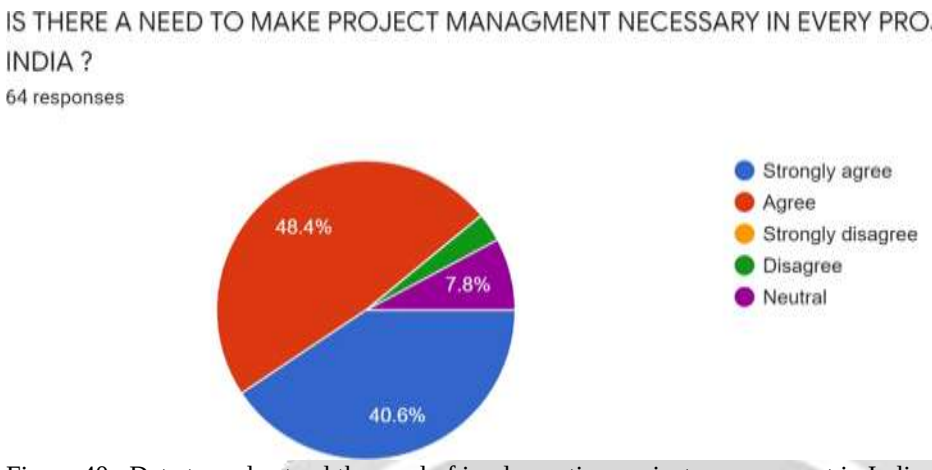


Figure 40– Data to understand the need of implementing project management in India

About 40.6 percent people think that construction management should become necessary in every project which is started in india.about 27.3 percent agree i.e. more than 75 percent people agree to the fact that construction management should become necessary.This can basically be a solution of the problem that if every project gets approval only if there is construction manager associated with it.The problem which india is facing right now related to construction industry will be solved for future

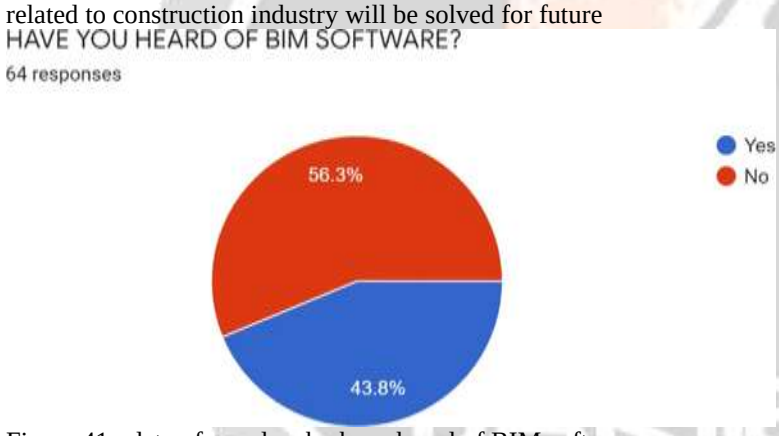


Figure 41– data of people who have heard of BIM software

About 56.3 percent of people have not heard about BIM software.There should be increase in knowledge about it . it's a major tool which helps us understand the short comings the project will face during construction as it helps in 3 dimensionally visualising our project and understanding the problems and finding on the spot solutions for them .

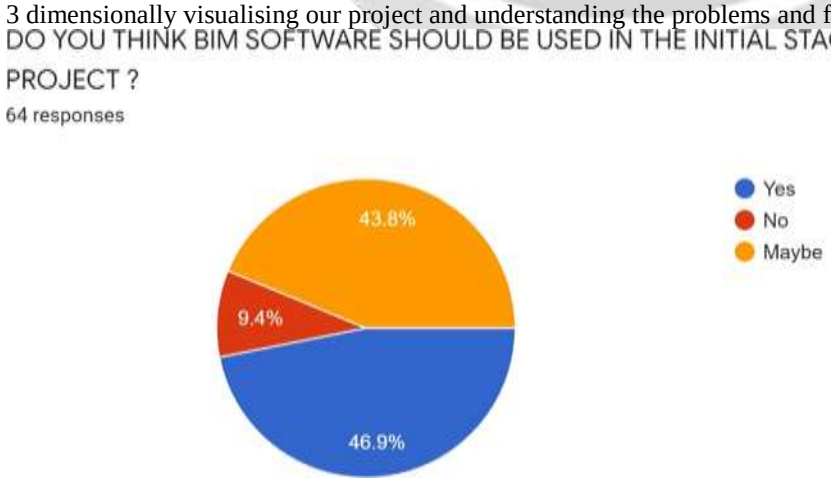


Figure 42– data of people who think BIM should be implemented in early stage of planning

About 43.8 percent people involved in the survey know what BIM is and they think that it should be involved in planning the project but still a majority population is not aware

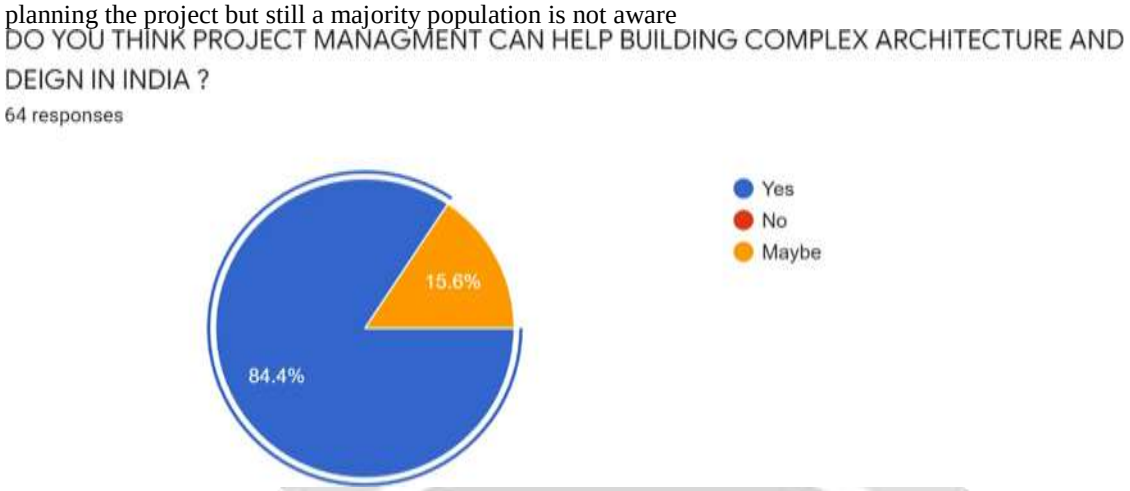


Figure 43– data of people who think project management can help in fostering creativity in India

This final question brings us to the end of the survey in which about 84.4 percent people agree to the fact that construction management can help constructing complex architecture and design successfully in India in the near future

4.2 EMAIL QUESTIONNAIRE

The questionnaire was designed for persons who work in the construction business in general. It was critical to consult certain specific people active in construction or related to the fields of design and project management to further corroborate my findings. Persons working in India as well as people working in affluent countries such as the United States were requested to participate in the survey. Architect Hafeez Contractor, Sanjay Puri Architects, Skidmore, Owings & Merrill (SOM) , Fosterandpartners, M3M India, and Nirala Infratech were among the firms involved.

The major goal of the survey was to determine the extent to which different project management approaches are used in the execution of their projects. It was discovered that all industrialised countries, such as the United States and the United Kingdom, have rules stating that any new project cannot be begun until a project management organisation is linked with it. Whether the project is government-funded or privately-funded, they must engage with a project management organisation to solve problems in the initial stages of their designs. This allows them to develop many complex ideas quickly and efficiently.They also stated that the importance of government help by altering the rules and regulations to construct a landmark building. That is the reason we see such landmark buildings which are considered architecture marvels in countries like Dubai and the United States. They stated the benefits they get from Bim softwares when they use it in the initial stage of planning a project. Due to the above mentioned reasons we can see some creative architectural designs in many developed nations, however in India, there is no such rules introduction of these rules can possibly help in speeding up the construction work in India . In India many private developers work with various project management organisations since they need to finish their projects in time, build confidence with their clients, and begin earning money from their projects. They also want their project to stand out from what their competitors are giving, but with government projects, 80 percent of projects that begin are never completed on time; they experience delays as a result of inadequate capital and resource management. It was also discovered that while cost overruns are uncommon in affluent countries, practically every government project in India has experienced cost overruns during development, which can be attributable to corruption. If the resources are well managed in India, we should expect to witness rapid progress in the field of architecture and design.

QUESTIONS THAT WERE A PART OF EMAIL QUESSTIONAIRE
Q1, do you use any project management techniques?
Q2, do you use BIM software's for speedy construction?
Q3 The effect of using project management in your projects?
Q4, do you get any help from the government?

4.3 CONCLUSION

The majority of Indians are familiar with the fundamentals of project management and its applications, but few have seen them implemented in India. People are aware of bim software, but they haven't seen it used by architecture companies. However, they believe that project management can benefit the Indian construction industry, which they believe is in desperate need of transformation. This leads me to the second step of data collection, which is an interview to validate the data from a far more reliable source: the developers and stakeholders. It was discovered that allocating a project management firm to each project is preferable, providing government support, flexibility in many rules and regulations which can aid in the timely completion of the project and the reduction of cost overruns, as well as the efficient completion of complicated architecture and design.

5.CONCLUSION

The construction industry is the cornerstone of any country's development. It not only helps a country's GDP, but it also helps other businesses such as tourism, manufacturing, fashion, and food by building infrastructure for them. Every country aspires to produce at least one such architectural masterpiece every five years, which might assist them attract more investment from developers who see a good opportunity in that location, as well as more tourists. This research looks at project management techniques that might be used in architectural design projects to encourage innovation in a developing country. The study uses a literature review to identify the need for developing architectural projects, to comprehend the problems that any developing country like India faces, and to propose solutions to these problems. For example, in India, many projects remain undeveloped or have time and cost overruns during construction due to poor resource management and a lack of trust between the architect and the client. The research aids in the identification of various project management tactics, such as the use of BIM, GIS software and other collaborating softwares, as well as their comprehensive benefits. The study also focuses on the requirements, advantages, and techniques for improving communication between the architect, stakeholders, and the contractor. Through several case studies, the study also draws a distinction between the cases of developed and developing countries. In the case of Dubai, they built the world's tallest building in just 5 years during the economic downturn, but in the case of the Palais Royale, India's highest residential building, it took a total of 12 years, with only 4 years dedicated to obtaining the necessary permissions to begin construction. It also emphasizes the critical

function of project management in finishing the building of extremely complex architecture and design in a timely and cost-effective manner. The case studies also highlighted the fact that in usa for freedom tower new laws were made in India we should have a similar approach for building a landmark building. Although the project management research was not specifically focused on architectural design projects, the survey that followed it investigated the applicability of its findings in an architectural context. So, an online poll was conducted with 64 replies, revealing that while over 80% of people knew or had heard of project management and BIM software, only about 30% had seen it being utilized in various construction sites in India and in architectural offices in India. This

brings up the issue of bad management in the Indian construction industry. The replies and feedback received from architects, stakeholders, and students studying architecture in India demonstrate that the questions were genuine and relevant to the area of architecture. An email questionnaire was sent to some major firms in India as well as firms practicing in developed countries to validate the responses. This highlighted the importance of project management in creative architecture and design, as well as the importance of having a planned approach before beginning any project related to architecture and design.
The major takeaways from the reading:

- A better communication between the architect, the stakeholder and the contractor
- Using BIM, GIS and collaborative software's at planning or bidding stage in a project
- Flexibility in bye laws for a landmark project

- Availability of resources (like we saw in Burj Khalifa how they built the communication system to communicate with the ground team from 60 floor)
- Availability of sufficient capital
- Keeping a check on corruption
- Managing the resources properly
- Prioritizing the project
- Managing the quality, procurement and communication
- Understanding the scope at an early stage
- Sticking to the deadlines prepared

5.1 RECOMMENDATIONS FOR FUTURE

This Dissertation was a first encounter and an attempt to highlight distinct intersections of creativity, project management, and architecture projects, therefore opening up a plethora of new research possibilities in the future. Project management as a tool is a broad topic to study, and while just a portion of it is covered in this dissertation, more in-depth research on the issue is possible. Another important subject is to evaluate the function and value of creativity in various sorts of initiatives, such as commissions, design contests, and research projects. The findings may indicate that alternative modifications of creativity-related project management approaches or technologies are required. Furthermore, making creativity an evaluation factor for project success could be an excellent way to emphasise its value and make it a priority for project management.

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