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"A Case Study for Identification and Analysis of Construction Project Risks in Vadodara City"

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Abstract: This study focuses on exploring the nature and causes of risks for construction projects for building construction in Vadodara City in India. Recent developments present several risks that affect the project; these are financial, legal environmental-social risks, safety risks as well as technical risks that relate to residential, commercial and infrastructural developments. The research combines both qualitative and quantitative approaches to estimating and assessing risks by applying site visits, interviews, and documentation surveys. Some of the regularly seen risks include weather, people and material-related issues, and legal concerns. The three key areas collectively affect cost, planning and quality of a project includes increasing planning efforts, management of construction stakeholders and the strategy of incorporating greater flexibility in the risk management of construction projects to improve the success rate of these projects.

Keywords: *Construction Risks, Vadodara City, Risk Management, Building Projects, Risk Mitigation, Project Performance etc.*

1. Introduction

The construction industry in Vadodara City in the Indian state of Gujarat has grown tremendously in the recent past due to increased expansion of this young city. This growth has been occasioned by higher demand for housing, commercial, and other infrastructure, thus standing as one of those sectors that attract many construction activities. Still, the process of turning the city around accelerates, and the size and intensity of construction projects are also growing. In as much as this dynamic environment presents many opportunities for economic development, construction projects within the environment are faced with numerous risks that bear influences on the construction projects time of completion cost, quality, and safety.

This is crucial in the construction projects since stakeholders have chances to examine conditions that may be undesirable in a certain project and avoid progression of these conditions. When it comes to the construction project of Vadodara, the kind of buildings being constructed – residential, commercial – brings uncertainties in every phase of construction right from design stage to procurement stage, execution to closure phase. These risks can be of external nature including, and not limited to, unfavourable weather conditions, high costs, regulatory alterations, scarce resources, and technological difficulties. It is crucial for individuals to be able to recognize, assess, and appropriately mitigate these risks, to improve project performance in construction deliveries.

2. Objective of the Study:

In line with the above background, the research main aim relates to examining construction risks in building projects within Vadodara City. The goal of this research is thus to undertake an empirical case study of construction practice to capture and document risk and its influence on building construction costs, time, quality

and safety. The research also aims at critically assessing available approaches of managing these risks and providing feasible suggestions to enhance risk management.

Scope and Significance:

This research will be useful to all the stakeholders with interest in construction projects in Vadodara, the project managers, engineers, developers and contractors. When the risks associated with the construction of buildings are fully understood then the performance of the project should receive a boost, and there will be little incidences of cost overrun, and more importantly, safety measures will have been observed properly. Furthermore, this research fills in the existing literature by providing information and findings on construction risk management practices in the region that can be useful for similar urban construction contexts.

3. Methodology

Case Study Selection:

- Works selected were based on the construct of normal construction processes in Vadodara City which involve both residential, commercial and combinations of both.
- Screening factors used included size and scope, work progress, existing construction, and accessibility to key project participants and information.
- Targets were set in the present and in the more recent past because this would give a broad view of the risks over time as projects are initiated, under construction, and during completion.

Data Collection Techniques:

- **Site Visits:** Those site visits were for assessing the construction progression, safety conditions and other problems or issues prevailing on site.
- **Interviews:** Qualitative surveys in the form of semi-structured interviews with project managers, engineers and site supervisors were conducted in order to understand the perception of risk, risk management approaches and the experience encountered during project delivery.
- **Project Documents Review:** Review of records in project contracts, plans, schedules, and risk registers with a view of assessing recorded risks and courses of action taken on them.

Risk Identification Methods:

- **Checklists:** Accomplishment of developing risk checklists with reference to the financial, technical, and environmental risks appropriate to the construction context in Vadodara.
- **Site Observations:** Assessment of risks during site visits that could be in relation to safety issues, environment or issues to do with access.
- **Expert Interviews:** Talks with other vendors revealed some of the hidden risks could not be quickly discerned by newer employees.

Risk Analysis Techniques:

- **Qualitative Assessment:** Risk-ranking on the basis of likelihood and impact; experts' opinions to determine risks priority.
- **Quantitative Methods:** Risk matrices have been used here to give a measure of the potential effects of each identified risk in terms of qualitative probability and qualitative impact on project performance.
- **Comparative Analysis:** Risk comparative analysis between projects to analyse systemic and unique characteristics in Vadodara construction process.

4. Case Study Findings:

Construction risk management is crucial for growing city construction projects like Vadodara City, India, to guarantee project success. As per the study complied by Goh and Abdul-Rahman (2013) Construction risks are of four types- financial risks, environmental risks, technical risks, safety and legal risks resulting in the problems related to cost, time & quality. These risks include; volatile raw material costs, employee drawback, and

climatic conditions that are a common con in Vadodara construction firms and compliance risks. The uncertainties seriously affect financial costs, especially cost of prices and availability of labour, which may lead to a budget increment of 10-20% (Ahmed & Azhar, 2004).

In addition, there is legal risks such as permits and zoning laws which take approximately 15-25% of the total time to handle (El-Sayegh, 2008). Accidents and incurred factors are an aspect of concern because some of them can lead to accidents on site and consequent legal charges affects the quality factor of a project as well as time factor. Risk-ranking and probability-impact matrices are widespread tools for evaluating these risks since they can be categorized as qualitative and quantitative (Carr & Tah, 2001). According to Kerzner (2017) it is better to improve general and specific project management planning solutions involving all stakeholders, and developing better contingency budgets to mitigate such risks and enhance project's performance.

5. Risks Identification in Construction Projects

Risk identification is also an important in construction projects because it involves time for noting down challenges which may later be controlled to delay the project, increase cost or affect quality. This paper aims at identifying the risks that may affect the performance of building construction projects in Vadodara City. The following can be classified under financial risks, legal risks, environmental risks, safety risks, and technical risks. Business financial risks include cost increases, budgetary increases and changes in cash flows due to key factors such as; fluctuating material prices, any other unanticipated incidences and even economic volatilities. This is because of elements such as contract and land development problems, regulatory problems that may perhaps be in certain contracts, changes within building codes or laws among many others. Some of the environmental risks include; The floods, extreme weather conditions which can affect work progress and Acts of God such as They include floods, extreme weathers and soil instability that hampers construction processes. Safety risks entail the possibility of occurrence of mishaps at a particular site, or to employees and other stakeholders due to failure to observe safety measures, poor site management, and or flouting safety standards. The technical risks are typically the design flaws or construction faults or problems with one or many systems of the buildings.

The following risks are prominently found in Vadodara's building projects because of the nature of construction business. This means that site-specific challenges may include; restricted movement to construction zones due to population density in urban areas and limited space for materials and equipment storage. Ideally, monsoon delays the construction period, brings lots of disturbance, damages material, and even site gets inundated, which disturbs the quality and time scale of construction. Another real threat is availability of human resources as well as skilled workers impede the process at hand and increase expenses. Besides, getting permits, following zoning requirements and meeting local environmental requirements add regional compliance factors that pose challenges.

The later that risks emerge, the further from their sources, the more diverse those sources and the more varied the causes that give rise to them. Design errors are commonplace in most construction projects and most times they are caused by a lack of proper planning, coordination or supervision. Business disappointments that include poor schedule planning, resource organization, and management as well as poor stakeholder coordination will worsen delays and cost sprees. Third, when safety compliance is absent from the workplace, worker mishaps and incidences of accidents are 'rife' on construction sites, which disrupt work and generate legal risks. Overall, the above risks indicate that risk identification, plus risk management strategies should be implemented in the construction industry in Vadodara to meet the set aims and objectives.

6. Risk Analysis

Risk assessment in construction projects is important as it helps in ordering the different risks discovered during the planning and project implementation stages. In the context of Vadodara City, the variety of risks involved in building construction projects were described quantitatively and qualitatively to determine the degree of influence they have on the outcome of building construction projects. Concerned risk identification, the likelihood and consequence of each risk management identified above was conducted using a qualitative

analysis approach and consultation of expert project managers, engineers, and site supervisors. They advised the team on the likelihood of risk occurrence and an assessment of the risk impacts on cost, time, quality and health of the project. The risks were subsequently ranked using a scale whereby risks are categorized in relation to their probability of occurrence and impact as being low, medium or high. For example, concerns like weather related risks are considered to be potential risks because it is likely to happen during the monsoon while most compliance issues are moderate risks because though complex they are not very likely to occur.

The tasks of risk prioritization were also supported by quantitative analysis and risk modelling tools including electricity probability-impact matrices. In this case, a likelihood rate and an estimated cost as well as time of occurrence of every identified risk factor were assigned. This made it possible to estimate potential risks effects to the project budgets and time frames much more accurately. For instance, shortages of labour force were described in relation to possibly doable cost added per day, and technical design faults were estimated in relation to the possible expense of redesigning or extra work. The probability-impact matrix was useful for making the key risks that need to be addressed and to address evident, for example material price volatility which is typically a cost increase with a probability of 15 to 20% or project schedule volatility where there can be 10 to 15% of an increase in schedule.

This investigation highlighted the fact that risk patterns emerged when data was collected from more than one building project in Vadodara. Some of the observations made were delayed schedules resulting from unpredictable weather, increased costs resulting from price fluctuations of materials, and more networking to delays resulting from labour shortage. Furthermore there were regulatory issues which were determined to have a great influence by type and location of the projects, whereby some of the projects required additional time for permits to be approved because of zoning or environmental issues. In general, these patterns underlined the necessity of development of sound risk management programs that would reflect the specific conditions of the Vadodara construction environment and would serve as a starting point for constant identification, assessment, and control of risks that might hinder project performance.

7. Risk Impact on Project Performance

Challenges affecting construction projects in the building construction sector in Vadodara City include costs and time, and quality, which make project unprofitable, time-consuming, and poor. Pending costs are common to most risks for instance material price changes, labour shortage and changes in design that result in addition of 10-20% in the cost of a project. There are also another problem, such as time delays which can arise due to the influence of this weather conditions, regulations, or proper management of time schedule, and it is another crucial factor which contributes to the percentage of project completion, and such can take around 15-25% more to complete a project. Quality is reduced when risks include lack of supervision that may cause the construction industry to be substandard, to undergo modification, or even complete redesign because initial construction did not meet expectations due to technical problems or lack of protective measures for workers. For example, some mistakes in construction could lead to flaws in the structure that is designing a building, and often lead to increased cost and time of construction.

In order to avoid these risks, the following strategies are practices by construction companies in Vadodara. Better project planning with special reference to risk analysis and time management addresses proactive approaches that seek to prevent or overcome the likely hitches that may cause delays. Safety procedures and compliance monitoring guarantee standard observance regarding quality and safe practices to avoid mishaps on site. Contingency is also used intensely in establishing budgets for the unexpected costs to be catered too. Also, having frequent communication with the stakeholders, few steps to acquire permit, and hiring experienced labour also reduce risks. Such strategies, appropriate in the circumstance of Vadodara construction context, have been useful in preventing the level of risk affects the project outcome.

8. Conclusion and Recommendations

The study conducted on the building construction projects in Vadodara City brought out some of the main risks hurts occur frequently and affect the projects. Among these, some of the more well-known risks look as follows:

weather risks, labour risks, material costs risks, and regulatory risks. For instance, the continuous raining through monsoons other through the year which is typical in Vadodara, affects work in that it triggers halts; work halts on average equal to 15-20 days. Shortage in workers, and in particular skills labour gently in addition to the timeframe, puts pressure on the cost of labour, rising by 10-15%. Also, the fluctuating nature of costs of basic materials in construction such as cement and steel has been cited to raise costs of construction projects by 20%. Environmental issues for example acquiring a building permit within the required time, and dealing with the ever changing environment laws add to these unpredictable project time variables.

With reference to this case study, key considerations of the Realization of Vadodara Construction Industry Crisis the area highlighted here is risk management in the construction industry of Vadodara. Construction risks should always be managed through planning for the potential risks, communicating with other stakeholders and incorporating flexibility for managing the risk. For example, choosing module construction approaches and carry out tasks depending on weather conditions can reduce weather contingent issues. One way to rationalization for unfavourable contract conditions is the basic relations with suppliers and by purchasing in large volume.

That being the case, several challenges remain for stakeholders. The scarcity of skilled employees is still a major problem here which hampers the work and causes the quality to suffer. In response to this, construction firms are considering the possibility of offering skill development programs for the local workforce and the use of innovative construction tools that can be managed with minimal human power. The longer the regulatory approval process is also a problem and is workable with proactive communication with regulators to adhere to the necessary conditions expeditiously. Further, the workflow of documenting projects and communication also increases the awareness of risks that are more likely to happen to a project so that quick action can be taken to overcome such problems.

9. References:

[1] Ahmed, S. M., & Azhar, S. (2004). "Risk management in construction projects." Construction Industry Institute Journal, 5(1), 1-12.

[2] Aven, T. (2016). "Risk assessment and risk management: Review of recent advances on their foundation." European Journal of Operational Research, 253(1), 1-13.

[3] Bhandari, R. (2020). "Risk identification and assessment in construction projects in developing countries." Journal of Civil Engineering and Construction Technology, 11(3), 43-52.

[4] Ahmed, S. M., & Azhar, S. (2004). Risk management in construction projects. Construction Industry Institute Journal, 5(1), 1-12.

[5] Carr, V., & Tah, J. H. M. (2001). A fuzzy approach to construction project risk assessment and analysis: Construction project risk management system. Advances in Engineering Software, 32(10-11), 847-857.

[6] El-Sayegh, S. M. (2008). Risk assessment and allocation in the UAE construction industry. International Journal of Project Management, 26(4), 431-438.

[7] Goh, C. S., & Abdul-Rahman, H. (2013). The identification and management of major risks in the Malaysian construction industry. Journal of Construction in Developing Countries, 18(1), 19-32.

[8] Kerzner, H. (2017). Project management: A systems approach to planning, scheduling, and controlling. John Wiley & Sons.

[9] Carr, V., & Tah, J. H. M. (2001). "A fuzzy approach to construction project risk assessment and analysis: Construction project risk management system." Advances in Engineering Software, 32(10-11), 847-857.

[10] Chileshe, N., & Kikwasi, G. J. (2014). "Perception of barriers to implementing risk assessment and management practices by construction professionals in Tanzania." Procedia - Social and Behavioral Sciences, 119, 682-690.

[11] El-Sayegh, S. M. (2008). "Risk assessment and allocation in the UAE construction industry." International Journal of Project Management, 26(4), 431-438.

[12] Flanagan, R., & Norman, G. (1993). "Risk management and construction." John Wiley & Sons.

[13] Goh, C. S., & Abdul-Rahman, H. (2013). "The identification and management of major risks in the Malaysian construction industry." Journal of Construction in Developing Countries, 18(1), 19-32.

[14] Jha, K. N. (2011). "Construction project management: Theory and practice." Pearson Education India.

[15] Kartam, N. A., & Kartam, S. A. (2001). "Risk and its management in the Kuwaiti construction industry: A contractors' perspective." International Journal of Project Management, 19(6), 325-335.

[16] Kerzner, H. (2017). "Project management: A systems approach to planning, scheduling, and controlling." John Wiley & Sons.

[17] Loosemore, M., Raftery, J., Reilly, C., & Higgon, D. (2006). "Risk management in projects." Routledge.

[18] Lyons, T., & Skitmore, M. (2004). "Project risk management in the Queensland engineering construction industry: A survey." International Journal of Project Management, 22(1), 51-61.

[19] Mehdizadeh, R., & Preece, C. (2016). "Risk management in construction projects." In Construction Safety, Health and Well-being, CIB World Building Congress (pp. 1-10).

[20] Ofori, G. (2000). "Challenges of construction industries in developing countries: Lessons from various countries." Construction Management and Economics, 18(2), 155-160.

[21] Oladokun, M. G., & Ibironke, O. T. (2013). "Assessment of risk associated with public-private partnership infrastructure projects in Nigeria." Journal of Engineering, Project, and Production Management, 3(2), 78-88.

[22] Raftery, J. (1994). "Risk analysis in project management." E & FN Spon.

[23] Smith, N. J., Merna, T., & Jobling, P. (2014). "Managing risk in construction projects." John Wiley & Sons.

[24] Tah, J. H. M., & Carr, V. (2000). "A proposal for construction project risk assessment using fuzzy logic." Construction Management & Economics, 18(4), 491-500.

[25] Zou, P. X., Zhang, G., & Wang, J. (2007). "Understanding the key risks in construction projects in China." International Journal of Project Management, 25(6), 601-614.