

An Evaluation and Analysis of Delay in Residential Building Construction Projects in India

Mritunjay Kumar¹ Rakesh Sakale²

¹Research Scholar ²Associate Professor & Head of the Department

^{1,2}Department of Civil Engineering

^{1,2}Peoples University, Bhopal, India

Abstract— Residential building projects in India plays a major role in its GDP. But, due to several factors this construction industry has become a problem for many involved in it directly or indirectly. Residential building projects are often delayed in India due to many factors. This research papers focuses on the identification and evaluation of factors which affect the delay in residential building projects in India. The two factors which have been studied in great details and discussed are cost escalation and cost overrun which affects the overall process of delay and creates several other problems. The research provides valuable insights in such factors.

Keywords: Building Construction Projects, Cost Overrun, Cost Escalation, Case Study, Questionnaire

I. INTRODUCTION

In India, Construction Industry assumes a critical part in both monetary development and destitution decrease. The business burns-through around 40 to half of the public long term plan expense and adds to almost 20% of GDP. Development industry is the second biggest industry next just to farming as far as giving work in India (Construction Industry Development Council). Government is focusing on a financial development of around eight percent during the Twelfth five-year Plan (2012-1). Development projects involve high danger, long incubation period, significant expenses and spending plan imperatives. India is the second most crowded country on the planet with more than one billion individuals representing around 16% of the total populace. It is assessed that the populace living in metropolitan regions will increment from 29% in 2000 to 40 percent by 2030. Thusly the heightening interest requires sufficient structure framework offices at sensible expense (The India Infrastructure Report 1996).

Indian government has joined high need to the structure area (UK Trade and Investment). Fast development in the country in the course of recent years has extensively stressed its foundation. India needs huge interest in the foundation area as numerous corporate pioneers feel that the current framework is deficient to help their business needs and long-term development. India has been somewhat delayed in making building foundation in front of interest, and has commonly taken care of business when bottlenecks become evident (Survey report of KPMG International and Economist Intelligence Unit). Speculation necessity for lodging in metropolitan regions has been assessed at Rs.526000 million (US\$ 12.5 billion) in the 9th long term plan (1997-2002). Market size, market potential, workforce abilities are the main components for thinking about Foreign Direct Investment in Construction and Engineering in India. Unfamiliar financial backers in India anticipate high paces of profit from their ventures (FDI Confidence Audit: India

2001). In India, the exhibition record of fruitful execution of foundation projects has not been empowering. Cost overwhelm and cost acceleration are an integral part of the development projects.

II. BACKGROUND AND LITERATURE REVIEW

The presentation of Government development projects is not found acceptable. Cost overwhelms and cost heightening are an integral part of the development projects in India. In India, all focal and state government supported super tasks and government assistance plans on a normal every year face cost heightening of about Rs. 400000 - 500000 million. The Infrastructure Monitoring Division (IMD) in the Program Implementation Wing is endowed with the checking of execution of the country's eleven key foundation areas viz. Force, Coal, Steel, Railways, Telecommunications, Ports, Fertilizers, Cement, Petroleum and Natural Gas, Roads and Civil Aviation. Venture Monitoring Division (PMD) screens all Central areas undertakings of the Government costing Rs.200 million or more.

As on March 2008, out of 909 ventures costing Rs.200 million or more, 346 tasks were running delayed concerning the most recent endorsed plan. The Cost heightening in 346 postponed projects is Rs.246890 million which is 13.33 percent of the most recent supported expense of Rs.1850890 million. Out of 515 activities, each costing Rs. 1000 million or more, have postponed in the scope of 1-96 months in regard of street, Steel, Power, Petroleum, Road Transport, Railways, Port and Shipping projects. The absolute expense of execution of 515 tasks when endorsed, was of the request for Rs.3534830 million however this was thusly changed to Rs.390640 million inferring an expense invade of 10.5 percent. The focal government-supported foundation tasks of over Rs. 1000 million is relied upon to ascend by another Rs. 460000 million when they are finished. Rail routes' tasks have announced greatest rate spike in their expected expenses. For a sum of 138 ventures, the expense is relied upon to practically twofold from Rs. 37,8630 million to Rs. 70,2370 million when they are finished (Indian Express, New Delhi, Oct. 10, 2008).

A single infrastructure project under ministry of health and family welfare reported maximum cost escalation of over 500%. About 250 projects of railways have reported cost escalation by about 88%. The situation is same with projects under ministry of water resources and ministry of information technology where cost of projects has escalated by 119% and 34% respectively. From 1st of Jan, 2009 the cost escalation has gone up by 41% from Rs. 918410 million to Rs. 1295600 million. It is unfortunate that despite repeated concern expressed by the government, the position instead of improving has rather worsened further and the escalation is

increasing with the passage of each year (Infrastructure Today, April 2009).

Warszawski (1982) [1] has concentrated on administrative choices under swelling. The review focussed on issues of administrative dynamic under swelling. Expansion presents an enormous proportion of vulnerability into numerous spaces of administrative dynamic in development. The most troublesome capacity in this regard is cost assessing. Another trouble emerges in capital planning measure, where an organization's capital base is disintegrated through tax collection from swelled instead of genuine pay. The trouble might be reduced exhaustive suitable change in deterioration bookkeeping. Farid et al (1985) [2] have concentrated on reasonable and sensible increase (ranch) evaluating model. The reasonable and sensible increase (ranch) is the littlest increase that fulfills the necessary pace of return (RRR) of the worker for hire for the specific task.

Panchadhari (1992) [3] have concentrated on value development hazard utilizing fluffy set application. The review introduced a danger estimating calculation to help workers for hire in choosing the offering cost of a development project where the outcomes coming about because of hazard occasions identified with the task are questionable. A microcomputer-based programming, in light of the danger evaluating calculation, was created. The strategy comprises of distinguishing hazard components and evaluating hazard related results. Parfitt et al (1993) [4] have concentrated on agenda basic achievement factors for building projects. The review distinguished that arrangement of basic venture achievement factors that assume a significant part in the arranging, plan, and development of fruitful structure projects.

Ioannou et al (1993) [5] have concentrated by and large – bid technique – cutthroat offering methodology. Investigation discovered that the essential benefit of the normal bid strategy, according to a proprietor's viewpoint, is that it shields against marking a development contract at a ridiculously low bid cost that very likely will prompt antagonistic connections during development. Exceptionally low bid costs frequently lead to inordinate cases and questions, and result in cost increments and timetable postponements. The fundamental disadvantage of the normal bid technique as characterized here is that it doesn't really advance value rivalry that prompts lower costs for the proprietor. The normal bid strategy doesn't debilitate advancement, innovation improvement and variation, and cost decrease. At the point when such reserve funds are free all through the business, be that as it may, bid costs ought not out of the ordinary to step by step fall and the investment funds will ultimately be passed to the proprietor.

Paek et al (1993) [6] have concentrated on evaluating development hazard: fluffy set appeasement. A danger valuing calculation was given to help workers for hire in choosing the offering cost of a development project where the outcomes coming about because of hazard occasions identified with the task are questionable. The review was fostered a microcomputer-based programming, in view of the danger valuing calculation. Effect on outcomes can be described by applying fluffy set hypothesis and consolidated straightforwardly into the offering value choice interaction. Since the determination of hazard components will in general

be case explicit, practical speculations are difficult to define. All in all, the sort of hazard components fluctuates with the sort of development projects, and the quantity of hazard components relies generally upon the degree of investigation wanted (fundamental or itemized). Be that as it may, care should be taken to recognize all the danger components, where unfortunate results may lethally blemish a development undertaking, and it should likewise be taken to eliminate a capability of one-sided inputs.

Touran (1993) [7] has concentrated on probabilistic expense assessing with emotional connections. The investigation discovered that hardships in probabilistic assessing represents the current relationships among cost parts demonstrated as arbitrary factors. Ascertaining precise upsides of relationship coefficients isn't possible more often than not. Read an approach for creating connected arbitrary numbers in a Monte Carlo recreation for development cost assessing. This technique works on the course of which comprises of appointing emotional proportions of relationship between's factors.

Yates et al (1993) [8] have concentrated on development choice emotionally supportive network for defer investigation. The review introduced the deferral examination framework (DAS) program, that adds the ability for deciding potential foundations for project delays and propose elective blueprints to forestall further postponements. The defer examination framework expands customary venture control frameworks and helps project administrators in dynamic cycles. The DAS coordinates conventional undertaking control procedures with intuitive techniques to deliver a program that screens progress toward accomplishing project achievements, yet additionally features foundations for deviations from set up baselines and gives suggestions concerning how further deferrals can be forestalled. Each deferral in a development project creates insight and ability in perceiving and redressing botch. This information is exorbitant to organizations on schedule, work, and wellbeing just as genuine expenses. This mastery can be collected, examined, and dispersed by the postpone examination framework, hence giving future administrators the advantage of involvement without the expense of relearning similar examples on each task.

Touran (1993) have concentrated on probabilistic expense assessing with emotional relationships. The review distinguished those troubles in probabilistic assessing is representing the current relationships among cost parts displayed as irregular factors. They have examined a strategy for creating associated arbitrary numbers in a Monte Carlo reenactment for development cost assessing. A procedure is then proposed that works on the method involved with consolidating the impact of relationship coefficients in probabilistic assessing. This philosophy comprises of allotting abstract proportions of connection between factors. Likewise, a strategy is proposed for changing the covariance grid wherein relationship gauges are not precise. Russell et al (1994) [9] have concentrated on mechanized restorative activity determination collaborator. Mechanized day by day site announcing combined with electronic information understanding as a basic piece of an undertaking the executive's framework can possibly be the missing connection for successful development project checking and control.

From this review depicts a plan to play out the mechanized translation of every day site records, to distinguish exercises encountering hardships, to recognize the wellsprings of these challenges, to distinguish the kinds of issue coming about, to discover verifying data from the day-by-day site records, to approve the reasons for these issues, and to propose likely restorative activities. A system was produced for a computerized translation of occupation records which will distinguish issue exercises and propose remedial activities. Building squares of this system incorporate a bunch of client appointed movement ascribes, a bunch of issue sources, a bunch of remedial activities, and master rules. Fluffy rationale is acquainted in an endeavor with address the human thinking measure. Execution of this structure as a model framework has been done, and will be depicted in a sidekick paper.

Hartman et al (1996) [10] have concentrated on building development definite assessing rehearses in Saudi Arabia. The review presents the consequences of a review dependent on an overview directed to examine assessing rehearses in Saudi Arabia's structure development market. An individual meeting survey was created and used to recognize the fundamental structure assessing interaction, issues, and data things required in creating quotes. The main data required by assessors incorporate offering reports, material costs, project extension and definition, normal work efficiency, hazard implied, work rates, unofficial laws, proprietor necessities, gear costs, generally speaking monetary circumstance, project area, chronicled information of comparative work.

Xiao (2003) [11] have done investigation of a global examination factors affecting worker for hire execution. Global examinations of worker for hire execution can give hearty benchmarks to project workers in various nations and help to distinguish ways towards execution improvement. In view of a theoretical development project, in general worker for hire execution (OCP) in Japan, the UK and the USA is looked at. Generally project worker execution is characterized to accept development cost, development time, development quality and reasonable turn of events, the way of thinking being that the accomplishment of one part of execution ought not be to the detriment of another. Different relapse investigation uncovers that general worker for hire execution is reliant upon: their previous presentation on past comparable ventures; their responsibility towards lifetime business; their apparent significance of time execution; their relationship with subcontractors; and the quantity of plan varieties during development. To work on their general exhibition, workers for hire are encouraged to zero in on development time, diminish delays, keep a steady labor force and build up organizations with their subcontractors. Customers should endeavor to diminish plan varieties during development.

Maloney (2003) [12] have done review on work – the executives collaboration and consumer loyalty. Work and the executives cooperating have the chance to impact consumer loyalty. Exercises at the project worker/make laborer level, the project worker/nearby association level and the project worker affiliation/neighborhood association level have the best potential to impact consumer loyalty. Rojas et al (2003) [13] have completed a review on development work efficiency truly declining. The review inspected the development work efficiency large scale financial information in the United

States from 1979 to 1998. The result of the review is that crude information used to compute development usefulness esteems at the macroeconomic level and their further control and translation results ought to be considered temperamental. Hassim et al (2003) [14] have concentrated on assessment of least turning out capital for development projects in Malaysia.

Yates (2006) [15] have considered keeping away from and limiting development defer guarantee debates in social contracting. Postponements and development projects, and the cases which exude from such deferrals, are a vital piece of the development interaction. Kassab et al (2006) [16] have concentrated on compromise in development debates utilizing the chart model. A conventional methodology is introduced for efficiently settling development clashes. Utilizing a genuine contextual analysis, a choice emotionally supportive network dependent on the diagram model for compromise (GMCR II), is utilized to adequately explore the essential connections that occurred between a proprietor and an overall worker for hire concerning the financing of a development project. The contention investigation measure thinks about the choice members, their choice choices, and their relative inclinations when displaying the debate. In addition, an affectability examination is executed to decide what changes in inclinations can mean for the harmony results. This compromise method is helpful for the two analysts and professionals to more readily manage the question inclined nature of the development business.

Blair et al (1993) [17] have concentrated on Construction claims debates, their causes and cost/time invades. The investigation discovered that development contract cases can be utilized to show a few pain points in the development cycle. These regions ought to be noted and observed by industry specialists during all phases of the development cycle. The most widely recognized contributing elements in claims were expansion in extent of the work, climate, limited admittance, and speed increase. Classes of cases that were referenced in the biggest number of cases were site overhead, loss of efficiency, loss of income, and financing costs. Agreement conditions that were cited in the cases were most ordinarily in the space of postponements, planning, and expansion in the extent of work. The unique thought ought to be given to contract statements managing changes/additional items, debates, soil/site conditions, and postponement. The fundamental stages a proprietor can take to limit dangers and manage the recognized causes are to permit sensible time for the plan group to deliver clear and complete drawings and particulars, to utilize esteem designing and execute constructability during the various phases of the task, to give a legitimate component to handling and assessing change orders that compensation for direct expenses.

Iyer (2001) [18] improvement of choice emotionally supportive network for goal of development debates: a methodical methodology. The investigation discovered that structure for comprehension and authoritatively settling arguments about time postponement and expansion in Indian development decreases through a choice emotionally supportive network. Choice emotionally supportive network has been framed dependent on the essential guidelines of law that are applied to questions including time deferral and expansion issues. Akpan et al (2001) [19] have read approach for deciding value variety in project execution. The issue of

cost invade in development industry is an overall marvel and its waves are ordinarily a wellspring of grating among customers and workers for hire on the issue of value variety. In the event that the grinding isn't as expected took care of, this could slow down the advancement of work and along these lines lead to project deserting. The significant reason for project cost overwhelms has been ascribed to the postponement in the arrival of assets when they become due, and this has led to two horrendous outcomes: the deferral in achieving the diverse plans for getting work done, and increasing expense of constructional materials and work because of expansion because of expanded undertaking term. The disappointment of the customer to deliver assets on time may have been because of the worker for hire's failure to convey as indicated by the concurred plan, which by suggestion would undermine the task fulfillment time and reasonability of the undertaking. This perspective was seen in one of the contextual analyses.

Iyer et al (2007) [20] have completed to examine on understanding time postpone questions in development contracts. Investigation discovered that issues which provoked to foster the current framework are predominantly the holes in agreement archives prompting questions. Better preparing in the space of contract the board to the experts is crucial for better comprehension of the agreement and this might help appropriate drafting of agreement. This would diminish the event of debates and fruitful fulfillment of activities on schedule. An information based master framework was considered as a helpful instrument for a legal executive and agreement chairmen to arrive at a resolution quicker and this being the inspiration an endeavor is made to foster the framework.

Chau (2007) [21] has done a review on knowledge into settling development questions by intercession/mediation in Hong Kong. The review presents the current setting in settling development questions by incorporating intercession and afterward assertion during the previous decade in Hong Kong. The cutting-edge modem intercession cycle and its philosophical beginnings were looked into. It very well may be contended that a justification for keeping away from court decisions in old occasions was that the law was not created. Nonetheless, today there are all around created rules and guidelines (right of disclosure and assessment of archives before hearings, expanded hearings, and so forth) However, corresponding acceleration of cost, delays, and ill-disposed connections, bring down both assertion and prosecution. The execution of the upgraded two-level design, specifically, intercession or mediation followed by discretion, in settling development questions in Hong Kong permits greater adaptability for the gatherings just as renders impetuses for development in the lead and the strategies of the regular intervention measure. In view of the victories and experience, it is accepted that there will be an enormous expansion in intervention or mediation utilization in Hong Kong for development questions.

III. OBJECTIVE OF THE RESEARCH AND ITS SCOPE

It is a lot of clear that the significant explanation of postponement in private development project are cost overwhelmed and cost acceleration. Henceforth, to

concentrate on the components, the exploration is centered around these variables. The current review was done with the accompanying goals:

- 1) To distinguish and assess the components influencing cost overwhelm in building development projects in India
- 2) To distinguish and assess the elements influencing cost acceleration in building development projects in India
- 3) To review the pattern in cost of building materials and cost lists in India and
- 4) To concentrate how the expense acceleration issue is by and by tended to in the structure development contracts in India.

IV. IDENTIFICATION AND EVALUATION OF FACTORS AFFECTING COST OVERRUN

Cost invade distinguishing proof is a fundamental piece of by and large expense the board structure of development projects. Cost invades related with government development projects vary as per the nation and the particular area wherein they are executed. In this part, the elements influencing cost invade are recognized and assessed. In this part the subtleties of poll definition is clarified alongside the subtleties of the study. The investigation dependent on the reactions acquired by overseeing the survey is additionally talked about. A contextual investigation examination as for critical factors and factor classifications influencing cost overwhelm acknowledgment and effect for six structure development projects is additionally introduced. Cost overwhelms in building development utilized with regards to this review, is the expansion in the expense of an undertaking because of components influencing the first quote and last expense of a task.

Stage	Process	Details
1	Preparation of preliminary list of factors and their category	- Study of literature including research papers and case study reports. - Unstructured interviews and discussions with project participants, consultant/experts for identification of factors contributing to cost overrun and their category
2	Identification of relative importance indices and factors ranking of factors contributing to cost overrun	Questionnaire survey among middle and senior level building construction project participants for identifying relative importance indices and ranking of factors contributing to cost overrun
3	Identification of significant factors contributing to cost overrun and case study analysis	Questionnaire survey among middle and senior level building construction project participants for identifying significant factors contributing to cost overrun.
4	Case study analysis	Detailed case study of six Indian building projects in terms of risk factor realisation and impact for validating the survey results

Table 1: Factors affecting cost overrun.

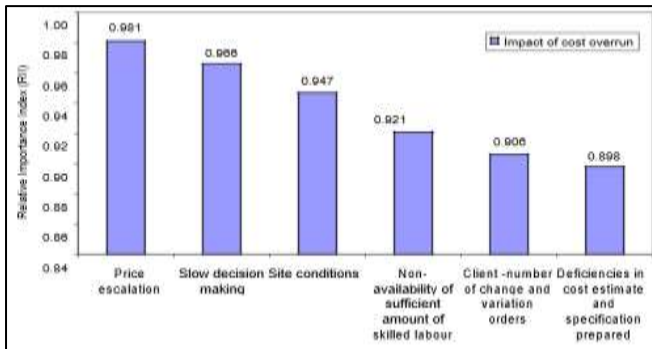


Chart 1: Signifant Factors affecting Cost Overrun

Categories	Risk factors contributing to causes of cost overrun
Client – Related	Number of change/ extra work orders, slow decision making, delay in contract award, delay in handing over of site, Unrealistic schedule, Cash flow during construction
Architect-related	Deficiencies in cost estimate and specification prepared, Incomplete Architectural drawings, Delay in work approval, Variation orders, Poor information and dissemination, Inadequate supervision
Structural Engineer - Related	Incomplete structural drawings, Structural design variations, Inadequate supervision, Late issuance of instruction, Poor services and design information
Contractor - related	Planning and scheduling deficiencies, non-availability of sufficient professionals and Managers, Non-availability of sufficient amount of skilled labour, financial difficulties, Low bid, Lack of coordination between project participants
External factors	Bad weather, Strike, Productivity, Environmental impact, Site conditions and Price fluctuations

Table 2: Factors contributing to cost overrun

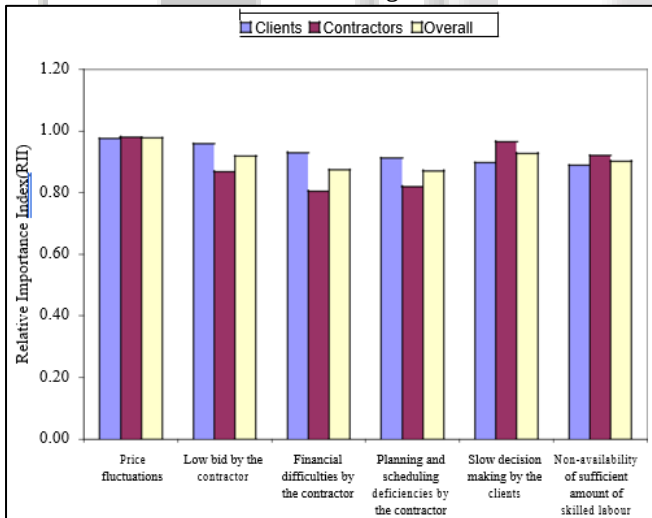


Chart 2: Factors affecting Cost Overrun as percieved by Client Contractor and Overall.

V. IDENTIFICATION AND EVALUATION OF FACTORS AFFECTING COST OVERRUN

Development Industry is the foundation of our economy. Yet, being a sloppy area is constantly been encircled by different issues identifying with quality, contract organization security. Probably the most serious issue is the danger dividing outline among proprietor and the project worker. Every one of the agreements have been planned to ensure the interests of customer. Proprietor would not like to lay out any additional

sum other than as expressed in delicate. However, all polite activities have development period of over a year or more. Henceforth most activities are exposed to cost heightening from the first supported expense. Cost heightening related with government development projects vary as per the nation and the particular area where they are carried out. In this part, the review completed for ID and assessment of components influencing cost heightening in Indian private structure development projects are introduced. The arrangement of fundamental rundown factor classifications and variables influencing cost acceleration, poll plan and review subtleties, examination of study reactions for recognizable proof of factor influencing cost heightening and brief conversation on each distinguished expense heightening components are introduced. A contextual investigation examination concerning critical factors and factor classifications influencing cost heightening acknowledgment and effect for six structure development projects is likewise introduced. Cost acceleration in building development utilized with regards to this review, is the increment in the expense of any development components of the first agreement or base expense of a venture because of section of time. A construction contract is an agreement between two parties (Constructor and owner) by which the constructor agrees to do the construction of a structure and the owner in return agrees to pay the constructor a price for construction as per (drawings, specification etc.). The agreement has the legal booking and constraints conditions regarding the course of action available in the case of deviation and/or default. Construction contracts management therefore is not only concerned with construction management but management of the contract management. When the construction is executed departmentally by the owner/user the construction management is his responsibility. When the construction is being done through contract the construction management is the main responsibility of the constructor who is actually a contractor but in order that the construction. Management is done effectively and efficiently, it is necessary to execute the contract and the contract management is the concern of all those who are associated with the contract. Contract is an agreement between two parties. By virtue of an agreement two parties can enter into transaction which may be selling, or buying any, commodity, borrowing or spending money, leasing, or hiring any property rendering any service etc. Legal system of a country gives its people freedom to enter into such an agreement. Any valid agreement creates mutual rights and an agreement. Any valid agreement creates mutual rights and obligation and, creates legal relations between parties entering into an agreement. To ensure uniformity among these agreement to a set of rules is formulated constituting the law of contract. The law of contract lays down the conditions enabling the enforcement of the agreement between two parties as per the law. Thus contract is an agreement, between two parties, satisfying the conditions laid down by the contract law and hence can be enforced by law.

Stage	Process	Details
1	Preparation of preliminary list of factors and their categories	- Study of literature including research papers and case study reports. - Unstructured interviews and discussions with project participants, consultant/experts for identification of factors contributing to cost escalation and their category
2	Identification of significant factors contributing to cost escalation	Questionnaire survey among middle and senior level building construction project participants for identifying relative importance indices and ranking of factors contributing to cost escalation
3	Identification of significant factor categories affecting to cost escalation	Questionnaire survey among middle and senior level building construction project participants for identifying significant factor categories contributing to cost escalation.
4	Case study analysis	Detailed case study of six Indian building projects in terms of cost escalation factor categories realisation and impact for validating the survey results.

Table 3: Factors affecting Cost Escalation

Factor Categories contributing to Cost escalation	Factors contributing to cost escalation
- Steel - Cement - Brick - Coarse aggregates - Sand and - Timber	- Inflation - Exchange Rates - Environmental Protection - Freight and Transportation cost - Demand and Supply - Government Policies - Taxes - Interest Rate - Power Tariff - Raw Material Input - Labour Cost - Technology Upgradation and - Price Increase by the Manufacturer

Table 4: Factors relating to Cost Escalation

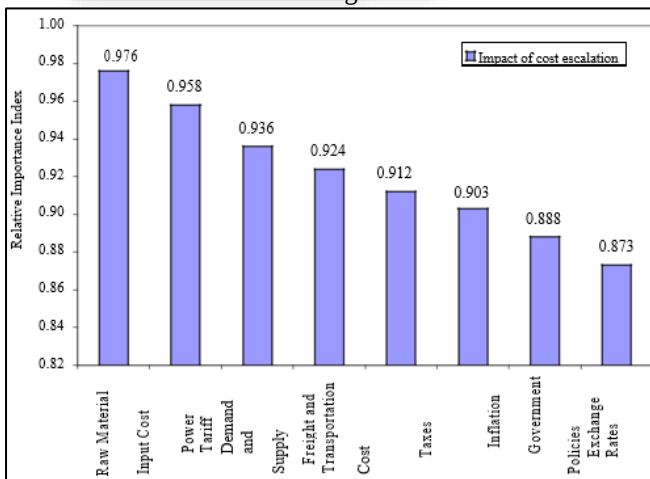


Fig. 3: Factors affecting Cost Escalation

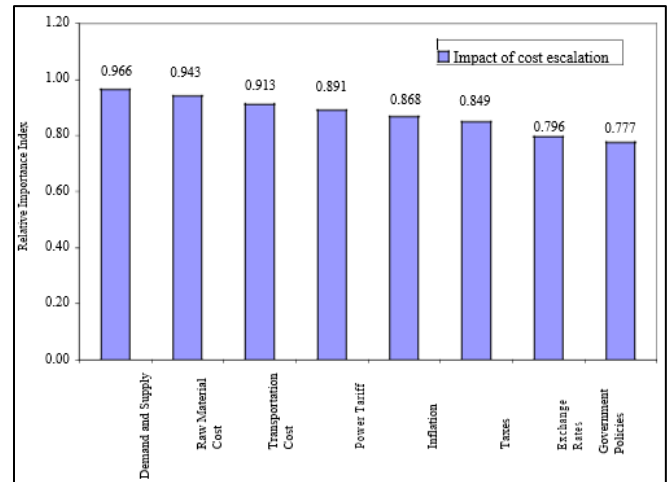


Fig. 4: Impact of Cost Escalation

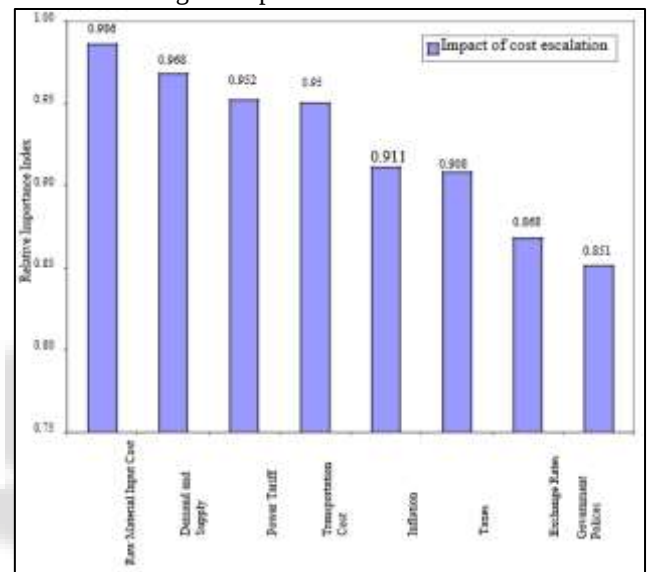


Fig. 5: Overall of Change Response

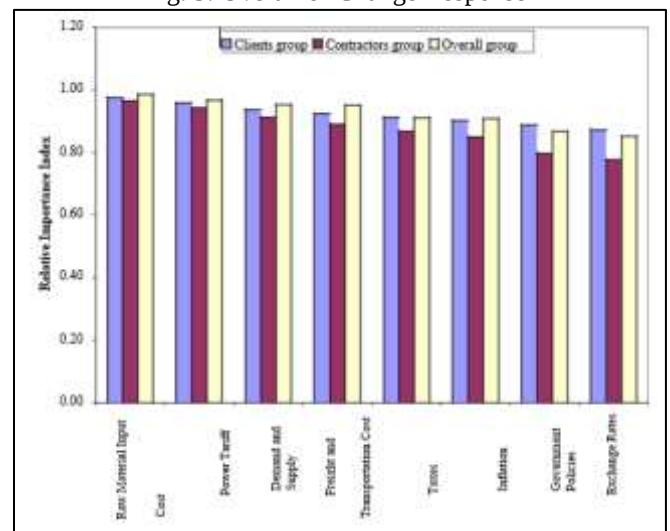


Fig. 6: Overall Factors affecting Cost Escalation

Indian government has appended high need to building area and accordingly needs critical interest in the framework area. Venture necessity for lodging in metropolitan regions has been assessed at Rs.526,000 million (US\$ 12.5 billion) in the ninth long term plan (1997-2002). Quick development in the country in the course of recent

years has significantly stressed the present status of foundation. Market size, market potential, workforce abilities are most significant variables for thinking about Foreign Direct Investment in Construction and Engineering in India. Development projects involve high danger, with long growth period, significant expenses and financial plan requirements.

In India, the presentation record in effective execution of framework projects has not been extremely reassuring. Cost invades and cost acceleration are a vital part of the development projects. It was tracked down that focal and express government's super activities yearly on a normal face cost acceleration of about Rs.400,000 to 500,000 million. Till date there has been no precise review on distinguishing proof and assessment of variables influencing cost acceleration in India. The degree of speculation prerequisite in the Indian private structure development industry, the helpless reaction in effective execution of government framework projects because of the serious level of apparent expense acceleration and the absence of satisfactory exploration in the space of cost heightening.

A blend of organized meetings, poll overviews, and contextual analyses approach has been taken on for accomplishing above targets. Study was completed among the two significant members of Indian private structure development projects - Government agents (Clients), and Contracting associations (workers for hire). Further a nitty gritty contextual analysis' on six structure development projects were completed to approve the review discoveries. The perceptions among the major participants in Indian building projects with respect to identification and evaluation of cost overrun and cost escalation have been studied based on the responses of the structured survey. 215 questionnaires were administered through personal contact in Government client organizations.

VI. CONCLUSION

Conclusions based on the research work related to the study on price of major building materials and cost indices in India. Steel, cement, brick, sand and coarse aggregates were identified (using case studies of six building construction projects) as most critical cost components contributing to cost escalation in building construction projects. These components contribute about 50% of the total cost of the project. Escalation in price of these materials have direct impact on the delay in project completion and increase in the cost of the project from the original estimate. An analysis of trend in prices of major materials were studied. The analysis includes month-wise trend of increase in price of materials and monthly percentage change in price of material over the period of time. The trend in prices of building materials for six years (2003-2009) reveals that cement price has increased about 108%, steel 250%, brick 240%, sand 286% and stone aggregate 250%. Trend in monthly percentage change in price of major materials were analysed for six years (2003-2009), the study proves that there was fluctuation in price throughout the period of study. The maximum percentage change reported during the period of study for cement was between -15% and 18%, steel between -17% and 19%, brick between -23% and 33%, sand between -36% and 48%, stone aggregate between -39% and 46%. Building Cost Index

(CPWD index) from 1958 to 2008 were analyzed to study the movement of building construction cost. From the study, it was found that the period's of 1960 – 61, 1971 and 1974 – 1975 witnessed high inflation in the building construction industry. During 1979 – 1984, cumulative percent of change for the India was 236% with an average of 39.3% per year. During 1988– 1991, cumulative percent of change of cost index was 201% with an average of 50.25% per year. The average building construction cost escalation for the last 50 years (1958 to 2008) in India was computed as 4.22 % per year. The building construction cost indices and also the building material prices have been forecasted for five years and twelve months respectively using the software "Forecast X". The lessons from this analysis would be of substantial use for planning engineer and construction manager working in the construction industry. They can make use of these findings to minimize the cost escalation. Escalation condition ought to be remembered for the agreements where the venture term is over a half year. Customers and project workers are not happy with the as of now utilized heightening proviso in agreement and want to work on the statement in government contracts. In view of the review, it is discovered that pay paid to the project worker dependent on the current acceleration provision in government contracts isn't sufficient to make up for heightening in Materials, Labor and POL. This is on the grounds that the discount value file is utilized in the equation for ascertaining the installment for heightening. It is suggested that the files of building cost list ought to be utilized for working out the acceleration installment rather than discount value file. Value heightening in material parts like steel, concrete and block and so forth ought to be repaid on real acquisition costs.

REFERENCES

- [1] Warszawski A. (1982), 'Managerial decisions under inflation', Journal of construction division', Proceedings of the American Society of Civil Engineers, Vol. 108, pp. 147-157
- [2] Farid F. and Boyer L.T. (1985), 'Fair and reasonable markup (farm) pricing model', Journal of Construction Engineering and Management, Vol. 111(4), pp. 374-390.
- [3] Panchadhari A.C. (1992), 'Evolution of the Escalation Clause', Papers on price variation in civil construction contracts, Goel O.P. and Vaid K.N. (eds.), National Institute of Construction Management and Research, Bombay, pp. 32-35.
- [4] Parfitt K.M. and Sanvido E.V. (1993), 'Checklist critical success factors for building projects', Journal of Construction Engineering and Management, Vol. 9(3), pp. 243-249.
- [5] Ioannou G.P. and Leu S.S. (1993), 'Average – bid method – competitive bidding strategy', Journal of Construction Engineering and Management, Vol. 119, pp. 131-147.
- [6] Paek H.J., Lee.W.Y. and Ock H.J. (1993), 'Pricing construction risk : fuzzy set application', Journal of Construction Engineering and Management, Vol. 119(4), pp. 743-755.
- [7] Touran A. (1993), 'Probabilistic cost estimation with subjective correlations', Journal of Construction

- Engineering and Management, ASCE, Vol. 119(1), pp. 58-70.
- [8] Yates K.J. (1993), 'Construction decision support system for delay analysis', Journal of Construction Engineering and Management, Vol. 119, pp. 226-244.
- [9] Russell A.D. and Fayak A. (1994), 'Automated corrective action selection assistant', Journal of Construction Engineering and Management, Vol. 120(1), pp. 11-32.
- [10] Hartman F. and Snelgrove P. (1996), 'Risk allocation in lump sum contracts- concepts of latent dispute', ASCE Journal of Construction Engineering and Management, Vol. 122(3), pp. 292-296.
- [11] Xiao H. and Proverbs D. (2003), 'Factors influencing contractor performance: an international investigation', Engineering, Construction and Architectural Management', Vol. 10(5), pp. 322-332.
- [12] Maloney F.W. (2003), 'Labor – management cooperation and customer satisfaction', Journal of Construction Engineering and Management, Vol. 129(2), pp. 165-172.
- [13] Rojas M.E. and Aramvareekul P. (2003), 'Study on construction labor productivity really declining', Journal of Construction Engineering and Management, Vol. 129(1), pp. 41-46.
- [14] Hassim S., Kadir A.R.M., Lie L.Y. and Sim C.Y. (2003), 'Estimation of minimum working capital for construction projects in Malaysia', Journal of Construction Engineering and Management, Vol. 129, 369-374.
- [15] Yates K.J. and Epstein A. (2006), 'Avoiding and minimizing construction delay claim disputes in relational contracting', Journal of Professional Issues in Engineering Education and Practices, Vol. 132(2), pp. 168-179.
- [16] Kassab M., Hipel K. and Hegazy T. (2006), 'Conflict resolution in construction disputes using the graph model', Journal of Construction Engineering and Management, Vol. 132(10), pp. 1043-1052.
- [17] Blair A.N., Lye L.M. and Campbell W.J. (1993), 'Forecasting construction cost escalation', Canadian Journal of Civil Engineering, Vol. 20, pp. 602-612.
- [18] Iyer K.C. (2001), 'Development of decision support system for resolution of construction disputes: a systematic approach', Management of Engineering and Technology, PICMET'01, Portland International, Vol. 1, pp. 274-275.
- [19] Akpan O.P.E. and Igwe O. (2001), 'Methodology for determining price variation in project execution', Journal of Construction Engineering and Management, Vol. 127, pp. 367-373.
- [20] Iyer K.C., Chaphalkar N.B. and Joshi G.A. (2007), 'Understanding time delay disputes in construction contracts', International Journal of Project Management, Vol. 16, pp. 174-184.
- [21] Chau W.K. (2007), 'Insight into resolving construction disputes by mediation/adjudication in Hong Kong', Journal of Professional Issues In Engineering and Practice, Vol. 133(2), pp. 143-147.