

## **RISK RELATED WITH CONSTRUCTION PROJECT – WITH REFERENCE TO ITS MANAGEMENT, RISK FACTORS MITIGATION AND VARIABLES IN THE CONSTRUCTION PROJECT**

**Rajesh Ukey,**  
Research Scholar,  
University of Technology, Jaipur

**DECLARATION:** I AS AN AUTHOR OF THIS PAPER/ARTICLE, HEREBY DECLARE THAT THE PAPER SUBMITTED BY ME FOR PUBLICATION IN THE JOURNAL IS COMPLETELY MY OWN GENUINE PAPER. IF ANY ISSUE REGARDING COPYRIGHT/PATENT/ OTHER REAL AUTHOR ARISES, THE PUBLISHER WILL NOT BE LEGALLY RESPONSIBLE. IF ANY OF SUCH MATTERS OCCUR PUBLISHER MAY REMOVE MY CONTENT FROM THE JOURNAL WEBSITE. FOR THERE AS ON OF CONTENT AMENDMENT/OR ANY TECHNICAL ISSUE WITHNO VISIBILITY ON WEBSITE/ UPDATES, I HAVE RESUBMITTED THIS PAPER FOR THE PUBLICATION. FOR ANY PUBLICATION MATTERS OR ANY INFORMATION INTENTIONALLY HIDDEN BY ME OR OTHER WISE, IS HALL BE LEGALLY RESPONSIBLE. (COMPLETE DECLARATION OF THE AUTHOR AT THE LAST PAGE OF THIS PAPER/ARTICLE

### **ABSTRACT**

*Construction projects in today's world are actually marred by risks which hold off the conclusion of tasks on result or time led to unnecessary cost overruns. These losses are multiplied whether the dimensions of the project as well as investments made are large. These risks can include unavailability of substances, erratic environmental changes, lack of funds, reduced quality of subcontractors, etc. Although the managers recognize the value of these risk factors and mitigating them, they fall quite short of an objective technique to control these chances depending on a priority schedule. Therefore, a prudent contractor (including subcontractors) has to be able to recognize, assess, and reduce such risks whenever it is practical to do so. In addition to relying on their own experiences, a considerable number of contractors seek advice in the areas of risk assessment and management from the companies that supply their surety bonds. The aim of the study is to explore construction project relation risks with their management and mitigation.*

**KEYWORDS:** Risk, Management, Mitigation, Construction, Project, etc.

### **1. INTRODUCTION**

Construction is a risky enterprise. Every construction project is different and also has the own set of it's of opportunities and challenges. Managing and identifying construction project risks might be challenging, however, not impossible with thorough planning and execution. If a risk turns into reality, it is able to disrupt as well as derail a task and that's why construction risk management is very critical. To be able to stay away from disaster, you have to have the ability to properly evaluate, influence, and monitor risks when they have

been identified. The process of construction is one that is notorious for being challenging and complex. It is necessary to, among other things, interpret and comply with a large number of laws, codes, and regulations; collect considerable resources, including labor, equipment, and material; and communicate with and coordinate multiple parties, such as the owner, the design professional, other contractors and subcontractors, and suppliers, all of whom may have different purposes and goals. Other than that, it is also necessary to collect considerable resources, including labor, equipment, and material. In addition to a few

other things, it is important to gather a substantial number of resources, which may include labor, equipment, and material. Additionally, in the outset of any project, there are a great deal of factors that are unknown or unknowable. Given the nature of the process, the existence of potential risks should thus not come as a total surprise to anybody. Therefore, a prudent contractor (including subcontractors) has to be able to recognize, assess, and reduce such risks whenever it is practical to do so. In addition to relying on their own experiences, a considerable number of contractors seek advice in the areas of risk assessment and management from the companies that supply their surety bonds.

## 2. CONSTRUCTION PROJECT

Construction management, often known as CM, is a professional service that employs specialized methods and tools for project management in order to monitor the planning, design, and construction of a project from the very beginning all the way through to its conclusion. Controlling a project's time/delivery, cost, and quality is the objective of construction management, which is sometimes known as a project management triangle or "three constraints."

The life cycle of a typical project is broken up into stages, each of which has a specified goal and overlaps with the preceding and subsequent phases, and as a result, a definable scope of work. The project begins with an idea, and then it is developed and modified in many stages in design to suit the client's interest, intent, and constructed as completion of the millions of activates by organizing the various disciplines, parties, vendors, and subcontractors at the end closed and terminated with the electro mechanical equipment commissioning and testing, and eventually the project would be handover to the client along with the facility

management systems to facilitate an operational transition.

### 2.1 Types of Construction Project

- **Agricultural:** Buildings and other enhancements for agricultural uses that are often constructed on a budget. Examples of such structures include barns, sheds for equipment and animals, specialized fencing, storage silos and elevators, wells, tanks, and ditches for water supply and drainage, and elevators and silos for grain storage.
- **Residential:** Residential construction include the building of single-family homes, multi-family dwellings such as apartments and townhouses, as well as other more compact, low-rise housing and office kinds.
- **Commercial:** Construction that caters to the requirements of private business, trade, and service industries is meant here. Office buildings, so-called "big box" businesses, shopping centers and malls, shopping centers and malls, warehouses, banks, theaters, casinos, resorts, golf courses, and bigger residential structures like high-rise hotels and condos are all examples of commercial structures.
- **Institutional:** This area is for the requirements of various public institutions, including the government. Schools, fire and police stations, libraries, museums, dorms, research buildings, hospitals, transit terminals, certain military installations, and government buildings are some examples of the types of structures that fall under this category.
- **Industrial:** The chemical and power plants, steel mills, oil refineries and platforms, manufacturing plants, pipelines,

and seaports that are included in this category are the buildings and other built things that are used for storage and the manufacture of products.

- **Heavy civil:** The building of transportation infrastructure, including roads, bridges, trains, tunnels, airports, and reinforced military sites, among other things. Dams are also considered part of this category; nevertheless, the majority of other water-related infrastructure is regarded as environmental.
- **Environmental:** Previously a subset of heavy civil construction, environmental construction today deals only with initiatives that enhance the environment. Examples include sanitary and storm sewers, water and wastewater treatment facilities, solid waste management systems, and air pollution control.

### 3. CONSTRUCTION RISKS

Risk plays a crucial role of the good results of construction project. There are a few different tools and procedures that may be used to manage risk either proactively or reactively. By the way, the distinction between proactive and reactive risk management may be summed up with regard to the handling of potential threats. A method that may be considered proactive is one in which the risk is managed before it ever occurs. The reactive method, on the other hand, involves mitigating the risk after it has already occurred. Risk management is a cooperative effort to get a project closer to its intended level of success via the use of various procedures. It is not a method nor a purpose to eliminate all

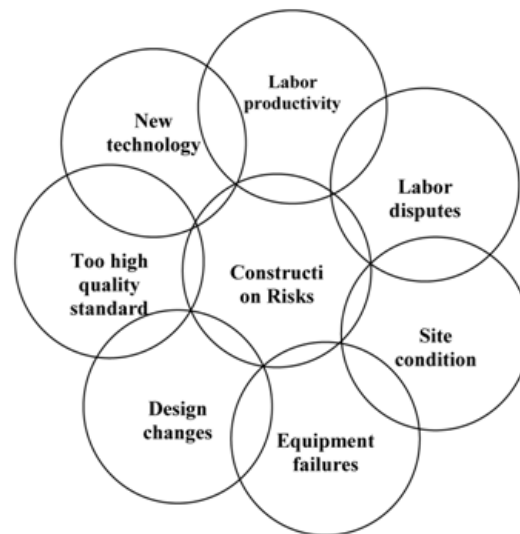
hazards associated with the undertaking. Without a doubt, its purpose is to forecast the likely occurrences, increase the likelihood of favourable outcomes (or the effect of those outcomes), and reduce the likelihood of unfavourable outcomes (or the impact of those outcomes). Every day, the parties involved in the building project are given choices to make, all of which will undoubtedly have a significant effect on the end product. The effective management of risks is essential to the process of making educated choices. To make a choice that is informed and proactive is to base the decision on clear information, even if that information involves some degree of ambiguity.

#### 3.1 What is Risk?

A risk is an occurrence that is likely to occur and has at least one of the following: a probability, a cause, and an effect. In most cases, the likelihood does not correspond to a specific number, and its value changes as the project progresses. Depending on the conditions around the project, there are times when it will be quite high and other times when it will be very low. Something that makes the chance of something happening into a hundred percent certainty is referred to be the source of risk. It might be a single reason, or it could be a collection of factors.

#### 3.2 Categories of Construction Risk

Any risk to the development and completion of a construction project that produces possible loss exposure is considered a risk. Construction organisations encounter several hazards, which may be classified into four major groups.



**Figure 1: Construction risk**

➤ **Financial risk**

Financial hazards include a lack of sales, tardy payments, rising material costs, and cash flow issues. These risks have a direct impact on the company's financial status and, if not handled, may lead to business collapse. All construction businesses should have financial risk mitigation policies in place. For example, maintaining lien rights decreases the risk of cash flow problems caused by non-payment.

➤ **Safety risk**

Construction is one of the most hazardous industries, with more worker fatalities than any other. Companies must understand the dangers of each activity in order to prevent exposure, protect personnel, or avoid the hazard entirely.

➤ **Project risk**

Schedule delays, escalating expenses, resource management, a lack of funds, and environmental circumstances such as weather and hidden conditions are among project hazards. All of these have the potential to derail a project and reduce profitability.

➤ **Economic risk**

The consequences of a recession on the construction sector and the company's specific trade or market are examples of economic risks, as well as the persistent threat of corporate collapse.

**4. PROCESS OF CONSTRUCTION RISK MANAGEMENT**

Construction risk mitigation is similar to other projects. Construction hazards vary solely in nature. Risk management has five stages.

- **Identification:** First things first, compile a list of all the potential problems that may occur. Perform the necessary research, consult with your workers, and investigate historical data from previously completed construction projects that are analogous to the one you are working on.
- **Assessment:** Not all risks are equal. Some are more likely to occur, others less so. One way to assess your list of risks is to use a risk assessment matrix,

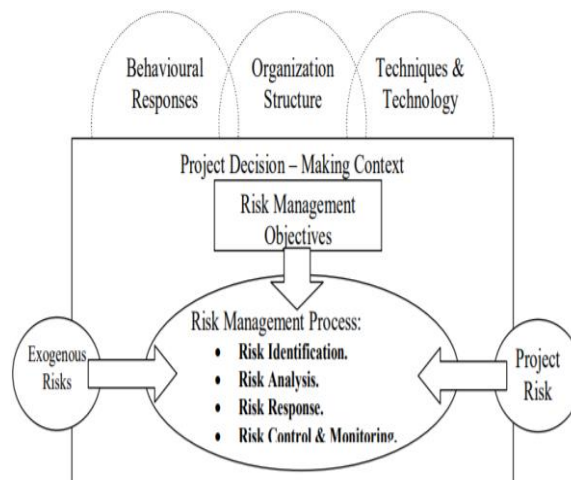
which charts the likelihood of each risk and the size of the impact it can have on your project.

- **Mitigation:** The next step is to put into action a backup strategy, or contingency plan, that will lessen the chance of the risks you identified earlier as well as their potential effect.
- **Monitoring:** This phase is never finished because you must always make an effort to recognize potential dangers as they emerge. This involves keeping an eye on how well your approach to mitigate the problem is working.
- **Reporting:** It is important to conduct an assessment of your construction risk management strategy and communicate it to the team as well as any stakeholders. You are able to assess the efficiency of the backup plan thanks to the reports on risk mitigation that have been provided.
- **Construction Risk Logs** Construction projects employ risk logs that are comparable to those used in other

sectors; however, these logs may analyze the effect on schedule and cost without using controls and may also contain actions on residual risks.

## 5. CONSTRUCTION RISK MANAGEMENT APPROACH- CONCEPTUAL MODEL

This particular design placed risk management in the context of project decision making while thinking about the over lapping contexts of behavioral responses, business system, and engineering. The goals of project as well as construction risk management must be certainly developed to the context of project decision making, and can be governed mostly by the risk attitude of the project proponent. In talking about man judgments in decision making, proposes an organizational and sociological context for risk evaluation. The construction risk management conceptual item offers a good systematic framework for quantitatively identifying, analysing, and responding to risk in construction projects. With this particular product emphasis is actually positioned on how you can recognize as well as control chances prior to, instead of after, they materialize into claims or losses



**Figure 2: Conceptual Model of Construction Risk Management**

## 6. RISK MITIGATION

Risk mitigation is a method that companies use in order to decrease the negative consequences that are caused by various business hazards. It's quite similar to the process of risk reduction, in which possible risks to a company's operations are discovered before the company takes the required actions to mitigate the consequences of these elements.

Accidents are far easier to prevent than it is to clean up after they have occurred. The first step that has to be taken in order to mitigate potential dangers is to compile a list of all of the potential dangers that might occur. When classifying potential dangers, we divide them into the following categories: occupational, financial, contractual, project-related, natural, and stakeholder risks. Following this step, the potential threats are assessed in terms of the chance that they will come to fruition, and preventive measures are designed in accordance with this rating. It is likely that avoiding risks may force you to turn down a project or renegotiate a contract at times. Nevertheless, it is better to stay clear of anything totally if the risk-to-reward ratio is negative.

There may be times when your company just does not have the financial resources to take a risk on a project. One method for dealing with the unknown is to get insurance. Because insurance does not cover all risks, it is essential that you have a conversation with your insurers about the kind of responsibilities they are willing to take on. Written contracts may allow the general contractor, the subcontractors, and the suppliers to share the risks associated with the project. The most prudent thing to do would be to have this discussion with the people who have a stake in the project and try to get a consensus on who would be liable for certain risks. The degree of risk that each party is

willing to take on has to be determined, and both the client and the general contractor are responsible for making that determination.

If a risk cannot be eliminated completely, the team working on the project should take actions to lessen the impact of the risk. If staff have gotten sufficient training and are utilizing suitable safety gear, the risk of accidents will be dramatically decreased. It is in everyone's best interest, including the contractor's, to break down hazards into manageable pieces, and the contractor should avoid spreading himself too thin.

As human beings, we may not always have the capacity to accept the risks that we are aware of. Choosing to put ourselves in harm's way is not something that should be done flippantly. The person who is required to take a risk should consider the probable outcomes of doing so before taking the risk. Risks with a low effect are simpler to bear, while risks with a high likelihood that might have a substantial negative impact on the project and the party responsible for managing them need careful management.

### 6.1 Risk Mitigation Importance

The process of comprehending specific risks and hazards, acknowledging that they do in fact exist, and taking the required steps to lessen the impact of those risks in the event that they do occur is known as risk mitigation. It is an essential step in the process of risk management and is required in order to get an organization ready for any potential dangers to its operations and procedures. In risk reduction, the goal is not to remove all potential dangers but rather to lessen the adverse effects of those dangers that cannot be eliminated. This may include natural catastrophes as well as other risks that have the potential to disrupt manufacturing and other activities. These are dangers that cannot be eradicated and are entirely beyond the

company's ability to prevent or remedy. The purpose of risk mitigation is to guarantee that, should any of these unfortunate occurrences take place; the firm will be prepared with the appropriate countermeasures to limit the amount of harm that is caused to the organization.

## 7. MITIGATING RISK MODELLING IN THE PROJECTS

- **BIM (Building Information Modeling)** - One example of how technology might be utilized in the design process is building information modeling (BIM). Prior to even putting a shovel in the ground, the technical risk in construction projects could be pinpointed and solved by visualizing the model in a computer. This would result in significant amounts of energy and cost being saved, and the percentage of potential error in the project could be minimized.
  
- **BIM Software** - BIM is a digital software tool that gives designers like Zaha Hadid, who develop the parametric modeling technique, the ability to sketch more complex shapes that are not geometric in nature. BIM software was first created by Autodesk in the year 2003. BIM is not a drawing or drafting program like AutoCAD or Illustrator. It is a data storage system. This technological shift from two dimensions to three dimensions and the introduction of electronic drawing has led to the development of Building Information Modeling (BIM) software. BIM software is a digital representation of the design process and is able to calculate accurate cost estimates, simulate and analyze models, and design scalable engineering and

architecture. The designer receives assistance from BIM in constructing, navigating, comprehending, and manipulating the design process.

- **BIM Management** - These days, the goal of the designers is to create designs that are quicker, cheaper, and more efficient. BIM assignment in construction projects from the beginning of the design development into the construction completion has made it possible for the construction industry to undergo continuous change in order to facilitate continuous development. BIM is facilitating all of the project key stockholders and disciplines to meet their scope on time and within budget by managing the Risks on or ahead of time in projects.

## 8. IMPACT OF RISK FACTORS MITIGATION AND VARIABLES IN THE CONSTRUCTION PROJECT

The non-financial construction industry (NCI) is one of the most important economic contributors. The Construction industry was ranked eighth out of the twelve sectors that contributed to the country's Gross Domestic Product in the year 2008, as reported by the National Bureau of Statistics (NBS) in 2011; 2012 and 2014. In addition, this ranking was maintained in 2014. These findings are derived on research conducted in the year 2008. (GDP). In 2009, it maintained the same position; but, from the third quarter of 2010 through the third quarter of 2012, it dropped to ninth place; and from the third quarter of 2013 through the fourth quarter of 2013, it moved up to eighth place. Nevertheless, despite the fact that the construction industry contributes to the economic development of nations, the industry is confronted with some peculiar challenges in Nigeria that pose varying degrees of risk to the

industry players. Despite the fact that the construction industry contributes to the economic development of nations, the industry is confronted with these challenges in Nigeria. This is the case despite the fact that the building sector helps countries to advance in terms of economic growth. These include an environment that is difficult for doing business, an absence of necessary building materials, a dearth of necessary technical skills, and limited access to credit. As a direct result of this, the sector continues to suffer with poor performance, as seen by the fact that a large number of projects are unable to meet their clients' expectations regarding cost, time, and quality. The inability of those who work in the construction industry to complete projects on time and without going over the authorized budget has emerged as the key cause for concern for a range of stakeholders in the industry. The high amount of risk that is always present in construction projects is one theory that might help to explain this phenomenon. It is observed that there are always going to be risks involved with construction projects, and that these risks might have an adverse effect on the project's completion in terms of time, money, and quality.

In the case that risks are not adequately managed, the parties involved in the project run the risk of suffering major losses as a result of budget overruns, delays, or even the complete failure of the attempt altogether. Because of this, the building and construction industry all over the globe has earned a reputation for having ineffective methods of risk management techniques (RM). In a similar vein, the Nigerian construction industry has been criticized for having poor RM processes, which has brought the sector under scrutiny. The bad performance of the industry over the course of the last several years makes this point very evident. According to Augustine and colleagues (2013), efficient implementation of risk management

has the potential to have a positive impact not only on the Nigerian construction industry but also on the economy as a whole. This is one of the conclusions drawn from their research. Therefore, the successful completion of projects depends significantly on the use of a strategy that is capable of providing efficient risk management. This demonstrates how vital RM is to each and every construction project, irrespective of how big or intricate the undertaking may be. Every undertaking is fraught with its own special challenges, any one of which might risk the final result. These threats differ from one project to the next due to a variety of circumstances including technology, money, construction site, total project size, etc. It was predicted that one of the key factors that led to the failure of the project was one of the primary causes that was an erroneous estimation of the risks involved in the execution of the project. As a direct result of this, many projects end up taking far more time and money to complete than they were originally budgeted for.

There is always the possibility that the expenses of a building project, no matter how simple or complex it is, will run above the allotted budget. As a consequence of this, the construction cost overruns and the risks that are linked with the project are interwoven components; neither one can exist independently of the other. The researchers have identified the factors that constitute a risk to the timely and profitable completion of construction projects. Changes in the scope of work that is to be performed on site, an incomplete design at the time of tendering, contractual claims, the owner's financial difficulties, a delay in progress payments by clients, inadequate cost planning and monitoring of funds, variations and additional works are some examples of the types of issues that can arise. Variations and additional works can also include things like the owner's



financial difficulties. Commercial hazards, project risks, political risks, financial risks, technical risks, and other types of risks are included in the category of risks linked with building. There is a strategy to mitigate each and every kind of risk, and it may be found among the many different kinds of risk reduction options that are accessible. In addition, the management of risks is a very significant aspect of projects in order to eliminate dangers before they may have an effect on the construction project (in terms of finance). The primary goal of risk management is to identify the risks, take steps to control them as quickly as possible, and find solutions to any problems that may arise during the course of a construction project. This is done with the intention of ensuring that subsequent construction project events are not negatively impacted.

## 9. CONCLUSION

Risk management is a technique for proactive project management that is intended to limit the vulnerability to losses experienced throughout a course of action. This method, which leaves an auditable trail of changes, is known as change management. The procedure directs the project's resources towards mitigating vulnerabilities, identifying possible trouble spots early on, and developing solutions. The entire project team needs to be involved in order for there to be effective risk management. This includes the design and engineering departments, as well as those responsible for project and construction management, as well as business, contracts, finance, purchasing, estimating, and project controls. The procedure is ongoing, a cycle that never comes to a conclusion, and iterative in nature, consisting of identification, qualification, modelling, management, and monitoring of the process. Identification of prospective hazards in a construction project and the subsequent

management of such risks might be actual problems that need to be properly monitored, recorded, managed, controlled, and transmitted over the course of the project's life cycle. On the other hand, the critical time at which to conduct risk assessment and impact reduction might be a central issue in building projects. Only by delegating highly experienced professionals to the project, who are currently working in the field and possess substantial experience in the construction industry, would these be able to be managed, and even then, only from the conceptual design stage all the way through to the end of the project. Continuous monitoring in addition to taking the appropriate precautions to lower risk levels are required in order to successfully limit risk in construction projects. In this study the conceptual model of risk management, Impact of Risk Factors Mitigation and Variables in The Construction Project etc. have been discussed.

## REFERENCES

1. Abdullah, Abdul Karim. (2013). Risk Transfer and Risk Sharing (A). 4. 279-294. 10.12816/0009744.
2. Ahmed A, Kayis B, Amornsawadwatana S. (2007), A review of techniques for risk management in projects. *Benchmark Int J* 2007, 14(1):22–36.
3. Sadeh, Arik & Zwikael, Ofer & Meredith, Jack. (2022). Organizational support as an effective risk mitigation approach. *International Journal of Managing Projects in Business*. 15. 10.1108/IJMPB-02-2022-0045.
4. Shafqat, Ali & Oehmen, Josef & Welo, Torgeir & Ringen, Geir. (2022). The role of risk mitigation actions in engineering projects: An empirical investigation. *Systems Engineering*. 25. 10.1002/sys.21639.

5. Shuaibu Saminu, Raj Prasad, V.Thamiasasu, A study of various factors affecting risk management techniques in construction project:A case study of India, International Journal of Research in Engineering and Technology,04(03),2015,591.
6. Shubham.A. Simant, Mr.Swapnil.S. Shinde,Mr.Swapnil. M. Sinha, Mr.Rhushikesh. D.Musale, Prof, D.D. Kadam “Literature Review Based On Risk Management In Building Construction” International journal of advance reassert in science and engineering vol. NO.6, Issue no.03, march 2017
7. Suchith Reddy “Risk Management in Construction Industry - A Case Study, international journal of innovative research in science engineering and technology vol.4A, 10 OCT 2015
8. Vishwa N. Vaghela (2020) – “Risk Management in The Construction Industry”, International Research Journal of Engineering and Technology (IRJET)
9. Ward S, Chapman C. (2008), Stakeholders and uncertainty management in projects, Construction Management Econ 2008; 26(6):563–577. 448 Risk Management – Current Issues and Challenges
10. Yembi Renault, Berenger & Agumba, Justus & Ansary, Nazeem. (2019). A Conceptual Model of Risk Management for Predicting Success in Construction Projects. 10.15224/978-1-63248-150-4-58.

#### Author’s Declaration

I as an author of the above research paper/article, hereby, declare that the content of this paper is prepared by me and if any person having copyright issue or patent or anything otherwise related to the content, I shall always be legally responsible for any issue. For the reason of invisibility of my research paper on the website/amendments /updates, I have resubmitted my paper for publication on the same date. If any data or information given by me is not correct I shall always be legally responsible. With my whole responsibility legally and formally I have intimated the publisher (Publisher) that my paper has been checked by my guide (if any) or expert to make it sure that paper is technically right and there is no unaccepted plagiarism and the entire content is genuinely mine. If any issue arise related to Plagiarism / Guide Name / Educational Qualification / Designation/Address of my university/college/institution/ Structure or Formatting/ Resubmission / Submission /Copyright / Patent/ Submission for any higher degree or Job/ Primary Data/ Secondary Data Issues, I will be solely/entirely responsible for any legal issues. I have been informed that the most of the data from the website is invisible or shuffled or vanished from the data base due to some technical fault or hacking and therefore the process of resubmission is there for the scholars/students who finds trouble in getting their paper on the website. At the time of resubmission of my paper I take all the legal and formal responsibilities, If I hide or do not submit the copy of my original documents (Aadhar/Driving License/Any Identity Proof and Address Proof and Photo) in spite of demand from the publisher then my paper may be rejected or removed from the website anytime and may not be consider for verification. I accept the fact that as the content of this paper and the resubmission legal responsibilities and reasons are only mine then the Publisher (Airo International Journal/Airo National Research Journal) is never responsible. I also declare that if publisher finds any complication or error or anything hidden or implemented otherwise, my paper may be removed from the website or the watermark of remark/actuality may be mentioned on my paper. Even if anything is found illegal publisher may also take legal action against me.

**Rajesh Ukey**