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Original Research Article

Analysis of Extension of Time Impact on Project's Performance: A Case Study of Projects in Hupsekot Rural Municipality

Binod Aryal[1*], Bhawani Dhakal[2]

[1]Engineer, Lumbini Engineering and Management Science College, Nepal
[2]Engineer, Lumbini Engineering and Management Science College, Nepal

***Corresponding Author:** Binod Aryal
Engineer, Lumbini Engineering and Management Science College, Nepal

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Abstract: This study was carried out on the basis of literature review and the questionnaire survey on selected construction projects with 5-point Likert scale and earned value analysis to know the opinion of different parties involved. The questionnaire contained statements on practices adopted of extension of time in construction field, consequences of extension of time in the project's cost and time and impacts of extension of time in the project's performance through literature review. The different timing of the extension of time claim were identified for the practices of extension of time adopted in the Hupsekot Rural Municipality and the study focused the consequences of extension of time in the projects' cost and time and the real factors for the projects time and cost overrun were also studied from Earned Value Analysis. Also, the impacts of extension of time in the project's performance were tested through Hypothesis test method. Total of four statements from practices adopted in construction, seventeen statements from the consequences of extension of time and four statements from the impacts of extension of time in projects performance were established and administrated on twelve projects for collecting the information in Hupsekot Rural Municipality. The identified results were analyzed with Relative Importance Index (RII) and Ranking.

Keywords: Construction, Extension of time, Impact, Consequences, RII index.

1. INTRODUCTION

One of the most crucial aspects of construction management is the completion date. A client's selected contractor was typically asked to provide assurance on the project's completion date as well as the date of handing over the completed project (Mishra AK. and Singh, NK, 2018). Nevertheless, due to its unpredictable nature, full of uncertainty, and ever-changing environment, delays had become the norm in the construction industry.

When delays occur, contractors are fined and are liable for the liquidated damages (LAD) agreed upon in the contract. In order to avoid this loss, contractors often seek for opportunities to claim for Extension of time (EoT). Extension of time (EoT) had become a typical construction activity in many projects, especially when standard forms of contract are used, and it is recognized as an excusable delay in ordinary construction contracts (Lian *et al.,* 2012: Chiluwal K. and Mishra A. K., 2018: Dr. Anjay Kumar Mishra (2020 a and b).

When it becomes fairly evident that there is, or is likely to be, a delay that would justify a time extension, the contractor notifies the contract administrator in writing, identifying the relevant incident that has caused the delay. EoT is one of the standard contract form's provision clauses. The goal is to protect an employer's right to liquidated damages. In the event that the delays are unavoidable, the EoT permits the contractor to specify a mutually agreed-upon completion date (Lian *et al.,* 2012).

Extension of time is the compensation granted to the contractor in the case of delays for which he is not responsible to prevent incurrence of undue liquidated damages (El-adaway *et al.,* 2016). According to Othman *et al.,*

(2006), EoT is a result of an excusable delay that occurs when a contractor is behind schedule because of events beyond his control.

According to Wishart 2012, contractors should design and maintain a robust document control strategy so that the planning team and contract administrator can manage the massive amounts of both electronic and hard-copy records. When and to what degree the risk of delay shifts from the contractor to the employer is determined by the wording of the extension of time clause.

Mishra *et al.,* (2018), studied on "Factors affecting performance and time extension of ongoing construction projects under town development fund, Nepal" and expressed that material related factor was the main elements among different categories for the delay in development projects. All projects under investigation had been provided with expansion of time dependent on the Public Procurement Act (PPA) 2063 B.S. and Public Procurement Regulations (PPR) 2064 B.S. As per the information accessible, all activities in this examination were discovered to be postponed because of natural catastrophes (rain, wind, earthquake and flood), land issue, strikes, and scarcity of the materials and design changes.

Delays are a common source of claims and disputes in building projects, and have even been recognized as one of the most prevalent and expensive sources of issues. There are several factors that might create delays in the construction sector, some of which are unavoidable (Alkass *et al.,* 1995, Othman *et al.,* 2006, Ahuja *et al.,* 1994: Anjay Kumar Mishra, & Aithal, P. S. (2020): Mishra, A. K. (2019): Mishra A K, Bhandari S, Jha T, 2018: Mishra, 2020). As a result, it would be good to produce a guideline to explain which events are eligible for EoT and which are not.

Out of the (nineteen rural municipality) construction projects that were completed by the end of FY 2077/078 B.S, eleven were delayed. Among the project's suffering for expansion of time in the building and upgrading of rural road (Rodhikhola-Chitre-Ramche), time was extended by 41.37 percent in Harinas Municipality-04. Part Ka of Phedikhola Rural Municipality Kuvinde Mattikhan Nuwakot Road had the most time overruns of any municipality. The percentage was 604.40 % (Acharya *et al.,* 2021).

Hupsekot Rural Municipality faced several time and cost overrun due to delay in construction projects and extension of time in construction projects was granted. The study was carried out to assess the impacts of extension of time in projects performance. Also, the impacts were from the extension of time or the impacts were also from delay factors and its effects as time and cost overrun was studied. The practices for extension of time were also discussed.

2. OBJRCTIVES

The overall objective of research was to analyze the impact of time extension on. Construction project performance based on A Case Study of Projects in Hupsekot Rural Municipality.

3. LITERATURE REVIEW

3.1 EoT Evaluation Techniques

With different delay factors have been identified as the important causes contributing to Delays in Nepalese construction industry. Several techniques are used to evaluate EoT. Application, namely 'Global Impact Technique', 'Net Impact Technique', 'But For Technique', 'Time Impact Technique' 'Snapshot Technique', and 'Adjusted As-Built CPM Technique'. Summary of the six EoT practices according to Lian *et al.,* (2012) are.

Global Impact Technique

On a summary bar chart, all of the delays are shown. The total durations of all project. Delays are considered. Individual activities were postponed without consideration. There are delays in parallel actions that occur at the same time.

Technique of Net Impact

Measures the total impact of all delays, including those that occur at the same time delays. Based on the as-built data, it's presented on a bar chart schedule. This approach, on the other hand, does not rely on a network as a result, they may mistake the true effect on the overall completion of the project, and there was a delay in activities.

Adjusted As-Built CPM Technique

When developing an as-built schedule using the critical path method (CPM) format. Delays will be recorded in CPM without distinction between the reasons of the delays.

But for technique

All delays that occurred due to contract-allowable reasons were added to the as-built Timeline. A new project completion date will be calculated using the CPM network Scheduling format. Delay is the cause of the difference between the revised timetable and the original schedule. "Different parties' 'but for' may result in different adjusted Schedules, for example, a contractor's 'but for' may be caused by the owner/consultant, while a consultant's 'but for' may be caused by the owner/contractor" (Hanif *et al.*, 2014).

Technique of Time Impact

At the relevant construction stage, the impact of any delay or delaying event on the Time table is determined. Based on the implications of large delays before and/or after, stop action picture' of the project would be created. After stop action, an additional length will be necessary due to the delay. The discrepancy between the expected completion dates at these two stages is regarded as the project's delay during that time. In other words, we assume that when something happens, the actions will be halted. The following activities can only be continued when the delaying event has been taken into account. The total delay in the project is the sum of all delays that occur during the project's execution.

Snapshot Technique

This technique is similar to the 'Time Impact Technique, but it will take into account the interaction between activities. The duration of the project is divided into several time periods, or snapshots. The extra time between snapshots will be investigated if a delay occurs. Having additional photos improves the accuracy of this procedure.

3.2 Approval of EOT

If the reasons stated in the application are proven to be true after a thorough examination, the EOT can be approved (PPMO, 2019) as:

- The Officer who approved the Procurement can approve an EOT of up to 15% of the initial Project length.
- The Departmental Chief can approve EOTs that are greater than 15% and up to 25% of the initial Project Duration.
- The Secretariat of the Concerned Ministry/Entity can approve EOTs of more than 25% but less than 50% of the initial Project Duration.
- There can be no EOT that exceeds 50% of the initial Project Duration. The Contract should be cancelled due to such requirements (Sharma *et al.*, 2022).

4. RESEARCH METHODOLOGY

3.1 Research approach

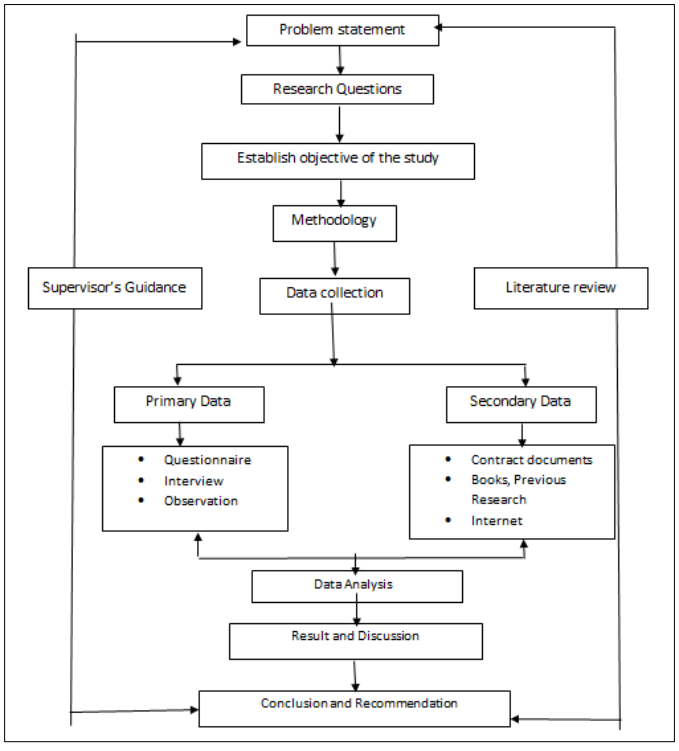

Figure 3.1: Research flowchart

3.2 Description of Research Area

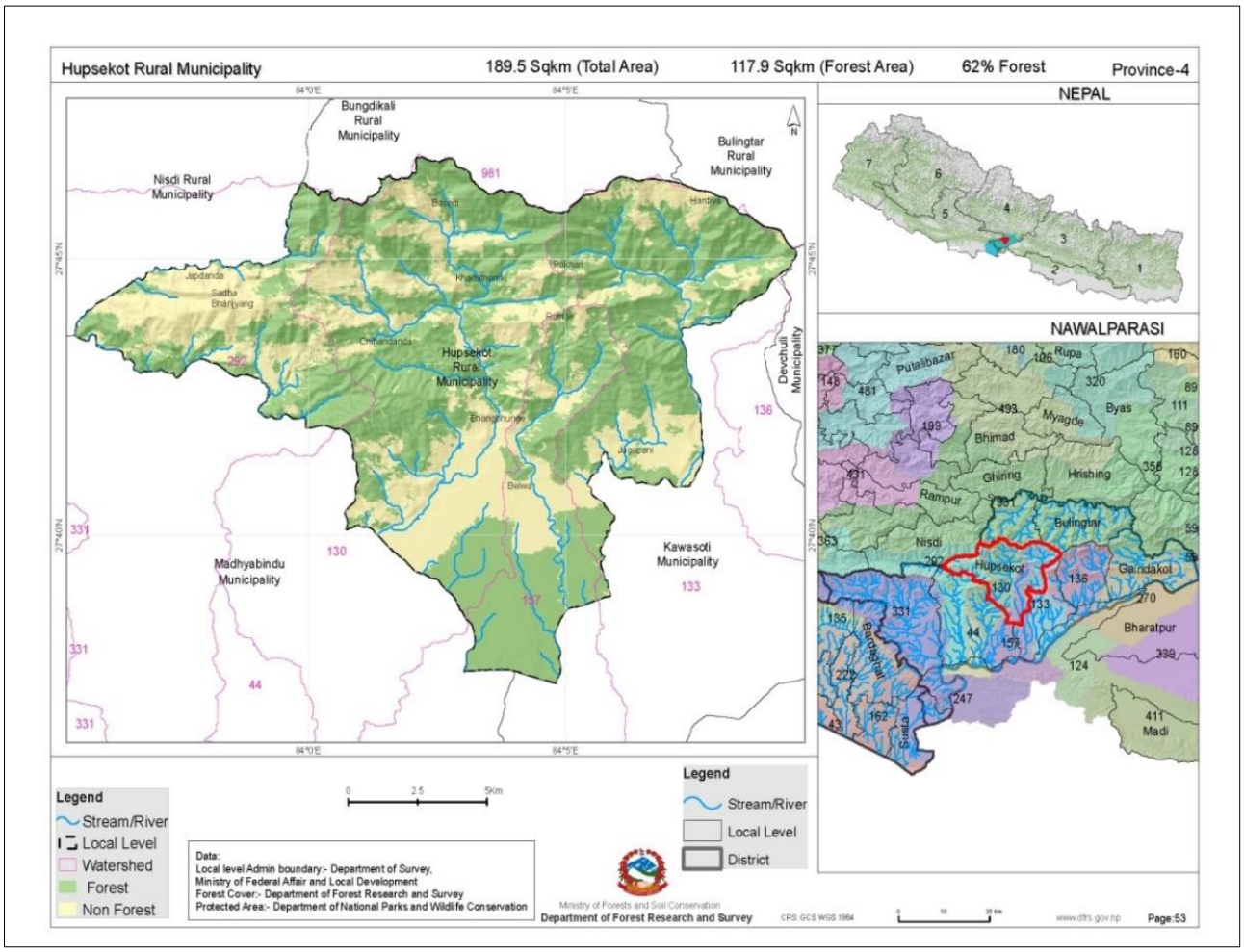

Figure 3.1: Strategic Area Network of Hupsekot Rural Municipality City

Figure 3. 2: Research Map of Road network of Girubari Beluwa Jukepani Road f Hupsekot

3.3 Research Design

The research was a practical problem developed from the observation of construction projects and the research questions was oriented to investigate the Practices adopted in extension of time in construction industries in Hupsekot Rural Municipality. This research was categorized as a validatary research design. The research also tried to relate consequences of time extension in term of projects time and cost and impact of extension of time in projects.

Sample Collection and Sample Size

Test was chosen on premise of stratified strategy technique. Strata were clients, contractors and consultants.

In order to analyze the practices adopted in extension of time in construction projects under Hupsekot Rural Municipality, a wide range of project personnel (including Clients, Consultants and Contractors) involved in construction of the projects was targeted. The list of the targeted project personnel had collected from Hupsekot Rural Municipality Office. As there are 20 numbers of construction projects in the fiscal year 2077-78 constructed under Hupsekot Rural Municipality in tender basis, the population of the research had included twelve construction projects. While distributing questionnaire, the questionnaire was distributed to the concerning Clients, Consultants and Contractors of construction projects under consideration.

The sample size had been determined by the formula:

` $n_{\circ} = \frac{Z^2pq}{e^2}$ (Cochran's Formula) ……eqn(i)

For small population the modified formula:

n= $(n_{\circ})/(1 + \left(\frac{n_{\circ}-1}{N}\right))$……..eqn (ii)

Where, n is the sample size.
N is the sample population, (from all the selected construction projects)
e is the desired level of precision (i.e. the margin of error)=0.05

Assume half of the population work in construction work. So p = 0.5. Now let's say we want 95% confidence, and at least 5 percent (+) plus or minus (-)precision. A 95 % confidence level gives us Z values of 1.96, per the normal table. N is the population =118

p is the (estimated) proportion of the population which has the attribute in question= 0.5

q is 1 – p= 0.5

$$n = \frac{Z^2pq}{(e^2)}$$

$=(1.96 * 0.5 * 0.5)/0.05^2$

=385

n= 385/ (1+ (385-1)/118

=90.58

=90

The sample size was 90 and targeted sample population was as client 30, contractor 30 and consultant 30. The purposive sampling technique was used in this study.

3.4 Projects Selection for Collecting Data

The main construction projects inside Hupsekot Rural Municipality, which were chosen purposively for research study which covered large population area, large budget and that were given under tender basis were listed on Table 2.1 from fiscal year since 2077 to 2078 of selected construction projects.

3.5 Document Analysis

Earned Value Analysis of the time extended projects had been analyzed from table 4.2. The estimated amount, Cost Performance Index, estimate to complete and estimate at completion was calculated. Also, the reasons for the extension of time were collected and the main reasons for the time extension were analyzed.

3.6 Methods of Data Collection

The essential information as primary data and optional information as secondary data was gathered in the accompanying manners.

3.6.1 Primary Data Collection

The primary data for the study was obtained through distribution of questionnaires as well as direct personal interviews with people involve in project construction.

3.6.2 Secondary Data Collection

Contract Document and agreement paper of Hupsekot Rural Municipality

- Running Bills.

- Other distributed and Unpublished Writing, Reports and Diaries papers, Internet and sites.

3.7 Data Base Preparation

The data acquired from the questionnaire and other sources were ordered, entered and analyzed in MS Excel. In view of their subjective and quantitative investigation all applicable primary and secondary information were prepared in MS Excel for further analysis.

3.8 Data Analysis

3.8.1 Time Extension Practices Adopted

The first step of this research was to analyze practices of extension of time adopted in construction projects under Hupsekot Rural Municipality. To assess the types of techniques or practices adopted of extension of types; monthly reports, quarterly reports, trimester reports of projects progress and contract documents and claims for extension of time and other relevant documents related to the project was reviewed at the time of desk study and data related to time and cost overrun of each of the project gathered. The questionnaires were adopted with the intention of investigating current practices by contract administrators in assessing EoT claims. The respondents of the survey were requested to state the timing of assessment of EoT claims based on four distinguished timings with reference to PPA 2007 provisions. The questions in this Section of the questionnaire were adopted from Yusuwan and Adnan (2013) with some modifications to suit the Nepalese construction industry and form of contracts used in the local construction industry.

The practices adopted in time extension in construction industries was listed and individual reactions to the poll which were then appointed with a numerical code was carried out. Information was broken down by figuring:

- Relative Importance Index (RII) of individual elements for their centrality, just as their recurrence of event.
- Ranking of factors in each category based on the Relative Importance Index (RI).

The positioning of variables in every classification depended on the RII to decide the level of connection on positioning the components among the gatherings. This area identified with inquiries on the variables that cause delays in ventures. The 5point Likert-type semantic rating scale was utilized to rate their discernments as follows (Preedy and Watson, 2015).

1 – Strongly Disagree
2 – Disagree
3 – Neutral
4 – Agree
5 – Strongly Agree

The Relative Importance Index (RII) was determined in the accompanying way:

$$\mathbf{RII}=\frac{\mathbf{1n1+2n2+3n3+4n4+5n5}}{\mathbf{A(n1+n2+n3+n4+n5)}} \quad \text{.....Eq. (iii)}$$

Where, n_1 = number of respondents who answered strongly disagree,
n_2 = number of respondents who answered disagree,
n_3 = number of respondents who answered neutral,
n_4 = number of respondents who answered agree, and
n_5= number of respondents who answered strongly agree.

Likert's scale by each respondent in a range from 1 to 5, A = highest weight (which = 5 in this study).

3.8.2 Consequences of Time Extension in Terms of Projects' Time and Cost

After causes of EoT claim was carried out then Earned Value Analysis was carried out. The Earned Value Analysis was calculated from the formula: (Suresh and Ramasamy N, 2015: Sharma *et al.*, 2022).

- Budget at Completion (BAC): is the baseline cost that shows the planned cost for a task, a resource for all assigned tasks or for work to be performed by a resource on a task.
- The earned value (EV): also called the budgeted cost of work performed (BCWP), is an approximation of the value of the physical work actually completed. It relates the original planned costs for the project or activity and the rate at which the team is completing work on the project or activity to date.
- Cost Performance Index (CPI): can be used to estimate the projected cost to complete the project based on performance to date. It is given by:

  CPI = EV / AC
  CPI = 1 means that the planned and actual costs are same.
  CPI < 1 means that project is under budget.
  CPI > 1 means that project is over budget.

- The Estimate at Completion (EAC): is the sum of actual cost in current till date and the estimated cost for the remaining work. EAC = Actual Cost (AC) + Estimate to Complete (ETC). Or, EAC= BAC (Budget at Completion) /CPI
- Estimate to Complete (ETC)=EAC-AC

3.8.3 Impact of Extension of Time on Projects

Following hypothesis was tested to analyze the impact of time extension on project (Mishra, 2019):

Hypothesis:

H_o: There is no impact of cost from extension of time on projects performance.
H_1: There is impact of cost from extension of time on projects performance.
H_o: There is no impact of time from extension of time on projects performance.
H_1: There is impact of time from extension of time on projects performance.
H_o: There is no impact of quality from extension of time on projects performance.
H_1: There is impact of quality from extension of time on projects performance.

These hypotheses were tested by using regression analysis followed by ANOVA test, which signified whether the impact exists between independent and dependent variable.

3.10 Validity and Reliability

Validity

Content validity assesses whether a test is representative of all aspects of the construct.

To produce valid results, the content of a test, survey or measurement method must cover all relevant parts of the subject it aimed to measure. The judgemental approach to establish content validity involves literature reviews and then follow-ups with the evaluation by expert judges or panels. It was a highly recommended type in report and techniques used in the content validity was literature reviews, expert panel, Q-sorting, content validity ratio (CVR) (Taherdoost, 2016).

For the validity the content validity method was used. The questionnaire prepared was tested by pilot testing and also evaluated by external such as senior engineers, supervisors of Hupsekot Rural Municipality and also compared with different literatures. The opinion from different groups was collected and the questions that should be administered for the study of extension time were chosen among the many questions in the questionnaire survey.

Reliability

Reliability concerns the extent to which a measurement of a phenomenon provides stable and consistent results and is concerned with repeatability. Reliability was also concerned with repeatability. Testing for reliability was important as it refers to the consistency across the parts of a measuring instrument (Huck, 2007).

For the reliability test the Cronbach alpha method was used. The Cronbach alpha Correlation was calculated to see the internal consistency between the questions in the questionnaire survey. Cronbach alpha were developed to test its internal consistency. The questions were gathered and covariation of sum of total questionnaire and total covariation of total sum was calculated (Ritter, 2010).

The formula for calculating Cronbach's α is:

$$\alpha = \frac{K}{K-1}\left(1 - \frac{\sum \sigma k^2}{\sigma\, \text{total}^2}\right) \ldots\ldots \text{(iv)}$$

In this case;

- K refers to the number of scale items
- $\sum \sigma_k^2$ is the sum of the k item score variances,
- σ_{total}^2 is the variance of scores on the total measurement

Rule of Thumb for Results

A rule of thumb for interpreting alpha for dichotomous questions (i.e., questions with two possible answers) or Likert scale questions is: (Google, retrieved on april 2022).

Cronbach Alpha	Internal Consistency
$\alpha \geq 0.9$	Excellent
$0.9 > \alpha \geq 0.8$	Good
$0.8 > \alpha \geq 0.7$	Acceptable
$0.7 > \alpha \geq 0.6$	Questionable
$0.6 > \alpha \geq 0.5$	Poor
$0.5 > \alpha$	Unacceptable

4. RESULTS AND DISCUSSION

4.1 Time extension of Project Practices Adopted in Construction Field

4.1.1 Time Extension of Project Practices Adopted in Construction Field Based on Questionnaire

To assess about the respondents' practices in evaluating EoT applications, they were asked to rate how often they submit EoT claims in accordance with clause no 120 of new amendment of PPA 2007 on a 5-point Likert scale (where 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree).

The respondents of the survey were requested to state the timing of assessment of EoT claims based on four distinguished timings with reference to clause no 120 of new amendment of PPA 2007 provisions;

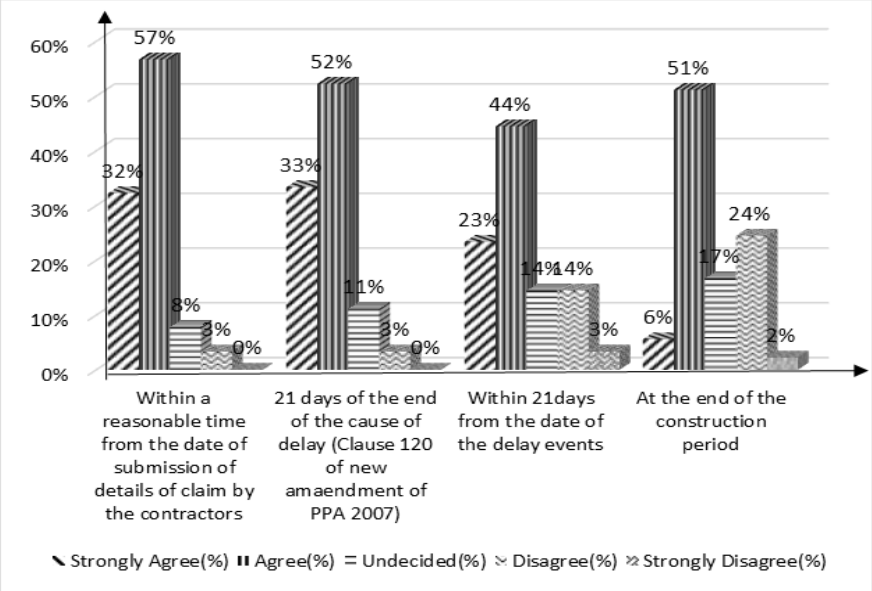

Figure 4.1: Bar graph for timing of assessment in evaluating EoT claim
Source: (Field Survey, May 2022)

Fig 4.1 shows that 32% of respondents strongly agreed, 57% of respondents agreed, 8% of respondent undecided and 3% of respondents disagreed that the client carries out the assessment within a reasonable time from the date of submission of a detail claim by the contractor. Whereas 33% of respondents strongly agreed, 52% of respondents agreed, 11% of respondents undecided and 3% of respondents disagreed that the EoT in Hupsekot Rural Municipality mostly adopted were in 21 days of the end of the cause of delay (Clause 120 of new amendment of PPA 2007).Similarly, 23% of respondents strongly agreed, 44% of respondents agreed, 14% of respondents undecided, 14% of respondents disagreed and 3% of respondents strongly disagreed that the client carries out the assessment within 21 days from the date of the delay events and 6% of respondents strongly agreed, 51% of respondents agreed, 17% of respondents undecided, 24% of respondents disagreed and 2% of respondents strongly disagreed that the client carries out the assessment of EoT at the end of the construction period.

In most cases, the client carries out the assessment within a reasonable time from the date of submission of a detail claim by the contractor had RII of 0.8356. This is similar results with what had been practiced in Malaysian construction projects, where a study by Yusuwan and Adnan (2013). The EoT in Hupsekot Rural Municipality mostly adopted were in 21 days of the end of the cause of delay (Clause 120 of new amendment of PPA 2007) carried RII 0.8311, within 21 days from the date of the delay events had RII 0.74 and at the end of the construction period had RII 0.6667.

4.1.2 Time Extension of Project Practices Adopted in Selected Projects Based on Document Assessment

The content analysis was done as shown in Table 4.1 of Annex 2, that in twelve projects only one project had completed in its contracted period. Eleven projects had been extended for time due to various reasons. Nine projects from eleven projects were completed after first extension of time. Two projects had gone through two times of extension of time. The reasons for extension of time were delay due to excess rain, scarcity of material and equipment and covid pandemic, scope of work change, political instability. The chief administrative officer had given date for the extension of time.

DISCUSSION ON RESULT

The results obtained from study were compared with different literature. For the objective of practices of EoT adopted in Nepalese construction industries Within a reasonable time from the date of submission of details of claim by the contractors and 21 days of the end of the cause of delay (Clause 120 of new amendment of PPA 2007) were the main practices adopted in Hupsekot Rural Municipality followed by Within 21 days from the date of the delay events and at the end of the construction period.

Yusuwan and Adnan (2013), conducted study on Assessing Extension of Time Application in Malaysian Construction Industry: Views from professionals, expressed that the respondents of the survey were next requested to state the timing of assessment of EoT claims based on four distinguished timings with reference to PAM 2006 provisions. It appears that, in most cases, the architect carries out the assessment within a reasonable time from the date of submission of a detail claim by contractor. The respondents were then asked to state their preferred method in evaluating EoT claims.

Azad *et al.,* (2019), performed research on Influence Factors in Extension of Time Claims and stated that incomplete documents/drawing, financial difficulties of client, lack of skilled labour, defective works, shortage of manpower, poor site management and supervision, mistakes during construction, change order, labour injuries/accident in site, changes in drawings/specifications, improper planning, conflict between parties, poor subcontractor performance were the main factors for extension of time.

The findings in this study were in similar to the findings of Yusuwan and Adnan (2013) and also with Azad *et al.,* (2019).

During comparison with literature from sharma *et al.,* it was assessed that the practices of extension of time was not properly used in Nepalese construction industries. The contract was awarded to the contractor with lowest bid but the contractor was not experienced, well-equipped. As a result, the completion was not timely and extension of time clause was applied without any legal requirements. Also, after extension of time the projects was not properly constructed and delay was occurring from time to time.

4.2 Consequences of Time Extension in Terms of Project's Time and Cost

4.2.1 Reasons of EoT Claim

Seventeen reasons for EoT were identified from literature review. To explain the second objective, 90 questionnaires were administered and the result from the analysis based on RII is shown in Table 4.1. The reasons for EoT were computed and ranked based on RII value. Off the total reasons, the effects are not known/could not foresee that an event would cause a delay until the delay occurred was found the top rank i.e. rank one. Similarly, Collection of relevant facts from site records to establish the principle of the claim and quantification/time consuming to check records, delay analysis methods used by contractor different with the method used by the Architect, acquired the second and third rank. Likewise, as motivational factors to contractor (absence of EoT may put pressure on contractor to perform more efficient) ,wait until the end of job because actual delay could not be determined until end of delay or construction, late Submission of claim by the contractor, delay in approval by employer, delay in providing required evidence for the claim of EoT by contractors, contractor submit global claim, no clear guideline/pre-contract agreement for assessing EoT claim, were among the top ten reasons. Architect too busy with other tasks attend the bottom position based on overall RII rank value.

RII analysis and ranking showed the main reasons of EoT as the effects are not known/could not foresee that an event would cause a delay until the delay occurred was found as highest rank. Similarly, Collection of relevant facts from site records to establish the principle of the claim and quantification/time consuming to check records, delay analysis methods used by contractor different with the method used by the Architect, acquired the second and third rank. Likewise, as motivational factors to contractor (absence of EoT may put pressure on contractor to perform more efficient), wait until the end of job because actual delay could not be determined until end of delay or construction, were the main top five reasons of EoT as the consequences.

This is in contrast with what had been practiced in Malaysian construction projects, where a study by Yusuwan and Adnan (2013), discovered that poorly submission by contractor/lack of details and particulars, Late Submission of claim by the contractor, Collection of relevant facts from site records to establish the principle of the claim and quantification/time consuming to check records, Delay analysis methods used by contractor different with the method used by the Architect, Delay in approval by Employer were the main causes of EoT claim.

4.2.2 Earned Value Analysis in Selected Ongoing Projects

Table 4. 1: Calculation of Earned Value Analysis

Hupsekot Rural Municipality Administrative Building construction	(Estimate Amount Budgeted at Cost (BAC): 29846582) (After 1st EOT 31113500) (2nd EoT (AC):31361232) Earned value (EV)=75% of 29846582 =22384936.5 Cost Performance Index (CPI)= EV/AC =22384936.5/31361232 =0.71 Estimate at Completion (EAC)= BAC/CPI =29846582/0.71 =42037439.4 Estimate to Complete (ETC)=EAC-AC =42037439.4-31361232 =9948861.33
Ring Road Construction	(Estimate Amount BAC: 19137681) (After 1st EOT 24137881) (2nd EoT (AC) :24785479) Earned value=75% of 19137681 =14353260.8 Cost Performance Index (CPI)= EV/AC =14353260.8/24785479 =0.58 Estimate at Completion (EAC)= BAC/CPI =19137681/0.58 =32996001.7 Estimate to Complete (ETC)=EAC-AC =32996001.7-24785479 =8210522.72

Source: (Field survey, April 2022)

Table 4.2 of Earned Value Analysis, Time extension was from Cost Performance Index that depended on Estimated at Completion (EAC) and Estimate to Complete (ETC). This EAC and ETC was depended from the rate analysis of the contracts. The Extension of time was not only main factors to time and cost overrun but also the availability of materials, labors productivity, Covid-19 Lockdown, Monsoon, etc.

Also, from Table 4.2 of Earned Value Analysis, two projects had been gone through two times of time extension. For project Hupsekot Rural Municipality Administrative Building construction Rs. 9948861.33 was calculated as estimate to complete after time extended for 6 and 3 months for two times. This result showed that amount to complete had been increased and the time to complete had also increased. For the project Ring Road Construction Rs. 8210522.72 was calculated as estimate to complete after time extended for 6 and 8 months for two times. This result showed that amount to complete had been increased and the time to complete had also increased. The consequences of extension of time as time overrun and cost overrun had been justified with the result.

The consequences on the project's cost and time were from causes of extension of time and also from the factors that delays the projects.

DISCUSSION ON RESULT

The results obtained from study were compared with different literature. For the objective of consequences of time extension in terms of project's time and cost the effects are not known/could not foresee that an event would cause a delay until the delay occurred was found as highest rank. Similarly, Collection of relevant facts from site records to establish the principle of the claim and quantification/time consuming to check records, delay analysis methods used by contractor different with the method used by the Architect, acquired the second and third rank. Likewise, as motivational

factors to contractor (absence of EoT may put pressure on contractor to perform more efficient), wait until the end of job because actual delay could not be determined until end of delay or construction, were the main group factors obtained from results.

Yusuwan and Adnan (2013), conducted study on Assessing Extension of Time Application in Malaysian Construction Industry: Views from professionals, expressed that poor submission of claims by the contractor (e.g., missing details and information), late submission of claims by the contractor, and gathering relevant facts from field records to establish the principle of the claim were ranked highest by respondents as reasons for late evaluation of EoT claims. These results suggest that the main reasons that may prolong the evaluation process are closely related with the management of projects records. It suggests the effective contract administration with organized record keeping not only leads to successful project management, but also increases the chances of a successful contractual claim. While there is no guarantee of getting everything, at the very least, proper factual evidence and adequate supporting documentation will facilitate claims management, helping to reduce conflicts and disputes that result from unsatisfactory claims resolution.

This is in contrast of the study in Nepalese construction industries with what had been practiced in Malaysian construction projects, where a study by Yusuwan and Adnan (2013), discovered that poorly submission by contractor/lack of details and particulars, Late Submission of claim by the contractor, Collection of relevant facts from site records to establish the principle of the claim and quantification/time consuming to check records, Delay analysis methods used by contractor different with the method used by the Architect, Delay in approval by Employer were the main causes of EoT claim.

Mishra *et al.*, (2021), conducted study on Dispute of the Contracts: A Case from Sikta Irrigation Project, Banke, Nepal, and found that: Major factors affecting the project performance identified were: Natural Catastrophes, Rainfall and Pre-monsoon, Land Issue, Blockade, Scarcity of the materials, Design change and Covid-19 Lock down. Natural Catastrophes, Rainfall and Pre-monsoon, Land Issue, Blockade was considered force majeure under their respective contract documents. Scarcity of the materials, Design change was also delay-related events that are the sole responsibility of the Customer. Covid-19 Lock down was also a delay related event due to the Covid -19 coronavirus and lockdown. So for all of the above events, the contractor was responsible for time extensions. At this point, it was noted that all projects reviewed followed the General Contract Conditions of the Office of Government Oversight Standard Bid Document for Schedules and Time Extensions. EoT1, EoT2, EoT3 for all projects were granted in accordance with Section 56 of the Public Procurement Act and Section 120 of the Public Procurement Rules.

Likewise, the study had identified the causes that leads to the claims of extension of time as natural catastrophe, land issue, scarcity of materials, Covid-19 lockdown etc., similarly, this study also identified almost similar results.

During interview, the different reasons for the extension of time were analyzed and the consequences of extension of time were mainly time overrun and cost overrun.

The content validity of the study was validated and the Cronbach alpha for all objectives was found as > 80 so it can be said that data taken were reliable and valid.

4.3 Impacts of Extension of Time (EoT) on Project Performance

From table 2.3 form Annex 2, the Examined (F) value was equal to (203.02) with possibility value (1.41E-24) and it was lower than the specific value (0.05), and that shows there was a significant impact exists between cost impact and Project performance. So, the null hypothesis was not accepted: There was an impact of cost on Project performance due to EoT which is very obvious and to control it, already new law had introduced. Before new amendment, it was stated that without absence of this new clause with the overrun in time, the cost should not increase. But from the new amendment of law in extension of time with the time overrun the cost will also overrun.

From table 2.4 of Annex 2, the Examined (F) value was equal to (234.10) with possibility value (1.59E-26) and it is lower than the specific value (0.05), and that shows there is a significant impact exists between time impact and Project performance. So, the null hypothesis was not accepted: There is an impact of time on Project performance due to EoT which is very obvious and to control it, already new law had introduced. Before new amendment, it was stated that without absence of this new clause with the overrun in time, the cost should not increase. But from the new amendment of law in extension of time with the time overrun the cost will also overrun.

The Examined (F) value was equal to (282.96) with possibility value (3.11E-29) and it is lower than the specific value (0.05), and that shows there is a significant impact exists between quality impact and Project performance. So, the null hypothesis was not accepted: There is an impact of quality on Project performance due to EoT which is very obvious and to control it, already new law had introduced. Before new amendment, it was stated that without absence of this new

clause with the overrun in time, the cost should not increase. But from the new amendment of law in extension of time with the time overrun the cost will also overrun.

Table 4. 2: Summary of Hypothesis Testing

S.N.	Hypothesis	F	Sig. F	Impact
1.	Impact of cost on Project performance	203.02	1.41E-24	Impact Exists
2.	Impact of time on Project performance	234.10	1.59E-26	Impact Exists
3.	Impact of quality on Project performance	282.96	3.11E-29	Impact Exists

As per the result presented on table 4.3, the calculated F value was higher than the significant f value. Therefore, all the null hypotheses were rejected and alternative hypothesis were selected i.e. There was impact of cost, time and quality on project performance similar to sharma *et al.,* 2022.

6. CONCLUSION

The motivational factors to contractor (absence of EoT may put pressure on contractor to perform more efficient), wait until the end of job because actual delay could not be determined until end of delay or construction, were the main top five reasons of EoT as the consequences. But from table 4.2 of Earned Value Analysis Time extension was from Cost Performance Index that depended on Estimated at Completion (EAC) and Estimate to Complete (ETC). This EAC and ETC was depended from the rate analysis of the contracts. The Extension of time is not only main factors to time and cost overrun but also the availability of materials, labors productivity, Covid-19 Lockdown, Monsoon, etc. Based on the findings of the research, the following recommendations are expected.

- Pre-execution preparation of land acquisition, EIA, IEE, and project planning, tasks, resource requirements, and resource allocation should all be handled by a consultant.
- Realistic duration assessment should be done and resources planning should be done.
- A contract with the contractor should include an advance purchase agreement the most likely occurrence in order to avert a building material scarcity.

RECOMMENDATIONS FOR FURTHER STUDY

1. Adequacy of contract duration of the projects.
2. After implementation of 11th amendment of PPMO, the impacts of newly introduced time clause (120) should be analyzed.

REFERENCES

- Ahuja, H. N., Dozzi, S. P., & Abourizk, S. M. (1994). Project management: techniques in planning and controlling construction projects, Wiley, New York.
- Al-Azad, N., Enegbuma, W. I., Bamgbade, J. A., & Ohueri, C. C. (2019, November). Influencing factors in extension of time claims. In *Australasian Universities Building Education Association Conference* (Vol. 43, pp. 70-85).
- Alkass, S., Mazerolle, M., Tribaldos, E., & Harris, F. (1995). Computer aided construction delay analysis and claims preparation. *Construction Management and Economics*, *13*(4), 335-352.
- Alnaas, K. A. A., Khalil, A. H. H., & Nassar, G. E. (2014). Guideline for preparing comprehensive extension of time (EoT) claim. *HBRC Journal*, 10(3), 308-316. DOI: http://dx.doi.org/10.1016/j.hbrcj.2014.01.005
- Anjay, K. M. (2020). Global Contract Administration (p. 145). *Tamilnadu: DK International Research Foundation.* http://doi.org/10.5281/zenodo.4817527 ISBN: 978-81-945468-3-2
- Anjay, K. M., & Aithal, P. S. (2020). Financial Impact Assessment of Time Overrun:A Case of Second Small Towns Water Supply and Sanitation Sector Project. *Nepal International Journal of Applied Engineering and Management Letters (IJAEML),* 4(2), 159-173. DOI: http://doi.org/10.5281/zenodo.4074715.
- Assaf, S. A., & Al-Heiji. (2006). Causes of Delays in Large Construction Projects. *International Journal of Project Management*, 24, 349 -357.
- Bayissa, F. Y. (2018). Causes and Effects of Delay in Oromia Roads Construction Projects Pertinent to Oromia Roads Authority Road Projects. In *Partial Fulfillment of the Requirement of the Master's Degree of Business Administration in Construction Management.*
- Chiluwal, K., & Mishra, A. K. (2018). Impact of performance on profitability of small hydropower projects in Nepal. *International Journal of Current Research*, 10(01), 63918-63925. http://www.journalcra.com
- Choudhry, R., Gabriel, H., Khan, M., & Azhar, S. (2018). Causes of Discrepancies between Design and Construction in the Pakistan Construction Industry. *Journal of Construction in Developing Countries*, 22(2), 1-18.
- El-adaway, I., Fawzy, S., Ahmed, M., & White, R. (2016). Administering extension of time under national and international standard forms of contracts: A contractor's perspective. *Journal of legal affairs and dispute resolution*

in engineering and construction, *8*(2), 04516001. Doi: 10.1061/(ASCE)LA.1943-4170.0000182,

- FIDIC, I. F. (2010). Condition of Contract for Construction for Building and Engineering works designed by the Employer. Geneva: www.fidic.org.
- GON, P. P. (2019). Standard Biddding Document Procurement of Works National Competitive Bidding (NCB). Nepal: www.ppmo.gov.np.
- Hanif, H., Saleem, Y., Shahid, Z. A., Hanif, A., & Zeb, A. (2014) Assessment of Extension of Time Claims in Hydropower Projects of Pakistan. *International Journal of Engineering and Advanced Technology (IJEAT),* 4(1). ISSN: 2249-8958.
- https://www.designingbuildings.co.uk/wiki/Extension_of_time_EOT_in_construction_contracts
- Huck, S. W. (2007). Reading Statistics and Research, United States of America, Allyn & Bacon.
- Ian, W. (2012). Delay and Disruption - a separable duo, *Construction Law J*.
- Kikwasi, G. J. (2012). Causes and effects of delays and disruptions in construction projects in Tanzania. *Australasian Journal of Construction Economics and Building, Conference Series,* 1(2), 52-59.
- Lim, C. S., & Mohamed, M. Z. (1999). Criteria of project success: an exploratory re-examination. *International Journal of Project Management*, 17(4), 243-248.
- Mishra, A. K. (2019). Safety Management Practice Impact on Project Performance. *Solid State Technology*, 62(3), 42-52. Archives Available @ www.solidstatetechnology.us
- Mishra, A. K. (2019). *Assessment of project performance in terms of time cost and quality* (Doctoral dissertation, Doctoral dissertation, Ph. D. Thesis, Institute of Business Management, Chhatrapati Shahu Ji Maharaj University Kanpur, India). DOI: 10.13140/RG.2.2.15038.84809.
- Mishra, A. K. (2020). Implication of Theory of Constraints in Project Management. *International Journal of Advanced Trends in Engineering and Technology*, 5(1), 1-13. http://doi.org/10.5281/zenodo.3605056
- Mishra, A. K. (2020). Project Management: Theory and Practice from Different Countries. (p. 345). Tamilnadu: DK International Research Foundation. http://doi.org/10.5281/zenodo.4817542 ISBN: 978-81-945468-4-9
- Mishra, A. K., & Bhandari, S. (2018). Performance Assessment of ongoing Construction projects under Town Development Fund, Nepal. *Int J Adv Res Civil Stru Engr*; 1(1&2), 27-39.
- Mishra, A. K., & Singh, N. K. (2018). A Review on Time and Cost Issues of Infrastructure Projects. *J Adv Res Comp Tech Soft Appl*, 3(3&4), 1-15.
- Mishra, A. K., Bhandari, S., & Jha, T. (2018). Factors Affecting Performance and Time Extension of ongoing Construction Projects under Town Development Fund, Nepal. *J Adv Res Const Urban Arch*, 3(4), 7-25.
- Mishra, A. K., Sudarsan, J. S., & Nithiyanantham, S. (2020). Assessment of time–cost model of public health buildings in Nepal. *Asian J. Civ Eng*, 1-10. https://doi.org/10.1007/s42107-020- 00294-4.
- Mohan, C. D., & Yukesh, S. (2018) Analysis and Modelling of Factors Causing Delay in Road Construction Projects. *The Asian Review of Civil Engineering*, 7(1), 44-48. ISSN: 2249 – 6203. Available at. www.trp.org.in.
- Mouton, J. (2001). *How to succeed in your master's and doctoral studies: A South African guide and resource book*. Van Schaik.
- Othman, A. A., Torrance, J. V., & Hamid, M. A. (2006). Factors influencing the construction time of civil engineering projects in Malaysia. *Journal of Engineering, Construction and Architectural Management*, 13(5), 481-501.
- Preedy, V. R. (2010). *Handbook of disease burdens and quality of life measures* (Vol. 4). R. R. Watson (Ed.). New York: Springer. DOI.org/10.1007/978-0-387-78665-0_6363.
- Ritter, L. N. (2010). Understanding a Widely Misunderstood Statistic: Cronbach's α. Paper presented at the annual meeting of the Southwest Educational Research Association, New Orleans.
- Sharma, M., Mishra, A. K., & Selvam, J. (2022). Extension of Time in Construction Projects. *(MEC-J) Management and Economics Journal*, 6(2). E-ISSN: 2598-9537 P-ISSN: 2599-3402. Journal Home Page: http://ejournal.uin-malang.ac.id/index.php/mec. DOI: http://dx.doi.org 10.18860/mec-j.v6i2.16659
- Suresh, S., & Ganapathy Ramasamy, N. (2015). Analysis of project performance using earned value analysis. *International Journal of Science, Engineering and Technology Research*, *4*(4), 1080-1085.
- Suroj, G., & Mishra, A. K. (2019). Comparative Study of Prospective Delay Analysis Techniques (DATs). *Saudi J Civ Eng*, 3(5), 84-98. DOI: 10.36348/SJCE.2019.v03i05.001
- Taherdoost, H. (2016). Validity and reliability of the research instrument; how to test the validation of a questionnaire/survey in a research. How to test the validation of a questionnaire/survey in a research (August 10, 2016), *International Journal of Academic Research in Management (IJARM),* 5(3), 28-36.
- Thakuri, A. R. S., Joshi, A., Sangpang, J. R., Chaudhary, N., & Dahal, S. (2021). Literature Review on Extension of Time (EoT) in Construction Project. DOI: 10.13140/RG.2.2.15588.09604
- The Public Procurement Act, 2063, 2007, 11th Amendment, 2019. Nepal: www.ppmo.gov.np.
- The Public Procurement Regulation, 2064, 2007, 2019. Nepal: www.ppmo.gov.np.
- Williams, T. (2003). Assessing extension of time delays on major projects. *International Journal of Project*

Management, *21*(1), 19-26.

- Yadav, S. K., & Mishra, A. K. (2019). Status of Time and Cost Overrun of Health BuildingConstruction Projects in Nepal. *Sch J. Eng Tech*, 7(9), 262-270.
- Yusuwan, N. M., & Adnan, H. (2013). Assessing extension of time application in Malaysian construction industry: Views from professionals. *Procedia-Social and Behavioral Sciences*, *105*, 54-63. Available online at www.sciencedirect.com. Doi: 10.1016/j.sbspro.2013.11.007.