FINANCIAL FORECASTS FOR WORKS CONTRACTS. A CONTENT ANALYSIS OF ROMANIAN RULES ON VALUE ADJUSTMENTS

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Abstract: *Unpredictable events, such as: international market prices evolution of construction materials, fuel and energy, changing rules regarding labour, wages and mobility of goods may lead to cost escalation during works contracts implementation. A proper value adjustment formula may contribute on managing emerging financial risk. Generally, those formulas are subject to national rules, but only for public investments, of great value and long duration, the rest remaining to the contracting authorities' decisions. Looking for the right formula in those cases of non-regulated situations induces stress for personnel, and also the risk of affecting investments performance through wrong decision.*
The paper's objectives are both qualitative and quantitative, searching, through a relevant Romanian legal frame content analysis for answers at two research questions: how a works contract value could be adjusted, and how can be choose the most appropriate one among different value adjustment formulas? A selection of contemporary relevant national rules and regulations on value adjustment formulas was studied to answer at these questions, revealing specific approaches on treating adjustments. Results of this content analysis refers to the presenting and discussing various models of value adjustment approach in Romanian works contracts. Paper's conclusions could be used by researchers in further investigation of relationship between various value adjustment formulas and investment's performance. Conclusions could be also useful for practitioners, in selecting the appropriate value adjustment formula in case of non-regulated such as relatively small value and short duration works contracts. As a personal contribution, a model on selecting a value adjustment formula is here presented.

Keywords: *COVID 19; works contract; statistical price index, unpredictable events occurrence.*

JEL Classification: *G17; H41; H72.*

1. Background

The paper is organized as the subject of works contract value adjustments may be easily to follow and understand. In this section is presented a Romanian legal background of this topic. In the next section is presented a relevant literature review, with an accent on studied factors that may affect a contract's value escalation, followed by a description of the research methodology. Next are presented the findings on the topic, including a model on how a choice may be made among different adjustment formulas, and finally are presented the conclusions.

Public works are contracted in Romania for execution mostly to private firms, selected after procurement procedures. Specific procurement procedure to be used is selected according to the intended contract type and value, following the public procurement law provisions. The outcome of procurement procedure is the works contract, mostly of a closed type. As foreseeing legal, technical and financial risks, the tender charged personnel feel a lot of pressure in drafting works contracts. Regarding financial risks, the most important is the effect of future unpredictable events such as prices variations on construction materials, fuel, labour, machinery and goods. Without a proper form of the works contract, the contractor may ask for unpredictable and fishy payments, affecting the contract economy and investment efficiency. This is why an accepted and already tested contract form, including an appropriate value adjustment formula is desirable. Recognizing the probability of unpredictable future events financial risks materialization, the Government imposed to all contracting authorities the use of adjustment formulas in all contracts having duration of more than twelve months.

Mandatory rules on procurement contracts are settled by the public procurement law, followed by Government Decisions and Instructions issued by central authorities. These rules could be also complemented with best practices models such as FIDIC, even they are no longer, or have never been enforced in Romania.

In the last ten years, for important contracts, the Government tried to implement FIDIC and also to enforce some adjustment value formulas. Even if there are no longer in force, past adjustment formulas may be an inspiration for new formulas to be included in smaller value and short contracts, not covered by actual law.

The Romanian Government tried to support contracting authorities by national implementing the models of the International Federation of Consulting Engineers (FIDIC), so in 2008, general and specific works contracts conditions were imposed, together with some national explanatory clauses. The FIDIC models were adopted in Romania, but for just one year, being repealed in 2009. In 2010 the Government returned to FIDIC, approving just a part of the models (Red and Yellow) strictly for

national interest transport infrastructure.

Seizing the necessity of methodological support for a broader area of works contracts, the Government issued in 2018 the Decision no. 1, referring to general and specific conditions of works contracts financed by public source. Two value adjustment formulas were introduced and further imposed.

After the effects caused by COVID 19 pandemic were felt on prices, as a reaction on the construction materials generalised prices increase, the Government proposed by the means of the Ordinance 15 and Orders 1336 and 2050 of 2021, another formula for value adjustment calculation.

In 2022 as the financial crisis and the Black Sea war overlapped to the effects COVID 19 pandemic on increasing construction materials prices, the issue of value adjustments has needed to be analysed in a broader perspective, so that the risk in contracts to be better treated. A new adjustment formula was introduced in the 64 Government Emergency Ordinance (G.E.O.), later modified by the G.E.O.109 and 117. This new formula, applied to all Romanian EU financed contracts has also a non-mandatory indication to be used in further contracts. Recognizing that some statistical indexes are no longer calculated, and thus old contracts adjustment formulas cannot be applied because of losing support for those indexes, by the provisions the G.E.O. 101/2022, the Government accepted to reimburse the amount of value corrections applied to Contracting authorities for using substitutes to older formulas that cannot be longer used by cause of missing values for certain indexes.

Initial regulatory framework, in force prior the overlapped crisis started in 2019, was focused on the matter of big and long-term contracts value adjustments, as long as setting up conditions for adjustments of smaller value and shorter duration contracts were let mostly at the Contracting authority's decision. In those cases, sound reasoning regarding economy and efficiency of implementing public works contracts should support the Contracting authorities' decision on designing, adopting and further use of the value adjustment formula.

2. Literature review

A consensus exists on the fact that contractor's bids are dependent on the value of materials, labour, energy, transport, recognized as critical factors in contracts cost escalation (Qadeer, Z. et al, 2019). Works contracts are attributed through public tenders, on the base of specific criteria, including the offer's price that may be or not subject of further justified adjustments. Works contract adjustments based on price escalation clauses were studied in the case of bridges construction by (Mishra, A. K., 2023), recommending a series of three coefficients for critical factors: labour,

materials and equipment that should be further used in justifying adjustments.

Beside these critical factors, some other factors were recognized by another study focused on owners, consultants, and contractors' perception (Enshassi A., et al. 2009) as affecting the performance of the construction projects: escalation of material prices, availability of resources as planned through project duration, the average delay caused by shortage in construction materials, etc. More recent studies, based on deep neural networks usage (Wang R., et al., 2022) insists on more factors contributing at contracts cost escalation, namely the economic factors such as: inflation rate and consumer price index. Also (Linlin Z., et al., 2021), concludes that certain identified external factors, the so called "complexities" may influence both directly and also indirectly the construction final cost. It became obvious that contract cost escalation depends on various factors, beside the critical ones already described, but because of uncertainly of extent of materialization, these non-critical factors are seldom treated inside closed contracts adjustment formulas, their approach being more appropriate within open contracts.

A rigid model of tendering closed works contracts, based only on the criterion of the lowest price was studied in Czech Republic (Ochrana F. Hrncirova K., 2015). Conclusions shows that in the case an only criterion – the lowest price – is used, even if the contract is attributed faster, the works quality may suffer, and further repairments of such apparently less expensive works comes with important further costs. Ignoring so the critical factors on cost escalation determines weak performance on infrastructure projects and finally financial losses. Aspects on cost escalation in public works contracts implementation were already studied, (Dogar C., 2022) presenting briefly in conclusion a risk approach analysis as a choice among: acceptance of some minor value increase, use of an adjustment formula or lastly termination of contracts.

3. Research methodology

Works contract value escalation due to unpredictable events occurrence represents a financial risk that may be managed if prior the contract was drafted, a value adjustment formula was properly selected to be used. Selecting such a formula requests a descriptive – exploratory approach consisting first on a content analysis of the existent relevant legal frame, establishing the basic hypothesis for the intended contract/investment, preselecting some relevant formulas, testing their impact and analysing it as a decision may be taken on the most appropriate value adjustment formula.

This research has two objectives. The qualitative one is about the possibility of updating works contract value, and the quantitative one is about the way that different existent formulas could be evaluated in order to facilitate the selection of an appropriate formula for contract value adjustment. There are two research questions to be answered to, each connected to a specific research objective:
• How can a contract value be legally adjusted? and
• How can be choose the appropriate one among different value adjustment formulas?

Conclusions were drafted related to the use of the most significant updating formulas. These should be relevant for contracting authorities' personnel and for consultants as well, in risk assessment on the early stages of drafting works contract including here proposition of value adjustment formulas for works contracts, in cases not entirely covered by the existent legal frame.

4. Findings and discussions

With reference to cost escalation as effect of unpredictable events, the open contracts type let space to contract parties in settling the unpredictable, as long as, the closed type contracts, as defined by the Romanian Law, let just a small margin of action, through the use of the initial adjustment formulas, limiting so the risk approach during contracts implementation. Estimating the contract financial risk involves so, foreseeing of some future realities determined by some unpredictable future events, and as a mean of treating risk stays only the value adjustment formula together with a clause of termination if contract implementation becomes too onerous. As long as including in contracts a value adjustment formula is mandatory, in case of works contracts of big value and long-time the Government imposed models for it. For the small value and short period contracts, the contracting authority has to decide on the most appropriate contract form, including adjustment value formula. In the prior case of non-mandatory formulas, estimation of future realities may be model within the contract design phase, by testing various value adjustment formulas against the most likely critical factors to be modified in time, by reporting to appropriate statistical indexes' evolution.

How much risk may be considered as acceptable is a question the contracting authorities management should answer through the selection and use of the most appropriate adjustment formula. This is inducing stress to local's authorities designated personnel, about how to test and choose for further usage of the most appropriate value adjustment formulas on the purpose of respecting the principles of economy, efficiency and effectiveness on spending public money. By comparing

available formulas output using an estimate of the monthly works value and appropriate statistical indexes, a conclusion may be formulated on the way the most appropriate formula may be selected to be used in the future works contracts. Such a decision model is presented, as a personal contribution, at the end of this section.

4.1. FIDIC contract clauses in Romania
Introduced in 2008, repealed in 2009, and reintroduced in 2010 for certain contracts, the FIDIC clauses are allowing for a contract value to be updated in certain conditions, but only if in the tender (procurement) procedure the tenderer submitted a data updating table. If such a table has been accepted by the beneficiary evaluation committee, the dedicated modification clause (no. 13) may enter in force. This clause is stating that a formula of the following type should be used to adjust the contract value in case of updating prices due to modification of legal framework or of the prices of materials, goods, labour or in other cases:

$$Pn = a + \Sigma \left(ai \times \frac{\text{index in}}{\text{index i0}}\right) \qquad (1)$$

Where "Pn" is the update index to be applied to the value of the works realized in the period n, "a" is a fixed coefficient, explained in the updating data table, representing the part of the value it is not to be updated, "ai" are coefficients that are expressing the estimate share of each relevant element of works (labour, goods, type of materials, energy, transport, etc., as described in the updating data table), "index in" represents current prices indexes and "index i0" represents reference data indexes, as stated in the contract. In order to be applied, update of FIDIC contracts values formula is to be accepted as general rule in the updating data table, as part of the offer, stating the "a", the "ai" and the reference period. The described formula is then mandatory, the parts cannot renegotiate a modification of this formula. This formula may be appreciated as a comprehensive one, as long as it takes into consideration necessary updates to all components identified as critical factors in modification of an estimate: materials, labour, transport and machinery needed. Setting up indexes refines the outcome, the adjusted value. This formula was used for a short period of time, being replaced by another one, introduced by the newest Romanian Law of public procurement no. 98/2016, as described below.

4.2. Government Decision nr. 1/2018 contract clauses in Romania
As a result of renewing the public procurement legal framework, the Government of Romania issued in 2018 the Government Decision nr.1 referring to works contract

clauses. Under this, value of works contracts shorter than 12 months should not be adjusted, and the longer ones should use a polynomial formula:

$$An = av + m \times \frac{Mn}{Mo} + f \times \frac{Fn}{Fo} + e \times \frac{En}{Eo} \qquad (2)$$

Here An is the adjustment index to be applied to the value of the works realized in the period n, av is the advance share of total works contract, the m, f, and e are the shares in total works, Mn, Fn and En are the appropriate statistical indexes in the month 60 days prior to payment request (works situation), and Mo, Fo and Eo are appropriate statistical indexes in the reference month for material, labour and equipment. This formula introduces a more accurate link between the contract adjustment index, the advanced paid to the contractor, and costs variation from contract signature to payment request of identified critical factors in price escalation: materials, labour, and equipment. The used indexes for material, labour and equipment are provided by the national statistical service for each month, so determination of the contract value adjustment index is transparent enough for all parties involved (beneficiary, contractor, engineer - supervisor, financial partners, auditor, etc.). Use of a simplified formula is allowed in certain conditions, using one single type of index, the general construction index published for each month in the monthly statistical bulletin at the point 15:

$$An = av + (1 - av) \, x \, \frac{In}{Io} \qquad (3)$$

In this case, taking into consideration the percentage of advance provided to the contractor (av), a simple comparison between the reference date construction index (Io) and the current one (In - 60 days prior to payment request) provides a simple and transparent adjustment index for the contractor's payment request value.

4.3. Overlapped crisis of COVID 19, materials shortage and induced increased prices, energy and financial crisis as unpredictable events recognised as licit reason to adjust EU financed works contracts values in Romania
As a response of increasing construction material prices in the COVID 19 pandemic period, in 2021 the Government issued the Ordinance no. 15, introducing so a formula to support all beneficiaries and contractors that didn't have an unpredictable events value contract adjustment formula. The introduced formula was:

$$Va = C \, x \, Vo \qquad (4)$$

Here Va is the actual value, Vo is the initial value and the adjustment index C.

$$C = P \times \left(\frac{ICCMo}{ICCMjan2021}\right) + (1 - P) \qquad (5)$$

C is calculated using the percentage of materials in the Payment request (P) and the construction material cost index at the month 30 days prior to payment request (ICCMo) reported to the construction material cost index in the month of concluding the works contract if the contract is newer than January 2021 or at January 2021 if works contract is older (ICCMjan2021).

As effect of the need to introduce a common application of this Ordinance, the Ministry of Development introduced a new formula, inspired from the G.D no.1/2018, but shorter:

$$An = av + m \times \frac{Mn}{Mo} \qquad (6)$$

Here m is the share of material in total estimate cost, Mn is the statistical index for material in the month 30 days prior to payment request and Mo is the material statistical index at the reference date (January 2021 or later). The legal text imposed to all contracting authorities to use this formula in the new concluded works contracts but also in on-going procurement procedures as well.

Later, in 2022, confronted with continuation of the crisis, the Government decided that already established adjustments for materials are not enough, as effect of interrelated effects of energy crisis, of financial crisis and trade difficulties caused by the Ukrainian war. The G.E.O no. 64/2022 introduced another formula for adjustment calculus, needed to follow the new market reality due to all these overlapped crises. According to law, this formula should be applied at builder's requests to all contracts, irrespective of already used adjustment formulas, based on the fact that nobody had could forecast at the contract signature the amplitude of overlapped crisis impact on markets and contracts as well.

$$Vapl = Vm \times \left[(\%av + \%p) + (1 - \%av - \%p)x\frac{ICCmr}{ICCmlr}\right] + (Vpl - Vm) +$$
$$(1 - \%cpm)x\left\{(Vpl - Vm)x\left[(\%av + \%p) + \frac{(1-\%av-\%p)xICCr}{ICCplr}\right] - (Vpl - Vm)\right\}$$

$$(7)$$

Here Vapl is the payment request value (with adjustment), Vm is the value of materials in the Vpl - real executed works. %av, %p and %cpm and are the percentages of advance payment, of contractor declared profit, and of materials share in total contract. ICCmr and ICCmlr are the construction cost index for materials

realized in the prior month of request of payment (ICCmr) and index realized in reference month (ICCmlr). ICCr and ICCplr are the construction total cost index realized in the prior month of request of payment (ICCr) and the index realized in reference month (ICCplr). This formula can be used to all contracts with no adjustment formula, or whose with initial formulas financial impact is lower with at least 5% than the impact of this new formula, as stated in the latest updated legal text form, in E.G.O. 99/2022. The relevant legal framework is still in development, so the E.G.O. 117/2022 introduces modifications of E.G.O. 64.

4.4. A model on choosing among different value adjustment formulas.

The feasibility study provides important information on expected total value of the intended investment, of its components (material, labour, equipment, transportation, goods, design) and of its monthly calendar progress. As a first step, a decision on correction of the investment calendar should be taken, in terms of duration and value allocation over time as analysing the exogenous factors of the contract such as: expected seasonality during the investment execution calendar, prior conditionalities on availability of construction site, lessons learned on recent similar investments implementation, local availability of necessary labour force, existence of local experimented potential contractors, etc.

Second it should establish the contract conditions correlating them to the exogenous factors: if advance payments are permitted and in what extent, what is the deadline for submitting offers, how much the tender procedure is expected to last, how long the works will last, how long the works reception will last and when it will the last payment be done. Then a selection of possible to be used formulas may be done, according to all basic hypothesis on the intended investment.

For testing the intended value adjustment formulas, the most recent period of time for which all indexes are published is to be selected, and used as model implementation duration, according to the corrected investment cash-flow.

For a new works contract with an estimate contract value of about 1,000,000 RON, having a period of implementation of about one year, choosing the appropriate value adjustment formula may start with preselecting adjustment formulas. Then after applying the already known recent statistical indexes in preselected formulas outputs are compared and analysed before a decision is taken. The base hypothesis for comparing formulas outputs here is: contract value 1,000,000 RON, from this value 40% represent costs with material, 10% contractor's profit, implementation is considered as being linear, with a monthly value of executed work of 100,000 RON, with no payments in advance for this contract. Four formulas are to be tested. The first formula is based on consumer price index (inflation):

$$Pn = Po \ x \ Consumer \ price \ index/100 \tag{8}$$

This formula is a simple one, and tempting because is easy to use in relationship with the contractor. The consumer price index covers the period between contract signature and each payment request, information being available on the National Statistics Services' site.

The second tested formula is formula (3), the third is formula (6) and the fourth is formula (7). Outputs are presented in the tables below, as absolute values (Table 1) and in comparison, (Table 2). Evolution over time is presented in Figure 1.

Table 1: Value adjustments with the formulas (8), (3), (6) and (7) in RON

Month	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23
Formula 3	9495	10530	12234	13877	9921	9799	10834	11990	12538	13999
Formula 8	7560	8380	9340	9950	11410	12840	14250	14680	15070	16190
Formula 6	6391	7139	7963	8994	5025	4149	4793	5231	3170	3273
Formula 7	6231	7214	8468	9890	5129	4304	5195	5936	2393	2900

Source: own processing study-case data with the formulas (8), (3), (6) and (7)

Table 2: Comparison of value adjustments with the formulas (8), (3), (6) and (7) in RON

Month	Total adjustment value with formula	% from total contract value
Formula 3	115216	11.52%
Formula 8	119670	11.97%
Formula 6	56128	5.61%
Formula 7	57660	5.77%

Source: own processing study-case data with the formulas (8), (3), (6) and (7)
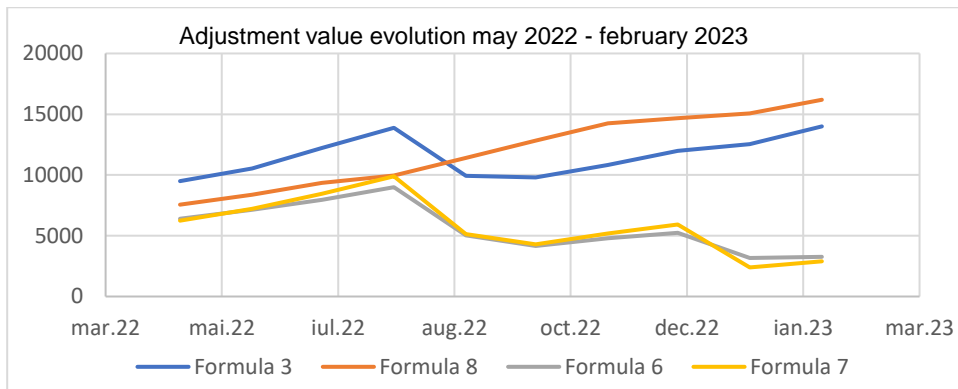
Figure 1: Different impacts in modelling the choice of adjustment formula
Source: own processing study-case data with formula no. 8, 3, 6 and 7

Even if formulas (3) and (8) looks like easier to be used, they imply more costs than the other two that have approximately a similar output. A decision in switching between the formulas 6 and 7, having in this case an approximately similar output, may be based on choosing between the ease of use (6), and a more reliable and complete output, with the risk of some of the indexes that may lose support in time leading at an unapplicable formula (8). Introducing too many indexes may affect the fairness of the value adjustments, by the way of shady index manipulation. Even if formula is accepted, this may affect the contractor's capacity of realizing the object of the contract since the adjustments he may receive in the contract period may not be enough to support the current works. As long as the State is assuming some parts of the adjustments, avoiding deficits may appear as a justified decision, and the moments of that decision may be observed in the figure 1 as the inflexion points of all curves depending on statistical construction indexes, as long as until than the inclination of all curves was approximately the same with the inflation based one, represented by formula (8).

This study case reflects, from the economy and efficiency perspective, the quality of reasoning in using a certain formula, which is directly connected to the presented base hypothesis. Too much economy (formula 7) may lead the contractor to a financial impossibility to finish the works, so the efficiency may be directly and badly affected. In this case the contract may be delayed or even terminated, without finishing the investment, meaning supplementary costs in works conservation, in legal actions, and more time and a greater budget in later works after a later tender procedure. Switching toward efficiency (formulas 3 and 8) may lead to a loss in terms of economy with significant values (as the surface between curves 3 – 8 to 6-7, meaning in this example about 5% of the contract value). Changing base hypothesis leads to other results, but the principle in choosing remains the sound financial management of public works contracts.

5. In conclusion

Materials, labour, energy and transport are recognized as critical factors in public works contracts cost escalation. Establishing a value adjustment formula is a must for contracts, in periods of crisis, irrespective of their value or duration, even if the legal framework does not request it imperatively. If there are legal provisions applicable, the value adjustment formula should follow those rules. As reality shows, in time, some of the indexes proposed to be used in mandatory formulas are losing support, being no longer available. Based on this finding, if there is room for choosing between different mandatory formulas, a formula with less number and more stable indexes should be selected. In case there is no a mandatory value adjustment formula to be use, a choice should be done among tested formulas.

Value adjustment formula is based on indexes applied to general estimate components (materials, labour, energy and transport), so an initial study in terms of values, trends and communicational stability throughout time of the most common applicable indexes should be a must, prior the contract drafting. A stable value adjustment formula will allow works contract's parties to agree on deserved, not on some doubtful payments.

As regarding the works general estimate components (also recognized as critical factors in contracts price escalation), their initial weight is known for a certain investment, so each of one could be analysed against risks. For example, the minimum wage legal framework is to be expected to be modified in the future, so risk in increasing labour costs in the next three years is very high. On the other hand, energy costs, already very high are likely improbable to increase significantly in the near future.

The reasoning on choosing an adjustment formula should involve certain criteria such as: a fair contribution to both economy and efficiency of works contract, ease of use and stability over time. The mix and weight of used criteria should be considered in close relationship with the base hypothesis: the general estimate value and associated cash-flow, but also with some "complexities" such as: lessons learned about the competence of local builders, their financial stability, their results in similar contracts in terms of quality and timing, the competence and prior results in similar contracts of local management teams and of engineers (works supervisors), the stability of economic environment, the climate change, the local unemployment, etc.

References

1. Dogar C. "*Performance approach of European Union funded works contracts in Romania, a case study* ", The Annals of the University of Oradea. Economic Sciences, Tom *XXXI* 1st issue, July 2022, p 172 - 182, ISSN: 1582-5450;

2. Enshassi A., Mohamed S., Abushaban S., (2009). "*Factors affecting the performance of Construction projects in the Gaza Strip.* " Journal of Civil Engineering and Management. 15. 10.3846/1392-3730.2009.15.269-280.
https://www.researchgate.net/publication/42622404_Factors_affecting_the_performance_of_Construction_projects_in_the_Gaza_Strip

3. Linlin Zhao, Jasper Mbachu, Zhansheng Liu, Xuefeng Zhao, Bill Wang, "*Investigating the Causal Relationships between Project Complexities and Project Cost: An Empirical Study from New Zealand*", Advances in Civil Engineering, vol. 2021, Article ID 6624647, 17 pages, 2021. https://doi.org/10.1155/2021/6624647

4. Mishra A. K., Chaudhary N., & Aithal P. S., (2023). "*Evaluation of Price Adjustment Coefficient for Construction Contracts.* "International Journal of Management, Technology, and Social Sciences DOI: https://doi.org/10.5281/zenodo.7646098

5. Ochrana F. Hrncirova K., "*Does the Lowest Bid Price Evaluation Criterion Make for a More Efficient Public Procurement Selection Criterion? (Case of the Czech Republic)*", 2015, NISPAcee Journal of Public Administration and Policy, DOI:10.1515/nispa-2015-0003

6. Wang R., Asghari V., Cheung C., Hsu S-C., Lee C-J. (2022). "*Assessing effects of economic factors on construction cost estimation using deep neural networks. Automation in Construction.* "134. 104080. 10.1016/j.autcon.2021.104080.
https://doi.org/10.1016/j.autcon.2021.104080

7. Qadeer Z., Memon N., Leghari M., Memon A., Siddiqui, F. H., (2019). "*Identification of Critical Factors Influencing Cost Escalation in Public Sector Construction Projects* "(PTK-051).
https://www.researchgate.net/publication/338501145_Identification_of_Critical_Factors_Influencing_Cost_Escalation_in_Public_Sector_Construction_Projects_PTK-051