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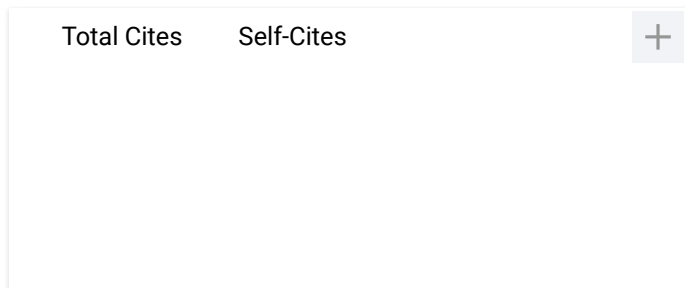
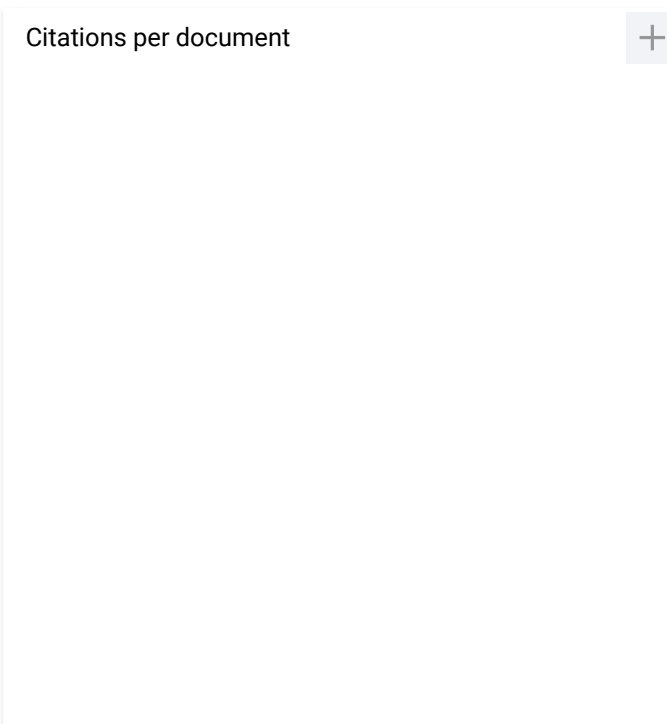
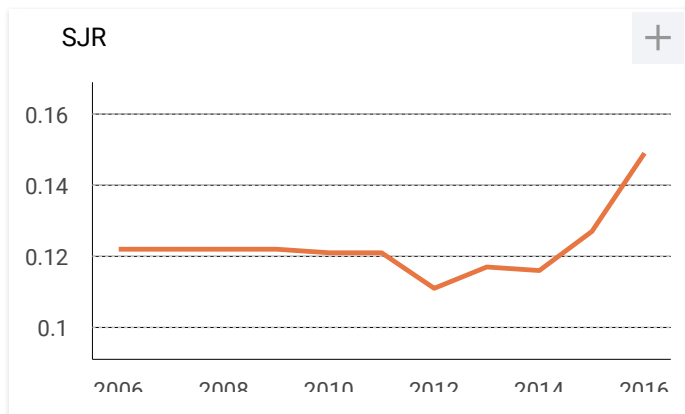
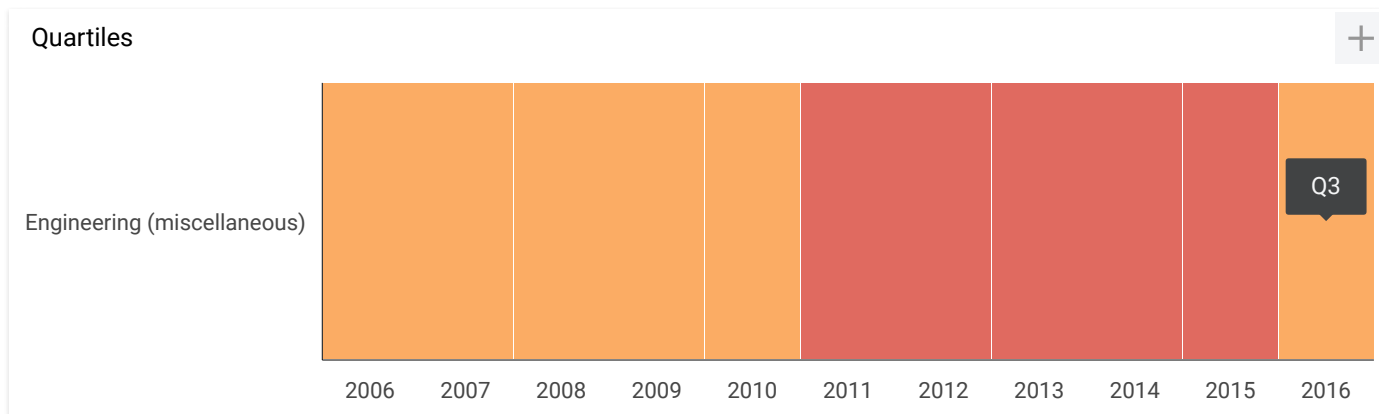


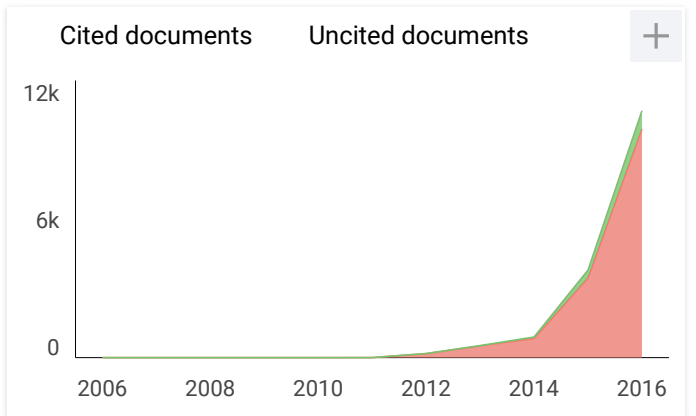
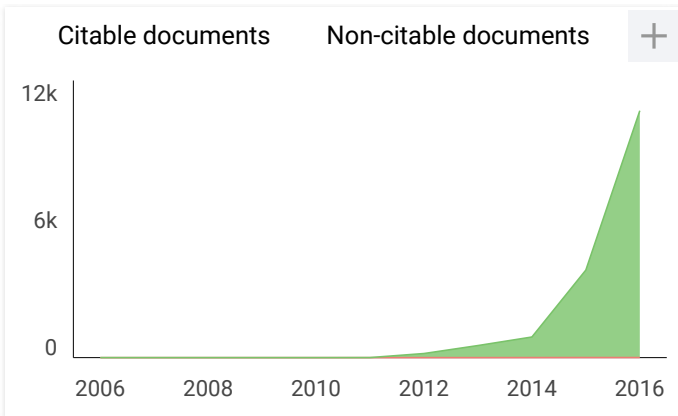
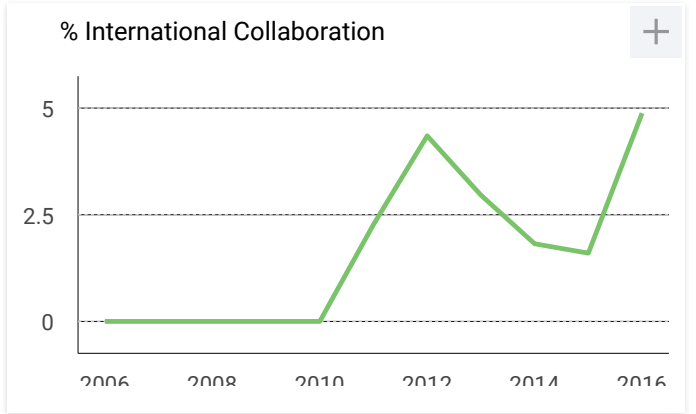
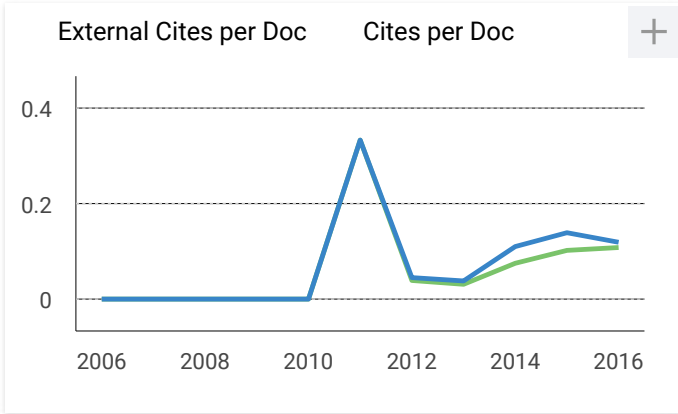
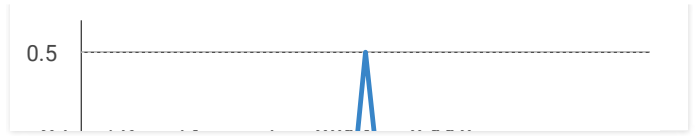
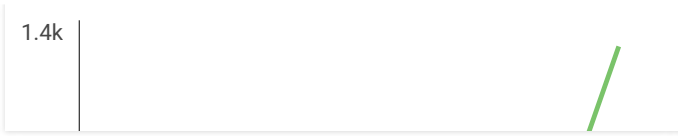
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Variation Order, The Causal Or The Resolver Of Claims And Disputes In The Construction Projects

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Abstract

Variation Order is the things that always happen in every construction project, which in some studies found as one of the causal factor of claims. The variation orders always have a cost and time implication, whatever the variations are there will be a risk that even in the omission of the works, where there are reduction of the original volume in the Contract, there are risk on additional cost should be taken into consideration. The variations in the works, if not handled properly, surely will become the main causal factor of the claims submitted by the contractor. The parties should also be aware that they should pay attention to the clauses related with the variations in the conditions of contract, since misinterpretation and/or different interpretation may lead to dispute. As what Adriaanse [1] said that "A variety of factors makes a construction contract different from most other types of contracts. These include the length of the project, its complexity, its size and the fact that the price agreed and the amount of work done may change as it proceeds". In the construction contract the most important goal is to complete the project and the premises could be operated without any disputes which are costly and time consuming, it also may hamper the operation which will cause another financial loss to the Employer. The variation orders have many forms, it vary from the Engineer Instruction until the approval of the working drawings which will be used for construction at site. This study concludes that the variation order is the most effective tool for resolving the claim.

Keywords: variation order, claim, dispute, causal factor, resolver.

INTRODUCTION

Seldom if ever is a project completed without any variations in the work. Considering such conditions, the contract clause on "variations" becomes a most important provision in the Conditions of Contract, since the disputes which may occur between the Employer and the Contractor is mainly about the determination on who should bear the cost incurred. Variations clause should also provide the party's rights and obligations. With the above understanding, for handling any variation in the work, the proper variation clause could be the effective mechanism.

Richter [2] said Once the construction phase of a project is underway, the employer and contractor may come to disagree over the precise composition and scope of the work required in their contract.

Variation Order is one ordered in a manner strictly conform to the requirements of the contract's variation clauses, generally

requires a written evidence on the variation where the works are different from the original contract. Most all acknowledged international standards on construction contract contain contract clauses allowing the Employer to make additions and/or deletions to the work to be performed or to change the quality of the work. This ability to make changes allows flexibility during the contract performance, facilitates the suggesting of changes by either party, provide a mechanism for compensating the contractor for additional work, and serves as a vehicle for contractor claims should the amount of compensation be disputed. Variation orders is legally the approved changes in a specification of project.

In the construction project, with reference to FIDIC Conditions of Contracts Rainbow Edition [3][4][5], there will be some variation orders issued in the works, due to many reasons, i.e. to change the quantity, to change the quality, to change the design, to change the works programmed, to change the method of working, to omit the work etc.

Takei [6] said that Variations might be defined as an alternation to the contract specifying works already required to be done. Variations is not the same with "the extra work", since the extra works involve additional items of work that are not included in the original contract.

Hardjomuljadi [7] said variation order is needed, since the Contractor is always required to perform different works from what he understand and imagine at the tender stage, it will mostly differ from the information to tender that he received during the pre-bid conference. In this case, the contractor can never refuse to perform such variation as ordered by the Employer/Engineer as stated in FIDIC Conditions of Contract for Construction.

Chow [8] said that variation order is an order or direction issued to a contractor by a person empowered to do so under the terms of a construction contract requiring the contractor to vary the works.

Abdulkadir [9] said that variation order issued in construction projects are vary from changes related to physical conditions such as geological condition, quarry site, landslide, flood etc until administrative conditions such as changes in the government regulation.

As an impact of variations ordered by the Employer/Engineer, the Contractor usually submit the claim for additional payment which will cause additional in contract price. Some of the request could be accepted and the Engineer will issue variation order for this purpose. In case that agreement can not be reached, and the dispute occurred, then they should come to arbitration, adjudication which are bound the parties or another alternative dispute resolution.

Hardjomuljadi [10] remind that in the construction contracted project, the less work does not always mean the less cost,

most of the variation orders to omit or reduce some works result the additional costs.

MATERIALS AND METHODS

FORMER STUDY (2009)

The result of the former study conducted by Hardjomuljadi [11] indicate the relationship among causal factors of claim in the hydroelectric power plant projects in Indonesia as figure 1 below, it could be seen the relationship among constructive change order-variation order-change in design, where variation order have the (+) relationship with the constructive change order and the (-) relationship with the change in design respectively.

This study had been done in 2014, conducted in the road construction within the Ministry of Public Works who act for and behalf of Government of the Republic of Indonesia in the construction of all public roads. Understanding on the variation order become extremely important since in the government programme 2014-2019, the road construction have the higher priority together with the power plant projects.

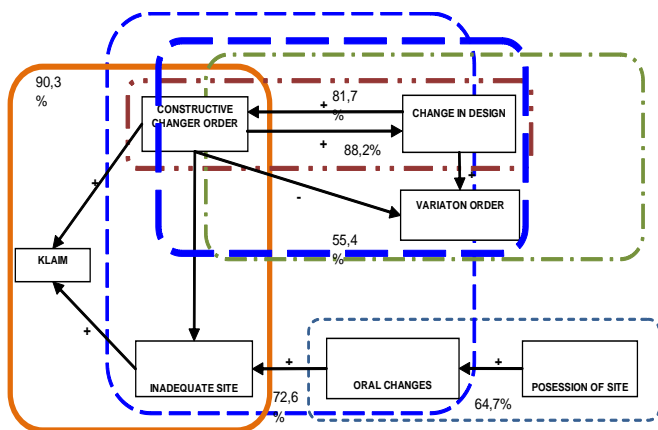


Figure 1: Relationship among causal factors of construction claims [11]

THIS STUDY (2014)

In this particular situation, the research objective was to identify the “Variation order”, whether it is one of the causal factor of claim or instead of that Variation Order is the resolver. In line with the objective of this study, the data collection was conducted in two steps: the secondary data were derived from the former studies related, FIDIC Conditions of Contract and others, followed by the primary data from the questionnaire with the respondent from the road construction community.

Federation International des Ingenieure-Coneseils (FIDIC) and Regional Standard Conditions of Contracts (PSSCOC and AS-4000).

Study conducted through the FIDIC Conditions of Contract for Construction Edition 1999 (Red Book) as a basic, comparing with other FIDIC Rainbow Conditions of Contracts, i.e. FIDIC Conditions of Contract for Plant Design

Build Edition 1999 (Yellow Book), FIDIC Conditions of Contract for EPC/Turnkey Edition 1999 (Silver Book), FIDIC Conditions of Contract for Construction MDB Harmonized Edition 2006 (Pink Book); other historical FIDIC Conditions of Contract for Works of Civil Engineering Construction 2nd Edition 1969, 3rd Edition 1977 and 4th Edition 1987 amended 1992; other regional standard from Singapore, Public Sector Standard Conditions of Contract (PSSCOC) Edition 2014 and Australia, Standard Australia, AS-4000, 3rd amendment Edition 2005.

FIDIC Conditions of Contract for Construction (1999)

Sub-Clause 13.1 Right to Vary (Red Book)

Variations may be initiated by the Engineer at any time prior to issuing the Taking-Over Certificate for the Works, either by an instruction or by a request for the Contractor to submit a proposal.

The Contractor shall execute and be bound by each Variation, unless the Contractor promptly gives notice to the Engineer stating (with supporting particulars) that the Contractor cannot readily obtain the Goods required for the Variation. Upon receiving this notice, the Engineer shall cancel, confirm or vary the instruction.

- changes to the quantities of any item of work included in the Contract (however, such changes do not necessarily constitute a Variation),
- changes to the quality and other characteristics of any item of work,
- changes to the levels, positions and/or dimensions of any part of the Works,
- omission of any work unless it is to be carried out by others,
- any additional work, Plant, Materials or services necessary for the Permanent Works, including any associated Tests on Completion, boreholes and other testing and exploratory work, or
- changes to the sequence or timing of the execution of the Works.

The Contractor shall not make any alteration and/or modification of the Permanent Works, unless and until the Engineer instructs or approves a Variation.

FIDIC Conditions of Contract for Plant Design Build (1999)

Sub-Clause 13.1 Right to Vary (Yellow Book)

Variations may be initiated by the Engineer at any time prior to issuing the Taking-Over Certificate for the Works, either by an instruction or by a request for the Contractor to submit a proposal. A Variation shall not comprise the omission of any work which is to be carried out by others.

The Contractor shall execute and be bound by each Variation, unless the Contractor promptly gives notice to the Engineer stating (with supporting particulars) that (i) the Contractor cannot readily obtain the Goods required for the Variation, (ii) it will reduce the safety or suitability of the Works, or (iii) it will have an adverse impact on the achievement of the Schedule of Guarantees. Upon receiving this notice, the Engineer shall cancel, confirm or vary the instruction.

FIDIC Conditions of Contract for EPC/Turnkey Project (1999)

Sub-Clause 13.1 Right to Vary (Silver Book)

Variations may be initiated by the Employer at any time prior to issuing the Taking-Over Certificate for the Works, either by an instruction or by a request for the Contractor to submit a proposal. A Variation shall not comprise the omission of any work which is to be carried out by others.

The Contractor shall execute and be bound by each Variation, unless the Contractor promptly gives notice to the Employer stating (with supporting particulars) that (i) the Contractor cannot readily obtain the Goods required for the Variation, (ii) it will reduce the safety or suitability of the Works, or (iii) it will have an adverse impact on the achievement of the Performance Guarantees. Upon receiving this notice, the Employer shall cancel, confirm or vary the instruction.

FIDIC Conditions of Contract for Construction MDB Harmonised Edition (2006)

Sub-Clause 13.1 Right to Vary (Pink Book)

Variations may be initiated by the Engineer at any time prior to issuing the Taking-Over Certificate for the Works, either by an instruction or by a request for the Contractor to submit a proposal.

The Contractor shall execute and be bound by each Variation, unless the Contractor promptly gives notice to the Engineer stating (with supporting particulars) that (i) the Contractor cannot readily obtain the Goods required for the Variation, or (ii) such Variation triggers a substantial change in the sequence or progress of the Works. Upon receiving this notice, the Engineer shall cancel, confirm or vary the instruction. Each Variation may include:

- (a) changes to the quantities of any item of work included in the Contract (however, such changes do not necessarily constitute a Variation),
- (b) changes to the quality and other characteristics of any item of work,
- (c) changes to the levels, positions and/or dimensions of any part of the Works,
- (d) omission of any work unless it is to be carried out by others,
- (e) any additional work, Plant, Materials or services necessary for the Permanent Works, including any associated Tests on Completion, boreholes and other testing and exploratory work, or
- (f) changes to the sequence or timing of the execution of the Works.

The Contractor shall not make any alteration and/or modification of the Permanent Works, unless and until the Engineer instructs or approves a Variation.

For the Red, Yellow and Pink book, variation instructed by the Engineer, for and on behalf of the Employer as could be seen in Sub-Clause 13.1 above, while for the Silver Book, instruction is by the Employer. That is the only difference among Red, Yellow, Pink with the Silver Book.

Engineer as defined in the FIDIC Conditions of Contracts Sub-Clause 1.1.2.4 “**Engineer**” means the person appointed by the Employer to act as the Engineer for the purposes of the Contract and named in the Appendix to Tender, or other

person appointed from time to time by the Employer and notified to the Contractor under Sub-Clause 3.4 [*Replacement of the Engineer*]. The most important role of the Engineer is issue the Variation Order as an Instruction of the Engineer, in the form of instruction and/or approval on the plan and drawing prepared by the contractor.

FIDIC Conditions of Contract for Construction (1999)

Sub-Clause 3.3 Instructions of the Engineer (Red Book)

The Engineer may issue to the Contractor (at any time) instructions and additional or modified Drawings which may be necessary for the execution of the Works and the remedying of any defects, all in accordance with the Contract. The Contractor shall only take instructions from the Engineer, or from an assistant to whom the appropriate authority has been delegated under this Clause. If an instruction constitutes a Variation, Clause 13 [*Variations and Adjustments*] shall apply.

The Contractor shall comply with the instructions given by the Engineer or delegated assistant, on any matter related to the Contract. Whenever practicable, their instructions shall be given in writing. If the Engineer or a delegated assistant:

- (a) gives an oral instruction,
- (b) receives a written confirmation of the instruction, from (or on behalf of) the Contractor, within two working days after giving the instruction, and
- (c) does not reply by issuing a written rejection and/or instruction within two working days after receiving the confirmation, then the confirmation shall constitute the written instruction of the Engineer or delegated assistant (as the case may be).

The instruction of the Engineer to modify the contract should strictly be subject to two significant limitations, i.e. the modification should not fundamentally change the contract and the contractor must be given the right to an equitable adjustment of costs if the modification affects its costs or schedule or both, in total or in portion [9].

The Employer and the Engineer should know what are the formalities for the contractor to recover additional costs and time adjustment, and for the Employer/engineer to pay the additional costs and to allow extension of time without doing something that may be classified as against the law.

If parties can read and interpret correctly, it could be found that in FIDIC Conditions of Contract, as fair and balance conditions of contract, the relevant clause for variation in FIDIC CC allows the greater flexibility, this achieved by permitting variations without necessarily a new contract for all kind of addition, deletion and/or revision on works in the project. Also it allows for adjustment of plans and specifications to designate exactly what the design professional and the Engineer/Employer intend the contractor to perform, and allows it to be done without breaking the contract requirement.[6]

If the contractors know well the variation orders mechanism, such knowledge of mechanism encourages the contractor to suggest beneficial variations that he will receive an equitable adjustment of costs and time for the additional works performed.

FIDIC Conditions of Contract (Intentional) for Works of Civil Engineering Construction (1977)

Clause 51 Variations

- (1) The Engineer shall make any variation of the form, quality or quantity of the Works or any part thereof that may, in his opinion, be necessary and for that purpose, or if for any other reason it shall, in his opinion, be desirable, he shall have power to order the contractor to do and the Contractor shall do any of the following:
- (a) increase or decrease, the quantity of any work included in the Contract,
 - (b) omit any such work,
 - (c) change the character or quality or kind of any such work,
 - (d) change the levels, lines, position, and dimensions of any part of the Works,
 - (e) execute additional work of any kind necessary for the completion of the Works and no such variation shall in any way vitiate or invalidate the contract, but the value, if any, of all such variations shall be taken into account in ascertaining the amount of the Contract Price.

FIDIC Conditions of Contract for Works of Civil Engineering Construction (1969)

Clause 51 Variations

- (1) The Engineer shall make any variation of the form quality or quantity of the Works or any part thereof that may in his opinion be necessary and for that purpose or if for any other reason it shall in his opinion be desirable shall have power to order the contractor to do and the Contractor shall do any of the following:
- (a) increase or decrease the quantity of any work included in the Contract
 - (b) omit any such work
 - (c) change the character or quality or kind of any such work
 - (d) change the levels lines position and dimensions of any part of the Works and
 - (e) execute additional work of any kind necessary for the completion of thenWorks and such variation shall in any way vitiate or invalidate the Contract but the vlaue (if any) of all such variations shakk be taken into accont in ascertaining the amount of the Contract Price.

FIDIC Conditions of Contract for Works of Civil Engineering Construction (1987 amended 1992)

Clause 51 Variations,

The Engineer shall make any variation of the form, quality or quantity of the Works or any part thereof that may in his opinion, be necessary and for that purpose, or if for any other reason it shall, in his opinion, be appropriate, he shall have the authority to instruct the Contractor to do and the Contractor shall do any of the following:

- (a) increase or decrease the quantity of any work included in the Contract

- (b) omit any such work (but not if the omitted work is to be carried out by the Employer or by another contractor
- (c) change the character or quality or kind of any such work
- (d) change the levels, lines, position and dimensions of any part of the Works and
- (e) execute additional work of any kind necessary for the completion of thenWorks
- (f) change any specific sequence or timing of construction of any part of the Works.

No such variation shall in any way vitiate or invalidate the Contract, but the effect, if any, of all such variations shall be valued in accordance with Clause 52.

Provided that where the issue of an instruction to vary the Works is necessitated by some default of or breach of contract by the Contractor or for which he is responsible, any additional cost attributable to such default shall be borne by the contractor.

BSA Singapore, Public Sector Standard Conditions of Contract for Construction Works, Edition 2014

Sub-Clause 19.1 Variations

The term "variation" shall mean any change in the original Contract intention as deduced from the Contract as a whole describing or defining the Works to be carried out and shall include but is not restricted to:

- (a) an increase or decrease in the quantity of any part of the Works;
- (b) an addition to or omission from the Works;
- (c) a change in the character, quality or nature of any part of the Works;
- (d) a change in the levels, lines, positions and dimensions of any part of the Works;
- (e) the demolition of or removal of any part of the Works no longer desired by the Employer or the Superintending Officer;
- (f) a requirement to complete the Works or any phase or part by a date earlier than the relevant Time for Completion.

For the avoidance of doubt the term "variation" shall include any changes as aforesaid which may be designed to alter the use to which the Works will be put, but shall exclude any instruction (which would otherwise be a variation) which has arisen due to or is necessitated by or is intended to cure any default of or breach of contract by the Contractor.

Standards Australia, AS 4000-1997, amended 2005

The Superintending may direct the Contractor to vary WUC by any one or more of the following which is nevertheless of a character and extent contemplated by, and capable of being carried out under, the provisions of the Contract:

- a) increase, decrease or omit any part;
- b) change the character or quality;
- c) change the levels, lines, positions or dimension;
- d) carry out additional work;
- e) demolish or remove material or work no longer required by the Principal.

METHODS

Discussion will be based on some standard conditions of contract i.e. FIDIC 2nd Edition 1969, 3rd Edition 1977, 4th Edition 1987 amended 1992, FIDIC for Construction 1st Edition 1999, MDB Harmonized Edition 2006, AS 4000 Edition 2005 (this AS 4000 and AS 2524 will be merged as AS 11000 in this 2015), PSSCOC Edition 2014.

There are some question raised from the literature study and interview with experts as follows:

What kind of Variation Order used to be issued by the Employer/Engineer?,

- A.1 To change the quantity
- A.2 To change the quality
- A.3 To change the design
- A.4 To change the works programmed
- A.5 To change the method of working
- A.6 To omit the work

What are the parties action in relation with variation order?,

- B.1 Both parties discuss about the variation
- B.2 Employer/Engineer issued written variation order
- B.3 Employer/Engineer giving oral instruction and then issue written confirmation of verbal instruction
- B.4 Employer/Engineer only giving oral instruction
- B.5 Contractor refuses to conduct the variation order

What is the impact of the issuance of Variation Order?

- C.1 Increase the quantity of works
- C.2 Decrease the quantity of works
- C.3 Ommision of some works
- C.4 Change the quality of works
- C.5 Change the levels, lines, positions and dimensions
- C.6 Change the works programmed
- C.7 Change the method of working
- C.8 Change timing of works
- C.9 Increase the contract price
- C.10 Decrease the contract price
- C.11 Increase the project expenses
- C.12 Increase additional payment to the contractor
- C.13 Increase the contractor overhead expenses
- C.14 Different interpretation between parties
- C.15 Rework and/or demolition
- C.16 Delay on completion
- C.17 Additional equipment
- C.18 Procurement delay
- C.19 New Procurement/Purchasing
- C.20 New professional hiring
- C.21 Termination by the parties
- C.22 Quality degradation
- C.23 Delay in payment
- C.24 The use of provisional sum
- C.25 Construction disputes

What are mostly the other impacts of variation order?

- D.1 Resolve problem caused by unforeseeable physical conditions
- D.2 Resolve claim from the contractor
- D.3 Resolve problem on additional cost

- D.4 Resolve problem on escalation
- D.5 Resolve the oral instruction by employer
- D.6 Resolve problem on extension of time
- D.7 Resolve problem on design matter

RESULTS AND DISCUSSIONS

This part will discuss the survey result by questionnaire. Analysis has been done by using *Relative Importance Index* (RII). Questionnaire distributed and filled by 30 respondents with engineering, legal and management education background who are working in the field of construction project majoring in contracts and claims, from the Employer/Engineer’s staff and the Contractor’s staff.

Table 1: Respondents’ groups

	Employer	Engineer	Contractor	Total
Respondent	10	10	10	30

Working experience of the respondent

Working experience of the respondent vary from 10 to 28 years, used to handling construction projects, especially contractual matters and claims. Majority of the respondent recently worked as Project Director or Employer Representative from the Employer’s side and Project Manager or General Superintendent in the Contractor’s side.

Table 2: Average working experience of the respondents [year]

	Employer	Engineer	Contractor	Avarage
Working Experience [year]	17	24	18	21

Analysis of Relative Importance Index (RII)

Analysis being done by using the Relative Importance Index (RII) = $\sum W / (A \times N)$ where W = the weight given to risk factors (ranges from 1 to 5) times frequency of the response (number of response); A = highest weight (5 in this study); and N = total number of respondents.

Table 3: RII limit of definition

RII limit	Definition
85 – 100	very important
70-85	important
50-70	slightly important
30-50	less important
15-30	not important
0-15	extremely not important

RII results of the Question 1 (A):

Table 4: Result of RII Analysis of Question 1 (A)

No	Code	Variable Name	RII
1	A.3	To change the design	0.772
2	A.1	To change the quantity	0.739
3	A.4	To change the works program	0.711
4	A.5	To change the method of working	0.594
5	A.2	To change the quality	0.589
6	A.6	To omit the work	0.572

Based on the result of analysis by RII, for the Question A, What kind of Variation Order used to be issued by the Employer/Engineer?, The highest result is to change the design (A.3) with the value of RII 0.772. Average value of RII is 0.663, there are 2 other variables could be classified as important, that are to change the quantity (A.1) and to change the works programmed (A.4).

RII results of the Question 2 (B):

Table 5: Result of RII Analysis of Question 2 (B)

No	Code	Variable Name	RII
1	B.3	Employer/Engineer giving oral instruction and then issue written confirmation of verbal instruction.	0.820
2	B.1	Both parties discuss about the variation	0.800
3	B.2	Employer/Engineer issued written variation order	0.760
4	B.4	Employer/Engineer only giving oral instruction	0.660
5	B.5	Contractor refuse to conduct the variation order	0.580

Based on the result of analysis by RII, for the Question B, what are the parties action in relation with variation order ? The highest result is Employer/Engineer giving oral instruction and then issue written confirmation of verbal instruction (B.3) with the value of RII 0.820. Average value of RII is 0.724, there are 2 other variables could be classified as important, that are Both parties discuss about the variation (B.1) and Employer/Engineer issued written variation order (B.2).

RII results of the Question 3 (C):

Table 6: Result of RII Analysis of Question 3 (C)

No	Code	Variable Name	RII
1	C.9	Increase the contract price	0.856
2	C.16	Delay on completion	0.850
3	C.24	The use of provisional sum	0.800
4	C.1	Increase the quantity of works	0.789
5	C.5	Change the levels, lines, position and dimensions	0.778

No	Code	Variable Name	RII
6	C.6	Change the works programme	0.756
7	C.7	Change the method of working	0.750
8	C.20	New professional hiring	0.733
9	C.19	New Procurement/Purchasing	0.728
10	C.14	Different interpretation between parties	0.706
11	C.12	Increase additional payment to the contractor	0.667
12	C.25	Construction Disputes	0.667
13	C.8	Change timing of the works	0.656
14	C.11	Increase the project expenses	0.644
15	C.15	Rework and/or demolition	0.639
16	C.23	Delay in payment	0.633
17	C.4	Change the quality of works	0.617
18	C.2	Decrease of quantity of works	0.606
19	C.3	Omission of some works	0.556
20	C.17	Additional equipment	0.456
21	C.21	Termination by the parties	0.439
22	C.18	Procurement delay	0.433
23	C.13	Increase the contractor overhead expenses	0.394
24	C.22	Quality degradation	0.389
25	C.10	Decrease the contract price	0.383

Based on the result of analysis by RII, for the Question C, what are the impact of the issuance of Variation Order ? The highest result is The increase of the contract price (C.9) with the value of RII 0.856. Average value of RII is 0.637. There are six other variables which could be classified as important, that are Delay on completion (C.16), The use of provisional sum (C.24), Increase the quantity of works (C.1), Change the levels, lines, position and dimensions (C.5), Change the works programme (C.6), Change the method of working (C.7), New professional hiring (C.20), New Procurement/Purchasing (C.19), Different interpretation between parties (C.14).

RII results of the Question 4 (D):

Table 7: Result of RII Analysis of Question 4 (D)

No	Code	Variable Name	RII
1	D.2	Resolve claim from the contractor	0.856
2	D.3	Resolve problem on additional cost	0.850
3	D.6	Resolve problem on extension of time	0.711
4	D.1	Resolve problem caused by unforeseeable physical conditions	0.706
5	D.4	Resolve problem on price escalation	0.622
6	D.5	Resolve the oral instruction by employer	0.544
7	D.7	Resolve problem on design matter	0.511

Based on the result of analysis by RII, for the Question D, what are mostly the other impact of variation order ? The result of the RII showed that the highest result is Resolve claim from the contractor (D.2) with the value of RII 0.856. Average value of RII is 0.686. There are other variable could be classified as important, that are Resolve problem on additional cost (D.3), Resolve problem on extension of time (D.6), Resolve problem caused by unforeseeable physical conditions (D.1).

Factor Analysis for variables for Question C: [17]

Considering that as the results of RII ten variables are above the “important” line, the analysis factor used to simplify the variables. The results of analysis factor are as follows:

Table 8: KMO and Bartlett’s Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy	.618
Approx.Chi-Square	42.327
Bartlett’s Test of Sphericity Df	28
Sig.	.040

First step of factor analysis is the *Kaiser-Meyer-Olkin Measure of Sampling adequacy* (MSA), MSA is one statistical method to calculate the Intercorrelation among variables, MSA value should be > 0,500. Based on Table 8 above, the value of MSA is 0.618 > 0.500 with significance 0.000 < 0.05, so the further analysis could be conducted.

Next is analyzing the *anti-image matrices* table. For getting the inter correlation among independent variables as table 9 *Anti-Image Matrices*.

Table 9: Anti-Image Matrices (C)

Anti image Matrices								
	Increase the quantity of works (C.1)	Change the levels, lines, position and dimensions (C.5)	Change the works programme (C.6)	Increase the contract price (C.9)	Delay on completion (C.16)	New Procurement/ Purchasing (C.19)	The use of provisional sum (C.24)	Different interpretation between parties (C.14)
Anti-image Covariance								
Increase the quantity of works (C.1)	.719	-.179	.186	.013	-.081	-.139	-.094	.002
Change the levels, lines, position and dimensions (C.5)	-.179	.834	-.259	-.021	-.060	-.087	-.059	-.048
Change the works programme (C.6)	.186	-.259	.466	-.008	-.015	-.176	.141	.184
Increase the contract price (C.9)	.013	-.021	-.008	.829	.140	.187	.088	-.155
Delay on completion (C.16)	-.081	-.060	-.015	.140	.858	-.032	-.067	-.123
New Procurement/Purchasing (C.19)	-.139	-.087	-.176	.187	-.032	.867	-.134	.003
The use of provisional sum (C.24)	-.094	-.059	.141	.088	-.067	-.134	.873	-.166
Different interpretation between parties (C.14)	.002	-.048	.184	-.155	-.123	.003	-.166	.690
Anti-image Correlation								
Increase the quantity of works (C.1)	.827*	-.265	.322	.017	-.103	-.201	-.136	.002
Change the levels, lines, position and dimensions (C.5)	-.265	.568*	-.476	-.029	-.081	-.133	-.090	-.073
Change the works programme (C.6)	.322	-.476	.538*	-.109	-.024	-.316	.253	.324
Increase the contract price (C.9)	.017	-.029	-.109	.587*	.166	.252	.118	-.205
Delay on completion (C.16)	-.103	-.081	-.024	.166	.798*	-.043	-.088	-.180
New Procurement/Purchasing (C.19)	-.201	-.133	-.316	.252	-.043	.841*	-.200	.004
The use of provisional sum (C.24)	-.136	-.090	.253	.118	-.088	-.200	.716*	-.243
Different interpretation between parties (C.14)	.002	-.073	.324	-.205	-.180	.004	-.243	.655*

Table 10: Rotated Component Matrixes

Rotated Component Matrix ^a	Component		
	1	2	3
The use of provisional sum (C.24)	.753	-.072	-.155
Different interpretation between parties (C.14)	.689	-.264	.360
Increase the quantity of works (C.1)	.682	.157	-.108
Delay on completion (C.16)	.511	.177	-.221
Change the levels, lines, position and dimensions (C.5)	.163	.859	.078
Change the works programme (C.6)	-.486	.756	-.018
New Procurement/Purchasing (C.19)	.235	.629	-.422
Increase the contract price (C.9)	-.138	.009	.915

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 5 iterations.

First Components:

No	Code	Variable name	Remarks
1	C.24	The use of provisional sum	.753
2	C.14	Different interpretation between parties	.689
3	C.1	Increase the quantity of works	.682
4	C.16	Delay on completion	.511

First new variable:

No	Code	Variable name	Remarks
1	C.AF.1	Claim on additional works and extension of time	

Second Components:

No	Code	Variable name	Remarks
1	C.5	Change the levels, lines, position and dimensions	.859
2	C.6	Change the works programmed	.756
3	C.19	New Procurement/Purchasing	.629

Second new variable:

No	Code	Variable name	Remarks
1	C.AF.2	Revised design and programmed	

Third Components:

No	Code	Variable name	Remarks
1	C.9	Increase the contract price	.915

Third new variable:

No	Code	Variable name	Remarks
1	C.AF.3	New contract price	.915

The result of the study for question A,B, C and D are:

What kind of Variation Order used to be issued by the Employer/Engineer?

To change the design (A.3), To change the quantity (A.1) and To change the works programme (A.4).

What is the parties action in relation with variation order ?

Employer/Engineer giving oral instruction and then issue written confirmation of verbal instruction (B.3). Both parties discuss about the variation (B.1) and Employer/Engineer issued written variation order (B.2)

What is the impact of the issuance of Variation Order ?

Claim on additional works and extension of time (C.AF.1), Revised design and programme (C.AF.2), New contract price (C.AF.3).

What are mostly the other impact of variation order ?

Resolve claim from the contractor (D.2), Resolve problem on additional cost (D.3), Resolve problem on extension of time

(D.6), Resolve problem caused by unforeseeable physical conditions(D.1).

The variation order issued as an order to change the design, quantities and the works programme. Usually employer will issue written order after oral instruction given at site. The important impacts are claim on additional works and extension of time, revised design and works programme, and finally there will be the new contract price.

Beside the above impact, there are also another impact that is resolving most all problems related with claim, additional cost, extension of time and other impact of unforeseen physical condition.

Considering also the former study by Hardjomuljadi [2] for hydroelectric power plant projects in Indonesia, it is found that there is negative (-) instead of positive (+) result on the variation order issued, that means the variation order will have negative impact to the occurrence of construction claims, so instead of causal factor of the claims, which will develop to disputes, it will resolve the claims

CONCLUSION

Two consequences follow the issuance of a variation order are: (a) the contractor is bound to execute the varied work. (b) there will be the adjustment of the contract price of the contract.

Construction contract require variation order to be made in writing that it has to be issued by the person who is duly authorized by the terms of the contract for this purpose, for example the engineer representative and/or the authorized engineer staff at the site. The formalities are important to establish the legal validity of a variation order.

Drawings may be issued as part of the contract administration process, it may be issued to describe variation work ordered pursuant to the terms of contract or to elaborate the description of works contain in the contract documents [Chow]. Working drawing required to be approved by the authorized engineer staff at site before construction works are carried out in reliance thereof.

The variation order will resolve the claim and dispute and reduce the unnecessary lengthy process of disputes for most all important things in the construction contract i.e. claims, extension of time, additional cost and the unforeseen conditions.

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