REFERENCES

1. Abrahaso, M. (2005). *Engineering law and ice contracts* (4th ed.). London: E&FN Spon.
2. Akinsola, A. & Potts, K.F. (1998). *Proceeding of COBRA 98, RICS: A methodology for evaluation of the variation clause in the standard forms of contract*.
3. Allen, M. (2010). Construction disputes on the rise, global head of contract solutions. *Construction and contract news forum*, 60 – 61.
4. Arian, F. M., Assaf, S. & Low S. P. (2004). Causes of discrepancies between design and construction. *Architectural Science Revie*w*, 47*(3), 237-249.
5. Arian, F. M. & Low S. P. (2005). Strategic management of variation orders for institutional buildings: Leveraging on information technology. *Project Management Institute*, *36*(4), 27-41.
6. Arain, F. M. & Low, S. P. (2007). Modelling for Management of Variations in Building Projects. *Engineering, Construction and Architectural Management 14*(5), 420-433.
7. Atlas, N. F., Huber, S. K. & Trachte-Huber, E. W. (Eds.). (2000). *Alternative Dispute Resolution: The Litigator's Handbook.* USA: American Bar Association.
8. Babalola, J.A. & Idehen, A.F. (2011) Causes of variations on building projects in Nigeria *In*: Laryea, S., Leiringer, R. and Hughes, W. (Eds). *Procs West Africa Built Environment Research (WABER) Conference*, 19-21 July 2011, Accra, Ghana, 229-236.
9. Barrie, D. S. & Paulson, B. C. (1992). *Professional Construction Management: Including CM, Design-Construct, and General Contracting* (3rd ed.). Singapore: McGraw-Hill.
10. Bassioni, H. A., El-Razekand, M. E. A., El-Salam, W. A. A. & Potts, K. (2003). *Proceeding of COBRA 03, RICS: Avoiding Claims in Egyptian Construction Projects: A Quantitative Survey Risk management on variations – two civil engineering case study.*Baster, J., Minogue, A., O"Really, M. & Ramsey, V. (2000). *Construction Law Handbook*. UK: Thomas Telford.

11. Bogamuwa, M. M. J. C. (2006). *How Sri Lankan con tractors correct the winners curse*. (Unpublished Dissertation). University of Moratuwa, Sri Lanka.
12. Boyd, D. & Chinyio, E. (2008). *Understanding the Construction Client*. Chichester: Blackwell Publishing.
13. CII. (1990). *The impact of changes on construction cost and schedule*. University of Texas, USA: Austin.
14. CII. (1995). *Qualitative effects of project changes*. University of Texas, USA: Austin.
15. Clough, R. H. & Sears, G. A. (1994). *Construction contracting* (6th ed.). New York: John Wiley & Sons Inc.
16. Callahan, M. T. (2005). *Construction Law Library: Construction Change Order Claims* (1st ed.). USA: Aspen Publishers Inc.
17. Chappell, D., Marshall, D., Powell-Smith, V. & Cavender, S. (2001). *Building Contract Dictionary* (3rd ed.). UK: Blackwell Science Ltd.
18. Chartered Institute of Building. (2002). *Code of Practice for Project Management for Construction and Development (Construction Management)* (3rd ed.). UK: Blackwell.
19. Cheung, S. O., Suen, H.H.C., Ng, S.T.T. & Leung, M-L. (2004). Convergent views of neutrals and users about alternative dispute resolution. *ASCE Journal of Management in Engineering, 20*(3), 88-96.
20. Ciccarelli, J. (2004). The Real Cost of Mitigating Delays. *AACE International Transactions*, *ABI/INFORM Global, CDR11*, 1-9.
21. Clough, R. H., Sears, G. A. & Sears, S. K. (2000). *Construction Project Management* (4th ed.). Canada: John Wiley & Sons Inc.
22. Cox, A. & Thompson, I. (1998). *Contracting for Business Success* (1th ed.). UK: Thomas Telford.
23. Cushman, R. F. & Loulakis, M. C. (2001). *Design-Build Contracting Handbook* (2nd ed.). New York: Aspen Law & Business.
24. Cushman, R.F. & Myers, J. J. (1999). *Construction Law Library: Construction Law Handbook*. New York: Aspen Law & Business.

25. Dykstra, A. (2011). *Construction Project Management: A Complete Introduction* (1th ed.). US: Kirshner Publishing Company Inc.
26. Easterby-Smith, M., Thrope, R. & Lowe, A. (2002), *Management Research: an Introduction.* London: Sage Publications.
27. Eden, C., Williams, T., Ackermann, F. & Howick, S. (2000), The role of feedback dynamics in disruption and delay on the nature of disruption and delay (D&D) in major projects. *Journal of the Operational Research Society*, *51*, 291–300.
28. Edgerton, W. W. (Ed.). (2008). *Recommended Contract Practices for Underground Construction*. USA: Society for Mining, Metallurgy, and Exploration.
29. Egbu, C. (Ed.). (2010). *Impact of variation orders on public construction projects*: *26th Annual ARCOM Conference*. Ministry of National Development, Independence House: Victoria.
30. Ekhator, O. J. (2016). Investigating causes of disputes in building construction projects in Nigeira. *International Journal of Science, Environment and Technology*, *5*(5), 3516 – 3527.
31. Emmitt, S. (2002). *Architectural Technology* (1th ed.). UK: Blackwell Science
32. Emmitt, S. & Gorse, C. (2003). *Construction Communication* (1th ed.). UK: Blackwell Publishing Ltd.
33. Enshassi, A., Arainb, F. & Al-Rae, S. (2010**).** Causes of variation orders in construction projects in the Gaza Strip**.** *Journal of Civil Engineering and Management*, *16*(4), 540-551.
34. Fenn, P. & Gameson, R. (Ed.). (1992). *Construction Conflict Management and Resolution* (1th ed.). London: E & F N Spon.
35. FIDIC (1999). *Conditions of Contracts for Construction for Building and Engineering Works Design by Employer* (1st ed.). ISBN 2-88432-022.
36. FIDIC (2000). *The FIDIC Contracts Guide: Conditions of contract for construction conditions of contract for plant and design-build conditions of contract for for epc/turnkey projects* (1st ed.). ISBN 2-88432-022.
37. Finsen, E. (1999). *The Building Contract – A Commentary on the JBCC Agreements* (1st ed.). Cape Town: Juta and Co, Ltd.

38. Fisk, E. R. (1997). *Construction Project Administration* (5th ed.). New Jersey: Printice-Hall.
39. Flick, U. (2006). *An Introduction to qualitative research*. London: Sage Publications Ltd.
40. Griffin, J. A. (2010). *Residential Construction Management: Managing According to the Project Lifecycle* (1th ed.). USA: J. Ross Publishing.
41. Gunawardane, D.A.S. (2011). *How balance of team roles affect the performance within design teams in Sri Lanka.* **(**Unpublished Dissertation). University of Moratuwa, Sri Lanka.
42. Halwatura, R. U. & Ranasinghe, N. P. N. P. (2013). Causes of Variation Orders in Road Construction Projects in Sri Lanka. *Hindawi Publishing Corporation ISRN Construction Engineering*, Article ID 381670,7pages,http://dx.doi.org/10.1155/2013/381670.
43. Hapuarachchi, D.U.A. (2007). *Team development process of construction project teams in Sri Lanka*. (Unpublished Dissertation). University of Moratuwa, Sri Lanka.
44. Herren, R. V. & Cooper, E. L. (2000). *Agricultural Mechanics: Fundamentals & Applications* (4th ed.). US: Thomson Learning.
45. Hester, W., Kuprenas, J.A. & Chang, T. C. (1991). *Construction changes and change orders: Their magnitude and impact*. University of California: Berkeley.
46. ICTAD(CIDA). (2007). *Standard Bidding Document* (1st ed.). ICTAD(CIDA): Sri Lanka.
47. Ibbs, C. W. (1997). Quantitative impacts of project change: size issues. *Journal of Construction Management and Engineering, 123*(3), 308-311.
48. Ibrahim, N. H. B., (2006). *Variation Orders in University Technology Malaysia Construction Projects*. (Master's thesis). University of Technology, Malaysia.
49. Jamil, M., Mufti, N. A. & Khan, A. H., (2008). *Risk Identification for international joint venture construction projects: International conference on construction in developing countries.* Pakistan 4-5 August 2008. Lahore: University of Engineering and Technology, 291.

50. Kassim, M. A. & Loong, L. J. (2002). A Study on Variations in Sewage Construction Projects*, Journal Technology*, *37* (B), 13 – 26.
51. Khekale, C. & Futane, N. (2015). Management of claims and disputes in the Construction Industry. *International Journal of Science and Research (IJSR)*, 4 (5).
52. Kumaraswamy, M. W., Miller, D. R. A., & Yogeswaran, K. (1998). Claims for extension of time in civil engineering projects. *Journal of Construction management and Economics, 16*(2), 283-294.
53. Kwakye, A. A. (1997). *Construction Project Administration in Practice* (1st ed.). Addison Wesley: Wokingham.
54. Leong & Yee, C. (2012). Mediating construction disputes. *Advocate & Solicitor, Singapore, Malaysian Bar Council, 13*(15).
55. Levin, P. (1998). *Construction Contract Claims, Changes & Dispute Resolution* (2nd ed.). USA: ASCE Press.
56. Love, P. E. D., Edwards, D. & Smith, J. (2006). Contract documentation quality and rework in Australian projects. *Journal of Architectural Engineering and Design Management*, *1*, 247-259.
57. Malewana, M. V. G. C. (2009). *Learning processes of construction project teams in Sri Lanka.* (Unpublished Dissertation). University of Moratuwa, Sri Lanka.
58. Manvendra Sinha & Waya, A. S. (2009). Dispute Causation In Construction Projects, *IOSR Journal of Mechanical & Civil Engineering, 2278*(1684), 54-58.
59. Mincks, W. R. and Johnston H. (2004). *Construction Jobsite Management*. USA:Thomson Delmar Learning.
60. Mohamed, A. A. (2001). *Analysis and Management of Change Orders for combined Sewer over flow construction projects.* (Dissertation). Wayne State University, United States.
61. Moselhi, O., Assem, I. & El-Rayes, K. (2005). Changes orders impact on labour productivity. *Journal of Construction Engineering and Management*, *131*(3), 354-359.

62. Murdoch, J. & Hugest, W. (1996). *Construction Contracts (Law & Management)* (2nd ed.). London: E & FN Spon.
63. Murdoch, J. & Hughes, W. (2000). *Construction Contracts: Law and Management*. Florence, KY: Routledge.
64. Nachatar, J. S., Hussein A. A. & O'Mara, A. (2010). Variations in government contract in Malaysia. *Information Management*, *12*.
65. Nishanth, T. (2005). Cost and time overruns in road rehabilitation projects in Sri Lanka. (Unpublished Dissertation). University of Moratuwa, Sri Lanka.
66. O'Brien, J. J. (1998). *Construction change orders*. New York: McGraw- Hill.
67. Ozorhon, B., Arditi, D., Dikmen, I. & Birgonul, M.T., 2007a. Effect of host country and project conditions in international construction joint ventures. *International journal of project management*, *25*, 799-80.
68. Patton, E. & Appelbaum, S. H. (2003). The case for case studies in management research. *Management research news, 26*(5), 60-71.
69. Perera, B. A. K. S., Dhanasinghe, I. & Rameezdeen, R. (2009). Risk management in road construction: The case of Sri Lanka. *International Journal of Strategic Property Management*, *13*(2), 87-102.
70. Price, A. D. F. (1995). *Financing International Projects (International Construction Management Series, 3)*. UK: International Organization.
71. Priyantha, Karunasena, G. & Rodrigo, V.A.K. (2011). Causes, Nature and Effects of Variations in Highways, *Built - Environment - Sri Lanka*, *9*(10), 01 – 02.
72. Raji, B., Mohemed, A. A. A. & Oseni, U.A. (2015). Reforming the legal framework for construction dispute resolution in Nigeria: a preliminary literature survey. *International Journal of Business, Economics and Law*, *6* (4), 2289-1552.
73. Ramachandra, T, Rotimi, J. O. & Gunaratne, S. (2014). Reasons for contractors' delay claims failures in Sri Lanka *In*: Raiden, A.B and Aboagye-Nimo, E. (Eds). *Procs 30th Annual ARCOM Conference,* 1-3 September 2014, Portsmouth, UK, Association of Researchers in Construction Management, 475-484.

74. RDA (2017). National Road Master Plan. [Online], Road Development Authority (RDA). Retrieved from http://www.rda.gov.lk/source/publications.htm [accessed 24 September 2017].
75. Reichard, D. D. & Norwood, C. L. (2001). Analyzing the cumulative impact of changes. *AACE International Transactions*.
76. Rudestam, K. I. & Newton, R. R. (2007). *Surviving your dissertation* (3rd ed.). London: SAGE publications.
77. Sekaran, U. (2003). *Research methods for business: a skill building approach* (4th ed.). New York: John Wily & Sons.
78. Sergeant, M. & Wieliczko, M. (2014). Construction Contract Variations. *Informa Law from Routledge,* 33-66.
79. Ssegawa, J. K., Mfolwe, K. M., Makuke, B. & Kutua, B. (2002), "Construction variations: a scourge or a necessity", *Proceedings of the 1st CIB-W107 International Conference on Creating a Sustainable Construction Industry in Developing Countries*. Cape Town: South Africa.
80. Sulistio, H. & Waty, M. (2008). Analysis and Evaluation Change Order in Flexible Pavement (Case Study: Road Projects in East Kalimantan). *Media Komunikasi Teknik Sipil*, *16*(4), 1.
81. Sunday, O. A. (2010). Impact of variation orders on public construction projects. *In*: Egbu, C. (Ed). *Procs 26th Annual ARCOM Conference*,6-8 September 2010, Leeds, UK, Association of Researchers in Construction Management, 101-110.
82. Tan, W. (2002). *Practical research method* (1st ed.). Singapore: Person Education Asia (Pvt) Ltd.
83. Thomas, H. R., and Napolitan, C. L. (1995). Quantitative effects of construction changes on labour productivity. *Journal of Construction Engineering and Management*, *121*(3), 290-296.
84. Travers, M. (2001). *Qualitative research through case studies* (1st ed.). London: SAGE publications.
85. Udawatta D. N. T. (2010). *Managing intra-group conflicts in construction project teams in Sri Lanka*. (Unpublished Dissertation). University of Moratuwa, Sri Lanka.

86. Veenendaal, J. A. (1998). Analyzing the impact of change orders on a schedule. *Journal of Cost Engineering, 40*(9), 33-39.
87. Wainwright, W. H. & Wood A. A. B. (1983). *Variation and Final Account Procedure* (4th ed.). Hutchinson: Nelson Thornes ltd.
88. Yin, R. K. (2009). *Case research design: design and methods*. (4 th ed.). London: SAGE publications.
89. Yin, R. K. (2003). *Case study research: design and methods*. (3rd ed.). London: Sage Publications.
90. Zulkfili, O., Omran, A. & Foo, C. K. (2009). The potential effects of variation orders in construction projects. *Journal of Engineering*, *7*(2), 1584 – 2665.

APPENDIX A: INTERVIEW GUIDELINES

Overview of the Study

Variation disputes have become a salient feature in the Sri Lankan road construction industry and it is essential to mange those disputes. The aim of the research is to manage the disputes arising from variations in road construction projects in Sri Lanka. Therefore, these guidelines will cover the existing practices of variation disputes, situations, reasons and effects of the variation disputes in road projects Sri Lanka.

Confidentiality Statement

The information from this interview will only be used in the fulfilling requirement dissertation for the awareness of Master of Science degree in Construction Law & Dispute Resolution. Moreover, this research is not a document published to refer by the general public, which is only referred within the university premises. Thus, all the responses will be kept confidential. However, to maintain confidentiality, the actual names of the interviewees will be not revealed in this report or any other document relating to this study.

Interview Procedure

The interviews are conducted with key participants of the road construction projects in each contract partner who is involved in disputes from variations. And the key participants of the selected cases are interviewed. Therefore, mainly three persons are interviewed from each case. Moreover, note taking and tape recording (with permission of the interviewee) will be doing while interviewing to collect data accurately.

Benefits to the Project contract partners

There are many advantages in studying the variation disputes in different contracts. However, by identification of those situations and mitigating the issues and barriers in real industry situation will be eventually beneficial to the organizations especially who are engaged in the projects with variations.

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The selected persons will be interviewed based on the following guidelines.

Designation:

Profession:

No of years of experience:

Date of interview:

Venue:

Duration:

General information about the project and the interviewee

1. What is your role in this Contract?
2. Can you give a brief introduction about the project, including the scope, duration and cost?
3. Can you give a brief introduction about the variations that occur in this project and the Number of variations?
4. Did all variations end up with the disputes?
5. If not what kind of variations ended with disputes?

Overview of existing practice

6. Your opinion of the Contractual provisions for the Variations?
7. Are disputes inter-related with causes for variations/Effects of variations?
8. What are the practical situations which create disputes arising from variation in the road construction projects in Sri Lanka?
9. What are the actual reasons of disputes due to the variations in the road construction projects in Sri Lanka?
10. What do you think as the solutions to minimize the disputes due to variations?

11. Did you identify any of the following causes for variations during this project?

Causes of variations					
	Yes/ No	**Explain the situation**	**Its effects**	**Finally ended with disputes /not? If disputed please explain.**	**How did you manage the situations?**
Owner /Client related issues					
Increasing the Requirement					
Poor/unclear brief by Client					
Change in mind-forced					
Change in mind-choice					
Financial problems					
Replacement of materials or procedures					
Change of schedule by owner					
Obstinate nature of owner					
Impediment in prompt decision making process					

	Yes/ No	**Explain the situation**	**Its effects**	**Finally ended with disputes /not? If disputed please explain.**	**How did you manage the situations?**
Consultant /Engineer related changes					
Design change by consultant					
Errors and omissions in design					
Conflicts between contract documents					
Design complexity					
Inadequate working drawing details					
Consultant's lack of judgment and experience					
Lack of consultant's knowledge of available materials and equipment					
Consultant's lack of required data					
Obstinate nature of consultant					
Inadequate site investigation					

	Yes/ No	**Explain the situation**	**Its effects**	**Finally ended with disputes /not? If disputed please explain.**	**How did you manage the situations?**
Incorrect assessment of brief					
Defects in BOQ and specifications					
Contractor related changes					
Lack of strategic planning					
Contractor's lack of required data					
Lack of modern equipment					
Poor procurement process					
Shortage of skilled manpower					
Contractor's desired profitability					
Long lead procurement					
Lack of communication					
Lack of a specialized construction manager					

	Yes/ No	Explain the situation	Its effects	Finally ended with disputes /not? If disputed please explain.	How did you manage the situations?
Unforeseeable Events/ Other changes					
Weather conditions					
Change in government regulations					
Change in economic conditions					
Socio-cultural factors					
Safety considerations					
Restrictions due to existing utility lines					
Floods and landslides					
Shortage of Materials					

12. According to your experience what are the other causes, effects and disputes arising from variations? Please explain.

Industrial view on Variation disputes

13. Do you think is it any project ended without any variation?
14. What are the main reasons of variations among above list in respected to Sri Lankan road construction projects?
15. According to summary of above Q11.answer the main disputes identified as time & cost overruns related to the roads projects. Are they become actual dispute to the project if partners are agreed?
16. When those disputes were created what are the next steps you are adapted to manage them?
17. After those management process do all the partners happy? Do you think finally it was success?
18. Do you think standard forms of contract is required to be changed to minimize the variation disputes? If yes how?

I would like to thank you for the information given and time you have dedicated to this research. If you are interested to know the outcome of this research, it would be my pleasure to share it with you.

Jayathilaka G.R.H.

Post graduate Student
Department of Building Economics
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APPENDIX B: EXAMPLE OF AN INTERVIEW TRANSCRIPT

Overview of the Study

Variation disputes have become a salient feature in the Sri Lankan road construction industry and it is essential to mange those disputes. The aim of the research is to manage the disputes arising from variations in road construction projects in Sri Lanka. Therefore, these guidelines will cover the existing practices of variation disputes, situations, reasons and effects of the variation disputes in road projects Sri Lanka.

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There are many advantages by studying the variation disputes in different contracts. However, by identification of those situations and mitigating the issues and barriers in real industry situation will be eventually beneficial to the organizations especially who are engaged in the projects with variations.

Researcher:
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Ch.QS.(Prof) Mrs.Kanchana Perera
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The selected persons will be interviewed based on the following guidelines.

Designation: *Planning Manager*

Profession: *Ch. Engineer*

No of years of experience: *15*

Date of interview: *05.12.2017*

Venue: *Interviewee Office*

Duration: *45 minutes*

General information about the project and the interviewee

1. What is your role in this Contract?
   All project related planning work

2. Can you give a brief introduction about the project, including the scope, duration and cost?
   Improvements to existing road, asphalt overlay, road sides improvement, landscaping, drainage improvements, road lighting etc.; Original Contract period:18 months, actual duration 2years; Accepted contract sum: Rs. 832Mn, Final Contract sum: Rs.912Mn (without disputed items).

3. Can you give a brief introduction about the variations that occur in this project and the number of variations?
   Adding new items/quantity increase/change in construction method; 148 nr of variations.

4. Did all variations end up with the disputes? *No*

5. If not what kind of variations ended with disputes?
   It's depend on the situations/team.

Overview of existing practice

6. Your opinion of the Contractual provisions for the Variations?
   It's very important clause, since it allows to adapt most suitable way to do the construction as well as to change the requirement according to the situations

7. Are disputes inter-related with causes for variations/Effects of variations?
   Sometime yes

8. What are the practical situations which create disputes arising from variation in the road construction projects in Sri Lanka?
   In rate build up/agreement for variations parties cannot come to a mutual agreement. /Engineer's determination not impartiality/ Contractor claim for high rates

9. What are the actual reasons of disputes due to the variations in the road construction projects in Sri Lanka?
   Poor contract documentation, not clear about the steps to proceeds variations/ ambiguity in Contract Clauses

10. What do you think as the solutions to minimize the disputes due to variations?
    When preparing the Contract document it is needed to join the won bidder also, without only give them to check immediately. Maximum usage of standard document for the Contract documents.

11. Did you identify any of the following causes for variations during this project?

Causes of variations					
	Yes/ No	**Explain the situation**	**Its effects**	**Finally ended with disputes /not? If disputed please explain.**	**How did you manage the situations?**
Owner /Client related issues					
Increasing the Requirement	*yes*	*Road side preparation with heavy landscaping*	*Project delay*	*No*	*Increase labour source & daily working time*
Poor/unclear brief by Client	*yes*	*Un clear specifications*	*Disputes*	*Parties interpretations in ambiguity situations are not agreed by each party to the Contract*	*Works completed with disputes & follow disputes procedures as per the Contract*
Change in mind-forced	*yes*	*Completely change the R/B detailing from the original Contract*	*Time extension required, but could managed, new price proposals agreed*	*No*	*Experience and proper planning & site management*
Change in mind-choice	*yes*	*-do-*	*-do-*	*No*	*-do-*

Financial problems	*yes*	*Local bank funding arrangements change with government change*	*Interest claims proceed for delay payments*	*No*	*Follow delay claims proceedings to accelerate the payments*
Replacement of materials or procedures	*yes*	*Change the tactile material in foot path*	*Rate changed*	*No*	*Engineer's requirement*
Change of schedule by owner	*yes*	*Accelerate the wok for national day function*	*Extra effort*	*No*	*Increase site supervision, labour force*
Obstinate nature of owner	*No*				
Impediment in prompt decision making process	*yes*	*Have to follow all government proceedings*	*Project delay*	*No*	*Accelerated the progress to mitigate the effects*
Consultant /Engineer related changes					
Design change by consultant	*yes*	*Change the R/A and landscaping designs time to time*	*Project delay & nr of financial proposals have to discussd*	*No*	*Time extent granted*
Errors and omissions in design	*No*				
Conflicts between contract documents	*yes*	*Ambiguity between specifications sections*	*Disputed*	*Yes*	*Works completed with disputes & follow disputes*

					procedures as per the Contract
Design complexity	*No*				
Inadequate working drawing details	*yes*	*New item related to pipe connection*	*Rate not agreed by both parties*	*Yes*	*Works completed with disputes & follow disputes procedures as per the Contract*
Consultant's lack of judgment and experience	*yes*	*Due to unavailability of materials to match with spec., Consultants rejected to approve equivalents which was available*	*Delay of Project*	*No*	*Proved that available equivalent materials are suitable and match with the project requirements*
Lack of consultant's knowledge of available materials and equipment	*yes*	*-do-*	*-do-*	*-do-*	*-do-*
Consultant's lack of required data	*No*				
Obstinate nature of consultant	*yes*	*New item related to pipe connection*	*Rate not agreed by both parties*	*Yes*	*Works completed with disputes & follow disputes procedures as per the Contract*

Inadequate site investigation	*yes*	*New item for traffic lighting system in a junction*	*Cost overrun*	*Yes*	*Works completed with disputes & follow disputes procedures as per the Contract*
Incorrect assessment of brief	*yes*	*Nr of new items*	*Time & cost overruns*	*Yes*	*-do-*
Defects in BOQ and specifications	*yes*	*Quantity error in BOQ & unit interpretations*	*Time & cost overruns*	*Yes*	*-do-*
Contractor related changes					
Lack of strategic planning	*Yes*	*Poor strategic planning of Management*	*Delay of Project*	*No*	*Submitted suitable planning Proposals to mitigate the effects*
Contractor's lack of required data	*Yes*	*Poor study of project area*	*Delay of Project*	*No*	*Accelerated the progress to mitigate the effects*
Lack of modern equipment	*No*				
Poor procurement process	*Yes*	*Poor financial management with material suppliers*	*Delay of Project*	*No*	*Accelerated the progress to mitigate the effects*
Shortage of skilled manpower	*Yes*	*Unavailability of skilled manpower due to rural area*	*Delay of Project*	*No*	*Had to recruit skilled people with over payments*

Contractor's desired profitability	*Yes*	*Part of the same item as variation & claim as varied rates*	*Had to arrange nr of discussion and time waste*	*Yes*	*Dispute refer to adjudication*
Long lead procurement	*No*				
Lack of communication	*No*				
Lack of a specialized construction manager	*Yes*	*Delay of appointing a specialized project manager*	*Delay of Project*	*No*	*Performed the Project manager's role until issue was resolved*
Unforeseeable Events/ Other changes					
Weather conditions	*yes*	*Heavy monsoon rain*	*Delay of Project*	*No*	*Time extension granted*
Change in government regulations	*No*				
Change in economic conditions	*No*				
Socio-cultural factors	*No*				
Safety considerations	*No*				
Restrictions due to existing utility lines	*yes*	*There were many existing personal water supply lines across the*	*Public objections*	*No*	*Proposed alternative solutions and obtained authority approvals*

		road to cultivation lands			
Floods and landslides	*No*				
Shortage of Materials	*yes*	*Huge shortage of material due to high demand*	*Delay of Project*	*No*	*Accelerated the progress to mitigate the effects*

12. According to your experience what are the other causes, effects and disputes arising from variations? Please explain.

    Using the Contract conditions as a norm to all the projects

Industrial view on Variation disputes

13. Do you think is it any project ended without any variation? *No*
14. What are the main reasons of variations among above list in respected to Sri Lankan road construction projects?

    Change of schedule by owner, Impediment in prompt decision making process, Errors and omissions in design, Conflicts between contract documents, Consultant's lack of judgment and experience, Poor procurement process, Change in government regulations, Shortage of Materials, Weather conditions
15. According to summary of above Q11.answer the main disputes identified as time & cost overruns related to the roads projects. *Please see the Effect Colum*

    Are they become actual dispute to the project if partners are agreed? *No*
16. When those disputes were created what are the next steps you are adapted to manage them?

    Disputes are resolved by the mutual agreement of both parties
17. After those management process do all the partners happy? Do you think finally it was success? *Yes.*
18. Do you think standard forms of contract is required to be changed to minimize the variation disputes? If yes how?

    Yes. Contract can be used as the guidelines to administrate the projects. However, they must be adjusted or amended based on the nature of each project as required

I would like to thank you for the information given and time you have dedicated to this research. If you are interested to know the outcome of this research, it would be my pleasure to share it with you.

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