

Appendix C

Qualitative analysis (thematic matrix)

Impact of variation orders	Significant negative impact- 1,8,11,14,15,18, 20, 23	Detrimental variations have greater impact- 1,8,14,18	Beneficial variations need to be managed- 1,14	Delay in the design stage- 2,5,9,10,18	Cost overruns- 2,9,18	Design errors- 8,14	Disputes and conflicts- 4,17,21	Quality defects- 6,14,21	Design productivity- 14	Effective design- 9,18	Design Performance and progress- 13,18		
How do manage variation orders	No formalised approach- 1,4,9,14,22	Simple process- 1, 14	Reviewing the design 8,16,18	Providing information about variation orders- 7,19	Negotiation- 4,8,21	Estimating the cost and time of the variation orders- 3,14,19	No problems with variation orders management- 5	Variation orders are normal to occur- 1,5	Variation orders are easy to manage- 4,5	Having good relation with the consultant- 2,5	Well identification of the change 14,18	Good evaluation of the change- 14	Getting the approval and implementing the change orders- 18
	Documenting and recording the change- 11,14,18	Reporting to the client for need of variation order 20,23	Having good project management practices- 16,17,21	Looking how variation orders are done from previous projects- 13,18	Time of applying any change is different depends on the variation- 1,13	No need for client approval for some minor changes- 9,13,18,21,22							
Problems associated with the current variation orders management	Poor change management- 2,8,11	Lack of trust- 9,10,12,20,23	Lack of awareness- 8,14	Lack of knowledge about variation orders management- 8	Bad reputation to the project parties- 2,9,14,21	Poor co-ordination and communication- 1,10,20	Lack on written down contracts- 14,18	Change in one discipline affects others- 14,19,21	Lack of training courses and workshops- 22	Poor definition of change management- 18	Late design changes- 8,14,21	Insufficient change details- 10,19,20	Lack of professional engineers- 2,5,12,13,19
	Not providing the need for the variation orders- 11,19,23	Lack of experience with change management- 14,18	Poor relation between client and consultant- 1,16	Initiating variation orders after the finalised design- 4,17	Lack of competitive process- 9	Bureaucracy of public sectors- 18	No attention to negative impact of variation orders- 7,17	Variation orders affect our other projects- 14	Absence of change management system practices- 1,19	Clients should provide more details about the variation orders- 9,11,21	No enough attention to the design stage- 4,5,9,22	Consultants making design changes without consulting the client- 1,3,	Need for strong structure for variation orders management- 1
Using models/ frameworks to manage variation orders	Currently no existing model or framework to manage variations- 1,2,3,7,9,11,14	Just with joint-venture with international consultants- 14	Having no ideas about models or frameworks to manage variation orders- 1,2,4,7,9,10,13,17,20,22,23										Lack of stakeholder engagement appropriately 2,6,8,10,14,16,19 ,20,22
Causes of not using models/ frameworks	Lack of awareness about the importance 14,18,20	Lack of knowledge 1,9,14,17	Lack of experiences with change management- 18,21	Lack of sufficient contracts 8,10,14,15	No effective communications- 2,10,16,18	Assuming that it is complex- 1,13	Scope of the project is not clear enough- 19,22	Causes of variation orders are not identified- 8,11	Initiating high amount of variations orders by the client 8,13,18	Requesting the variations to be implemented immediately - 12,19	Clients are not educated about using models and frameworks- 14	No enough meetings with the clients- 11,19,21	Choosing consultants without competitive process- 8,11
	No enough details are produced during the design stage- 9	Not getting information from the client quickly- 14,18,21	Cultural related issues 1,4,9,10,18,19										
The existing model/ framework to manage variation orders	Straightforward process to manage variation orders- 11,14,18,20	Identifying the variation order- 9,17,18,19	Cost and time estimations- 2,7,18,14	Approval of the variation orders- 8,9,13,14,18	Implementation of the variation order- 2,14,18	Documentation of the variation order- 14,18							
Problems with using model/ framework to manage variation orders	Assuming it is hard to be applied- 1,5,9,17	Lack of awareness of change management systems 1,18,23	Assuming it is costly- 2,7,17	Need for training courses and workshops- 4,5,18	Need for professional and qualified engineers- 1,5,18								
The need for variation orders management system	Significant need- 1,3,5,14,18,20, 23	Would assist us to better manage variation orders- 11,14	Would help to identify the variation order- 3,5,13	Analysing the variation order comprehensively - 1,12,18	Leading to have effective design and review process- 9,14	Better understanding for variation orders- 18	Avoiding unforeseen design errors- 19,22	Need for strong structure for variation orders management- 1	Training courses, variation process and contract' terms must be reviewed before applying a change management system- 11,18,21				

