CONSTRUCTION DELAYS IN SRI LANKA: PERSPECTIVE OF MAJOR PARTICIPANTS

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ABSTRACT

Delay can be defined as a slipping over the scheduled construction duration beyond the agreed completion date. Notwithstanding the all project participants suffer from inevitable consequences originated from construction delays, they all themselves influence to engender delays in more or less portions while contractors, consultants and employers conclusively afford massive deal. Therefore, this research tends to investigate the causes of delays from the perspective of responsible parties thereby suggest solutions to avoid them.

Initially the researchers conducted a comprehensive literature review to identify the causes of project delay. A total of 50 previously conducted researches were examined and 130 delay causes were found. Thereafter, 59 of the delay causes which frequently stand in Sri Lankan building construction context were filtered and responsible parties were recognised through opinions of 15 experts. Thence, the main questionnaire survey was carried out adapting 30 samples for each perspective of contractor, consultant and employer in order to identify the significance of delay causes by ranking them in each of the perspectives utilising Relative Importance Index (RII). The agreement between perspectives for the ranking was obtained from Spearman's Rank Correlation Coefficient (rs) and Kendall's Correlation of Concordance (W). Thereafter, the preventive measures to enrich responsibilities of major participants in order to avoid delays were explored through ten interviews.

Consequently, the study revealed that the contractor is the most responsible party for construction delays. Eventually, the strategic framework was developed to enrich responsibilities of the major participants on avoiding construction delays ameliorating elicited facts from the study thereof.

Keywords: *Construction Delays; Causes; Major Participants.*

1. INTRODUCTION

Construction industry is one of the significant sectors which emphasis a society achieves its goals towards development of economy. This consists complex and sophisticated process itself due to large number of participants involved (Divya & Ramya, 2015). A construction project consists of a unique set of high risk activities which should be accomplished by effective management in all stages in order to originate a unique output (Kesavan et al., 2015). Meanwhile, the successful endeavour on project depends on achieving goals and objectives within predetermined cost and time (Shaikh et al., 2010). A project cannot be considered as successful until it satisfies the prime measures defined for it (Mahamid et al, 2012). Delay is defined as the time overrun either beyond completion date specified in a contract or the date that parties agree upon for delivery of a project (Alwi & Hampson, 2003). Delays lead projects towards either extension or acceleration which both results in additional cost and further to disputes (Sambasivan et al. 2017). Disputes, arbitration, litigation and even total abandonment can be resulted due to delays in construction projects (Sambasivan & Soon 2007).

Since the multiparty involvement, construction delays entail aggregate negative consequences on project participants (Divya & Ramya 2015). Contractors who instigate any delay themselves confront financial

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penalties called liquidated damages (Thomas et al., 2004). Apart from that, delays induce dissatisfaction and loss of revenue to the employer (Jeyakanthan & Jayawardane 2012). Nevertheless, delays arise due to the issues related to project stakeholders such as clients, contractors, subcontractors and consultants (Abisuga et al., 2014).

However, the necessity of acceleration or extending duration encounters some cost augment derived from the delays (Aibinu & Jagboro, 2002). Whereas, preventing and mitigating delays have potential to save cost (Abdul-Rahman et al., 2006). In addition to that, identification of actual delay causes is essential in order to avoid and minimise delays (Divya & Ramya 2015). Therefore, the research investigates the causes of delays from the perspective of responsible parties and suggests solutions to avoid the project delays and finally develop a framework of avoiding delays in construction projects.

2. LITERATURE REVIEW

2.1. NATURE OF CONSTRUCTION PROJECTS

The construction industry represents a significant portion of the economy in spite of developed or developing (Monyane et al., 2016). Construction can be commentated as a specific project industry due to its inherent features such as uniqueness, circumscribed location and temporality in production (Karna et al. 2013). A production process of a construction project usually consists of three major phases called project conception which recognises the need and primary concept, project design which converts the concept into a manifestation and project construction which converts the design into reality (Chan & Kumaraswamy 1997). Usually, construction projects involve design and build of a new structure (Zwikael, 2009). Construction projects are classified in accordance with two parameters called constructed facility and type of client (Ankrah et al., 2008). A construction project is a process in which employer and other project participants are brought together to proceed with interdependent relationships towards achieving a project goals (Karna & Junnonen 2016). However, construction project team as a "Temporary Multi Organization (TMO)" which is formed by different entities and further the relationships between parties within the project team are naturally interdependent and uncertain and can be called as "independent autonomy". This is formally governed by a contract (Love et al. 2002). Thus, various construction project stakeholders either direct or indirect such as owners, project managers, designers, shareholders, legal authorities, labours, sub-contractors, suppliers, service providers, competitors, financial institutions, insurance companies, media organisations, neighbours and community representatives, the general public, government establishments, visitors, regional development agencies, the natural environment and pressure groups are involved (Jin et al. 2017). Stakeholder management has great relevance on the success of a project (Rathenam et al. 2016). Although the different participants involved in construction process may have divergent interest depending on their own objectives, there must be an agreement between them to achieve project objectives (Toor & Ogunlana, 2009). However, it is obvious that interests of project participants highly affect the project performance either positively or negatively (Samset, 2003).

2.2. CONSTRUCTION PROJECT DELAYS

Construction projects seldom run smoothly (Thomas et al., 2004). Performance of modern construction projects is disturbed by the complex and uncertain nature in physical, financial and economic environment due to the employment of advance technologies, changing owner requirements and multi-party involvement (Divya & Ramya 2015). Success of a construction project is measured in terms of time, cost and quality which accomplished within the predetermined limitations (Frimpong et al., 2003). However, Mahamid (2016) exposed that time, cost and quality constraints as "the golden triangle" in a project success. Time is concerned as a head most constraint for success of a project (Mahamid, 2016). The contract time, which can be defined as the maximum time allowed for the contractor to complete all work specified in the contract documents (Herbsman et al., 1995). A construction project delay is defined as "the non-completion of the project within the original or stipulated or agreed contract period" (Dolage & Rathnamali 2013). The two main categories of delays can be seen in construction projects called 'inexcusable delays' which are caused solely by either contractor or supplier subjected to delay damages or compensation to the employer that no relief is given to the contractor and 'excusable delays' which are caused by employer or any of his representatives and causes beyond the control of project team (Tumi et al., 2009).

2.3. AVOIDING CONSTRUCTION DELAYS

The frequent effects of delays are cost overrun, time overrun, litigation, lack of continuity by client and arbitration (Amoatey et al. 2015). According to Sambasivan and Soon (2007), the most significant effects of delays are time overrun, cost overrun, disputes, arbitration, litigation and total abandonment. The negative effects of construction project delays impact the employer, contractor and consultant by emerging conflicts between parties, mistrust, litigation and cash-flow problems (Divya & Ramya 2015). However, 78-90% of construction projects in Sri Lanka have experienced time overruns during 2010-2012 periods (Ramachandra et al., 2014). An effective project management team can proceed by utilising proactive strategic measures prior to effects of the delay become reality (Zailani et al. 2016). Similarly, growing importance of time is significant for the employer in terms of performance to obtaining revenue early from the investment and for the contractor in terms of obtaining profit from their business (Alaghbari et al., 2007). Overcoming or mitigating delays heavily depends on the delay causes, nature of the cause and resource availability (Abdul-Rahman et al. 2006).

It was identified that design changes, labour productivity issues, inadequate planning and resource shortages as major delay causes (Kaming et al. 1997). According to a case study regarding delay factors in building construction projects in Libya shows that slow decision making, low supervision, material shortages, project scope changes, non-finalised design documents, adverse weather conditions, material delivery delays, financial problems, owner interference, delays in claim settlements and material price fluctuations are critical delay factors (Shebob et al., 2011). Accordingly, manpower issues such as lack of skills, labour productivity and mismanagement of project manager, method related causes such as problems in planning and approval, design changes, poor control and obtaining permits, supply chain issues such as delivery of materials, financial issues such as delayed payments by the employer and cash flow problems as significant causes of delays in construction projects (Mitra & Tan 2012). However, delay events occur due to individual or joint contributions of project participants prominently contractor and the client (Aibinu & Jagboro 2002). A clear understanding of delay by the project team members, dominant with contractor help to avoid or minimize delays (Ayudhya 2011). In addition, identification of responsible party is required to mitigate construction delays (El-Razek, Bassioni & Mobarak 2008).

3. RESEARCH METHODOLOGY

Basically, a research approach of any research can be a one of three ways as qualitative or quantitative or mix of both. Integration or mixing of both qualitative and quantitative approaches is named as mixed approach (Creswell 2012). Accordingly, a three rounds of data collection was conducted in this study which consists of both the quantitative and qualitative approaches in order to attain the established aim. Initial study was implemented in order to identify research gap, research problem, aim, objectives, scope and limitations. The causes of delays were found out by systematically reviewing 50 previously done studies on construction delays. Preliminary questionnaire as first round of data collection was prepared based on that to sort out delay causes which can be seen in construction stage of the project in Sri Lankan context. Main questionnaire survey, second round data collection was carried out as a close-ended questionnaire with the use of filtered delay causes through preliminary survey in order to rank them in accordance with the significance of each for construction delays and to identify the most responsible party thereby. Correspondingly, perspectives of contractor, consultant and employer were considered and 30 sampling units for each perspective were selected through simple random sampling. Relative Importance Index (RII) was computed utilising below equation (Eq 01) to rank the significance of delay causes. Spearman's Rank Correlation Coefficient (SRCC) and Kendall's Coefficient of Concordance (KCC) were utilised to obtain the relationship between parties for the ranking.

$$Relative\ Importance\ Index\ (RII) = \frac{\sum w}{AxN} \qquad \text{Eq. (01)}$$

Where, W = Weighting given to each factor by each practitioner, A = Highest Weight, N = Total number of Authors

$$Spearman'sRank\ Correlation\ Coefficient\ (r_s) = 1 - \frac{6\sum d_i^2}{n(n^2-1)} \qquad \text{Eq. (02)}$$

$$Kendall's\ Coefficient\ of\ Concordance\ (W) = \frac{12S}{m^2\ (N)(N^2-1)} \quad \text{Eq. (03)}$$

Semi structured interview was deployed as third round data collection in order to get means of avoiding construction delays. Thus, the research involved Five (05) experienced professionals from both contractor and consultant organisations.

4. RESEARCHES FINDINGS

The systematic literature review was executed to identify the causes of delays. Thus, this formed a foundation for data collection. Accordingly, 50 numbers of previous researches conducted during last two decades (1997-2017) by various authors in the world regarding the identification of delay causes in construction projects. Numbers of deployed researches during 1st and 2nd decades were 15 and 35 respectively. Thence, 130 of delay causes were identified. After conducting a preliminary survey, 59 numbers of delay causes which exceeds the 80% acceptance percentage were extracted as most frequent delay causes in Sri Lankan building construction industry. These are taken to the main questionnaire survey. Thus, the significance of each delay cause for construction delays was obtained in three perspectives as, contractor's perspective, consultant's perspective and employer's perspective. Although 59 of factors were filtered in the preliminary survey, 70 of factors had to be employed in main questionnaire survey since some of the factors were influenced by all the three parties or sometimes two parties and therefore to be defined as separate causes in order to obtain most responsible party for delays. Ranking of delay causes can be seen as follows;

Table 1: Causes of Construction Delays

No	Delay causes	Responsible Party	Contractor's Perspective		Consultant's Perspective		Employer's Perspective	
			RII	Rank	RII	Rank	RII	Rank
1	Contractor's improper planning, scheduling and controlling	Contractor	0.9840	1	0.9200	1	0.8240	1
2	Contractor's slow decision making	Contractor	0.9520	2	0.8960	2	0.7760	3
3	Poor communication and coordination of contractor	Contractor	0.8880	3	0.7760	15	0.7680	4
4	Poor site management and supervision	Contractor	0.8880	3	0.8080	8	0.7920	2
5	Consultant's slow decision making	Consultant	0.8720	5	0.7680	17	0.7120	13
6	Difficult in financing project by contractor	Contractor	0.8720	5	0.8080	8	0.7440	5
7	Late procurement in material	Contractor	0.8720	5	0.8160	6	0.7360	8
8	Poor communication and coordination of consultant	Consultant	0.8640	8	0.7760	15	0.6320	30
9	Employer's slow decision making	Employer	0.8640	8	0.7600	19	0.6400	28
10	Payment delay for completed works	Employer	0.8640	8	0.7440	24	0.7120	13
11	Skill labour shortages at site	Contractor	0.8640	8	0.7840	13	0.7440	5
12	Changing orders during construction	Employer	0.8560	12	0.7920	11	0.6720	19
13	Inadequate contractor's experience	Contractor	0.8560	12	0.7920	11	0.7360	8
14	Mistakes during construction by the contractor	Contractor	0.8480	14	0.7120	32	0.5840	45
15	Poor communication and coordination of Employer	Employer	0.8400	15	0.7440	24	0.5440	53
16	Improper construction methods used by the contractor	Contractor	0.8400	15	0.6720	40	0.5840	45
17	Inadequate managerial skills of contractor	Contractor	0.8320	17	0.8560	3	0.7440	5
18	Mistakes and discrepancies in design documents	Consultant	0.8240	18	0.6640	41	0.5920	40
19	Material delivery delays	Contractor	0.8240	18	0.7520	20	0.6480	24
20	Consultant's slow response for inquiries	Consultant	0.8240	18	0.7520	20	0.6240	32
21	Delay in approving and reviewing by consultant	Consultant	0.8160	21	0.7440	24	0.6160	35
22	Low quality material usage	Contractor	0.8160	21	0.6000	58	0.5680	50
23	Poor workmanship	Contractor	0.8160	21	0.7200	30	0.6240	32
24	Insufficient staff of contractor	Contractor	0.8160	21	0.8080	8	0.7280	11

25	Insufficient working drawing details	Consultant	0.8080	25	0.6240	52	0.5760	47
26	Poor qualifications of contractor's technical staff	Contractor	0.8080	25	0.7520	20	0.7120	13
27	Contractor's poor project management	Contractor	0.8080	25	0.8240	4	0.7360	8
28	Consultant's poor project management	Consultant	0.8080	25	0.6480	43	0.6480	24
29	Reworks in construction	Contractor	0.8000	29	0.7120	32	0.6800	17
30	Inadequate consultant's experience	Consultant	0.8000	29	0.6080	56	0.5920	40
31	Poor contract management	Consultant	0.7920	31	0.7520	20	0.7040	16
32	Material shortages at site	Contractor	0.7840	32	0.7680	17	0.6640	21
33	Handling complexity of the project by the contractor	Contractor	0.7840	32	0.6080	56	0.6080	38
34	Delay in approvals by the employer	Employer	0.7840	32	0.7840	13	0.6560	23
35	Employer's financial problems	Employer	0.7680	35	0.8160	6	0.6640	21
36	Lack of adequate monitoring and instructions by consultant	Consultant	0.7680	35	0.5760	60	0.5040	62
37	Damages to stored material while they are needed urgently	Contractor	0.7680	35	0.7120	32	0.5920	40
38	Less cooperativeness of the employer	Employer	0.7680	35	0.6480	43	0.5440	53
39	Incomplete contract documentations (Main contract)	Consultant	0.7680	35	0.7280	29	0.6800	17
40	Late handover site by employer	Employer	0.7680	35	0.7360	27	0.6160	35
41	Poor labour productivity	Contractor	0.7600	41	0.8240	4	0.7280	11
42	Conflicts of the contractor with other parties	Contractor	0.7520	42	0.7360	27	0.6480	24
43	Handling complexity of the project by the consultant	Consultant	0.7440	43	0.5600	62	0.5520	52
44	Equipment failure and maintenance	Contractor	0.7440	43	0.6480	43	0.5360	58
45	Low efficiency of equipment	Contractor	0.7440	43	0.6880	36	0.5920	40
46	Preparation of shop drawings/schedules and material samples	Contractor	0.7360	46	0.6560	42	0.5760	47
47	Delay in commencement of the construction	Contractor	0.7360	46	0.6480	43	0.5920	40
48	Sub-contractor related issues	Contractor	0.7280	48	0.7040	35	0.6720	19
49	Long inspection procedure of completed works	Consultant	0.7280	48	0.6480	43	0.5760	47
50	Conflicts of the employer with other parties	Employer	0.7280	48	0.6480	43	0.6080	38
51	Organisational structure linking to the project	Contractor	0.7200	51	0.6000	58	0.5680	50
52	Conflicts of the consultant with other parties	Consultant	0.7200	51	0.6480	43	0.6320	30
53	Equipment shortages at site	Contractor	0.7120	53	0.7200	30	0.6480	24
54	Undefined scope of works	Consultant	0.7120	53	0.6880	36	0.6400	28
55	Equipment delivery delays	Contractor	0.6960	55	0.6880	36	0.6160	35
56	Owner interference	Employer	0.6880	56	0.6160	54	0.5440	53
57	Shortages of unskilled labours	Contractor	0.6800	57	0.6800	36	0.6240	32
58	Working environment at site	Contractor	0.6720	58	0.4960	67	0.4480	65
59	Slow evaluation of completed works	Consultant	0.6560	59	0.5600	62	0.4720	64
60	Claims and disputes initiated by the contractor	Contractor	0.6560	59	0.5680	61	0.5360	58
61	Claims and disputes initiated by the consultants	Consultant	0.6560	59	0.4960	67	0.4080	68
62	Claims and disputes initiated by the Employer	Employer	0.6560	59	0.5120	64	0.3920	69
63	Service availability to the site	Contractor	0.6560	59	0.6160	54	0.5040	62
64	Labour disputes at site	Contractor	0.6560	59	0.6240	52	0.5440	53
65	Improper equipment	Contractor	0.6400	65	0.6480	43	0.5440	53
66	Handling complexity of the project by the Employer	Employer	0.6400	65	0.4960	67	0.4240	67
67	Ineffective delay penalties	Consultant	0.6400	65	0.4720	70	0.3600	70
68	Poor site arrangement	Contractor	0.6400	65	0.5120	64	0.5120	61
69	On site accidents	Contractor	0.6160	69	0.5120	64	0.4400	66
70	Inadequate staff of consultant	Consultant	0.6000	70	0.6400	51	0.5280	60

Since the ranking was obtained in three different perspectives, the strength of association between rankings was computed utilising SRCC (r^s). The results of SRCC vary between -1 to +1 where -1 implies strong negative relationship, 0 indicate neutral and +1 implies strong positive relationship. According to table, r^s between the contractor's perspective and consultant are 0.747 which implies a positive correlation of agreement between the contractor and the consultant. Similarly, coefficient value of 0.724 between contractor and employer also represents the positive agreement between the ranks. Meanwhile, the coefficient value between consultant and employer is 0.903 which implies higher convenience to the strong positive relationship between rankings. Similar to the SRCC, the values KCC also varies in the range of -1 to +1 when -1 implies perfectly negative relationship (disagreement) while +1 implies perfectly positive relationship (agreement) and 0 indicates very little or no correlation. However, the computed value for W to obtain relationship among contractor, consultant and employer's perspectives was 0.85 which intimate positive relationship regarding the rankings. Then the responsibility of each party for the construction delay was calculated. According to the contractor's perspective, the contractor is the most responsible party by acquiring 78% while consultant's and employer's responsibilities are 76% and 77% respectively. According to the consultant's perspective also the contractor is the most responsible party for construction delay while having 71% and the consultant's and employer's responsibilities are 65% and 69% respectively. According to the employer's perspective also contractor is the most responsible party by acquiring 71% and the consultant's and employer's responsibilities are 65% and 69% respectively. In all events, the results of the questionnaire survey in all the three perspectives of contractor, consultant and employer clearly exhibited that the most responsible party for the construction delay is contractor.

Semi structured interviews were conducted in order to find out preventive measures for avoiding construction delays concerning delay causes related to major responsible party. In compliance with that, 39 contractor related delay causes were divided into 11 categories considering the nature of the delay cause as management related, equipment related, labour related, material related, technology related, financial related, construction related, site-operation related, stakeholder management related, subcontractor related and contractor's technical staff related. Consequently, all the findings in qualitative approach were gathered in a framework development.

5. CONCLUSIONS

A construction delay is known as slipping over pre-determined time duration for project fulfilment beyond the established completion date. Although numerous researches were conducted previously with regard to identification of the construction delays, recognising effects of the construction delays and investigation of mitigating measures, the construction delays still stand in the construction industry which adversely effect on project participants. The project participants, especially major participants like contractor, consultant and employer suffer from financial losses, conflicts and disputes, resource wastages, litigation, dissatisfaction and perhaps total abandonment of the projects, the liability of originating delay causes also rests on them. The utilisation of preventive measures henceforth to suppressed construction delays will provide noble satisfaction to project participants. Since the construction projects involves various participants and all of them contributes in different portions to the construction delays, identification of major responsible party and avoid accompanied delay causes significantly accommodate reducing large segment of construction delays. However, causes of delays extracted from 130 causes of delays which identified through a systematic literature review of previously conducted researches were employed in conducted preliminary data collection process to filtering delay causes stand in Sri Lankan building construction industry that can be controlled by project participants. Among the extracted delay causes from literature review fifty-nine (59) delay causes which were filtered concerning as more frequent in the industry which had obtained more than 80% accepted percentage. The agreement for the ranking of delay causes once in between two perspectives was obtained through SRCC (r^s). The resulted r^s values represented the positive relationship of agreement between contractor- consultant perspectives, contractor- employer perspectives and consultant-employer perspectives respectively since the results were imminent to +1. Meanwhile, the agreement among three different perspectives for ranking of delay causes were computed by KCC (W) and result of this correlation also portrayed positive relationship. The eventual results of the quantitative analysis show that massive responsibility rests on the contractor to avoid construction methods. The following framework indicate the causes and the measures to avoid construction delays in Sri Lanka.

Table 2: Framework of Avoiding Construction Delays in Sri Lanka: Perspective of Major Participants

	Management Related Delay Causes	Equipment Related Delay Causes	Material Related Delay Causes	Technology Related Delay Causes	Financial Related Delay Causes
	Contractor's improper planning, scheduling and controlling Poor site management and supervision Inadequate managerial skills Slow decision making	Shortages of equipment improper equipment equipment delivery delays equipment failure and maintenance low efficiency of equipment	Material delivery delays Material shortages Low quality material usage Damage of stored material while they are needed urgently	Improper construction methods used by the contractor Complexity of the project Inadequate contractor's experience	Difficulties in financing project
	Preventive Measures				
Contractor	Proactive planning Feedback system Development of management competencies Development of efficient control ability Establishing management hierarchy Employing experienced supervisory staff Familiarization of supervisors to site operations Accurate project record keeping Proper observation of the work flow and events Usage of construction time estimation models Risk identification, assessment and response Frequent progress meetings Following PMBOK by project managers	Alternative resource sharing mechanisms Awareness of the resource strength and obtain up-to date machinery Prepare and update the equipment allocation schedule Purchase new equipment which required Additional equipment to be kept when use to equipment breakdown Concerning the repair and maintenance schedule	Effective management of a material procurement schedule Hiring of an independent engineer to supervise and monitor the progress of construction works in relation to material Proper planned area for material shortages Aware about material inventory management Establishing feedback system to notify the required materials, time for purchasing materials	Realized the benefits of using contemporary methods and techniques, in addition to appropriate exploitation of modern equipment in construction projects Significant concern on contractor's technical competency Employ specialist subcontractors who have experienced in particular work Obtaining approvals for the method statements Perform work studies Continuous workshops for training staff regarding new technologies Collaborative approach with other parties	Adequate contingency allocation Contractor should ensure the advance payment is used to finance the project activities Identification and assessment of risk and responses Plan the income and expenditure properly Identify the required monetary resources for projects by accurate tendering Obtain bank loans Alternative financial plans Keeping sufficient contingency amount
Consultant	Following PMBOK by consultant's project managers Clear definition to project scope Issuing on time notices and instructions in compliance with the Conditions of Contract	Specify the equipment particularly required for project Carefully concerning the pre-qualification documents submitted by the contractor	Preparing accurate specifications Descriptive specifications	Highly concern the contractor's experience in pre-qualification evaluation Ask to submit method statements before work started Clearly define the project scope	Significant concern on contractor's prequalification Evaluate payment applications accurately and on time Concern the financial stability of the contractor in selection
Client	Giving freedom to contractor to add management related suggestions Facilitate the contractor's decision making by providing on time information as requested by the contractor	Clearly mention his requirements from the project let consultant to select the contractor by considering the requirement of the project rather than go for lowest bid	Proper indication of material quality Approval for material selections on time Supply the right material at the right time which agreed to supply	Introduce the nominated subcontractors who specialist in particular work Consider the contractors past experience in pre-qualification Clearly convince his requirements to the project team	On time payment Make the early financial arrangement

	Construction Related Delay Causes	Site operation Related Delay Causes	Stakeholder management Related Delay Causes	Subcontractor Related Delay Causes	Technical Staff Related Delay Causes
	Mistakes during construction Delay in commencement Poor Workmanship Preparation of shop drawing and schedule	On site accidents Working environment at site Service availability to the site Poor site arrangement	Organizational structure linking to the project Poor communication and coordination Claims and disputes Conflicts	Subcontractor delays Poor performance and Conflicts Subcontractor payments	Poor qualifications of the technical staff Insufficient staff
	Preventive Measures				
Contractor	Awareness of supervisors regarding the client requirements Troubleshooting Proper planning the sequence of work prior commencement Evaluate the previous experiences to avoid mistakes Onsite training programs In line with the drawings Comply with the conditions of contract Proper Supervision	Coordination and corporation in locating and relocating service lines Well perform environmental and social assessment Collecting the mapping of underground utility data Well prepare the project site Adequate safety regulations Regular safety meetings Visit the site before bidding the project Perform social and environmental assessment to avoid future conflicts	Identification of the objective of each stakeholder Comply with conditions of contract Transparency of the information Use written agreements Just-in problem solving methods Appropriate communication protocol Multimedia information management Record maintenance Respecting each other Effective problem solving methods Communication protocols Clear information Joint and collaborative work Developing team spirit Create project culture Participatory approach	Make contractual agreements Regular Meetings Clearly defined the scope Evaluated the progress Concerning the subcontractor's past experience on particular works which they are intended to employ On time payments Daily superintendence Long term strategic relationships Coordination &cooperation Not to withhold larger amount of retention Set plans together with subcontractor Selection through prequalification Adhere to quality standards	Task proficiency Conducting continuous training programs Quality and efficiency may be enhanced through job training Check the performance level of the staff Minimum qualification level to be added as a requirement Attractive salary and incentives Keep proper human resource management team in order to notify the required professionals and technical personal Identification of capabilities of each personnel to assign "Right man to right job"
Consultant	Close inspection of the consultant Regular site inspections Issue non-conforming certificates for incomplete works Prepare descriptive specifications	Properly include preliminary to the BOQ	Comply with conditions of contract Identification of the objective of each stakeholder Comply with conditions of contract Transparency of the information Establishing respecting culture		Prequalification procedure Well observing the prequalification Mentioning the requirement of technical staff in the tender document
Client	Select the right contractor lies with the client in most projects	Obtaining necessary approvals regarding the construction by government and other organization Enforce acceptance standards and consider designated site proposals as criteria for tender evaluation	Respecting each other Effective problem solving methods Communication protocols Clear information Joint and collaborative work	Introduce competent subcontractors Concern the past relationship of the subcontractors with the main contractor when introducing a nominated subcontractor	

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