

**A STUDY ON THE IMPACTS OF THE AD-HOC
SITE INSTRUCTIONS ON BUILDING
CONSTRUCTION PROJECTS IN SRI LANKA**

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Dissertation submitted in Partial Fulfillment of the requirements for the
degree Master of Science in Construction Law & Dispute Resolution

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DECLARATION

I declare that this is my own work and this dissertation does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or Institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by any other person except where the acknowledgement is made in the text.

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ABSTRACT

Construction projects are more and more complex, involving in complicated contractual procedures. Complex nature can lead to construction disputes. Contract disputes are unavoidable and Ad-hoc site instruction is one of the significant reasons which may lead to contract disputes. Lack of clarity in contract documents, unforeseen circumstances during the construction phase, Changes in the employer's requirements etc. allow the Engineers to occasionally do alterations throughout the construction phase by providing the ad-hoc site Instructions as per their authority given in the contract administration. But, this prevailing practice of providing ad-hoc site instructions to contractors seems to over and over again be deficient in communicates the required instruction effectively to perform the construction activity. This study was a research on how ad-hoc site instructions impacted on building constructions in Sri Lanka. A detail literature review was done in order to understand the nature of the ad-hoc site instructions, causes of site instructions, wrong practices in the issuance of site instructions and the impact of the site instructions during the construction phase. Mixed method approach was adopted during the research study to achieve the objectives of the research. Five number of experts in the relevant subject were interviewed in 2 phases. After the first phase of expert interview, a representative sample of contract parties in the building construction projects that are registered with CIDA (successor to ICTAD) were surveyed. Gathered data was analysed using appropriate statistical analysis tools and the content analysis. Expert interview phase II was done to arrive the conclusions and recommendations. It was found that the project time delay and project cost overrun are the highly occurring outcomes due to the ad-hoc site instruction and those outcomes have significant adverse impacts on the building construction projects in Sri Lanka. Finally, strategies were developed to minimise the adverse impact of ad-hoc site instructions. The key themes of the developed strategies were knowledge improvement of construction practitioners, effective pre-contract management by the contract administrators, awarding the project to competent contractors and seriousness on engineers' duty of care.

Key words: *Ad-hoc Site instruction, Adverse impacts, Building Construction projects, Sri Lankan Construction Industry*

DEDICATION

*This dissertation is
Lovingly dedicated to
My beloved Parents, Wife, Son,
Brothers & Friends
For their Love and Support*

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This dissertation is accomplished owes much dedication and appreciation to many persons who supported me in several ways. Even though it is hard to indicate each as every person, but it is my obligation to extend my thankfulness and appreciation to all of them who endeavour.

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LIST OF ABBREVIATIONS

ARII	- Average Relative Important Index
A/CA	- Architect/ Contract Administrator
CIDA	- Construction Industry Development Authority
CPD	- Continuing Professional Development
CVI	- Confirmation of Verbal Instruction
FIDIC	- International Federation of Consulting Engineers
GPMCM	- Guide to Project Management and Contract Management
ICTAD	- Institute of Construction Training and Development
JCT	- Joint Contracts Tribunal
SBD	- Standard Bidding Documents
SLNAC	- Sri Lanka National Arbitration Centre
SRS	- Simple Random Sampling
RII	- Relative Important Index

CHAPTER 01

1.0 INTRODUCTION TO THE RESEARCH

1.1 RESEARCH BACKGROUND AND RATIONALE

The major operators of construction projects could be divided into three categories namely; clients, consultants and contractors (Jin et al., 2017). The consultant develops the design and drawings for implementation by the contractors as per the requirements of the Clients. Preferably, the drawings are ought to deliver adequate data (Shahsavand et al., 2018). Whenever a change is required in a construction work, the contractors always ask the Instruction of the authorised person who is named as the contract administrator of the construction contract (Cunningham, 2016). Let's term the authorised person as the Engineer for the purpose of this study as usually the condition of contracts mentioned "Engineer to the Contract" in the construction contracts, Sri Lanka.

Construction contracts give the authority to the Engineer to the contract to issue site instructions to the contractor in order to vary the works, to delay the works, to set right workmanship or material, to perform quality tests, to eliminate undesirable worker from the construction site and in relation to the expenditure of provisional sums. The contractor must comply with the instructions within certain limitations (Ehimen, 2019). Site instruction shall be an instruction delivered by the Engineer in written format with authorised signature to the contract awarded to the constructor that is envisioned to intensify, rectify, resulting in to slight variations to the design and specifications under control of the Engineer's delegated power and to instruct the utilisation of provisional sum as well (Willoughby, 2005). In this study, the site instruction is termed as ad-hoc site instruction because of such instructions are often issued in ad-hoc manner. Even though the procedures of issuing site instructions were obviously defined in the condition of contracts, prevailing severe practical wrong practices are hindering the administration of site instructions. Disputes and prolonged dispute resolution proceedings were risen due to such wrong practices and have caused in to strenuous analyses of documents, enormous claims (Alkarimi,

2013). Durdyev and Hosseini (2019) state that engineer has the responsibility to deliver instructions and replies for clarification of contractors within a reasonable time. If the engineer fails to obey this responsibility, it often leads to disputes and claims. With reference to the usual practice in Sri Lankan building construction projects and generally because of the time limitation, individual approaches and certain standard of procedures by the clients, many site instructions by the Engineers are emerged to the contractors in different ways and formats like verbally, site log books, meetings minutes, e-mails, instruction letters, draughts and modified drawings. Chappell (2017) states that the method of issuing a site instruction ascertain whether its outcome will be vanished, debilitated or misunderstood.

Another very usual context of from where difficulties rise in construction projects is as soon as orders are delivered by different officer from the consulting party, clerk of works or the client himself (Powel-Smith et.al, 2000). When engineers detain in delivering site instructions to make circumstances clear like as this kind of damages in respect of shiftless workers and machineries are come upon whereas waiting for the engineer's decision (Ndiokubwayo and Haupt, 2009). Pathirana and Halwatura (2010) state that issuing instruction to vary the works by engineer seemed as the serious issues in resulting delays in construction projects of Sri Lanka. Halwatura and Ranasinghe (2013) argued that the delay in relaying variation instructions can have negative repercussion for a project especially if the project is at an advanced stage.

Most building projects shall take attempt to make sure that variation instructions are issued in written format. However, clients mostly prefer the flexibility to provide verbal instructions in some circumstances. Though, most construction projects refer to written instructions, they often refer to an option to instruct orally. The problem at that juncture rises as to whether, on the precise interpretation of the contract provisions, a verbal instruction is adequate (Ashworth,2013). In most of the Standard construction contract such as FIDIC, JCT and CIDA, there are provisions for instructions to be delivered verbally by the engineer as well as in written format. The contractor has to confirm the verbal instruction to the engineer within specific no of

days (generally 2 working days in FIDIC, 7 days in JCT and CIDA) from the receipt of such instruction. (FIDIC 2017, JCT 2016, CIDA/SBD/02 /2007). This is particularly the case where the contract includes a confirmation of verbal instruction (CVI) practice. The Court of Appeal's judgment in *Ministry of Defence v Scott Wilson Kirkpatrick* is a case in point. In this case, the contractor was successful since the Court of Appeal found that the relevant condition of contract clauses allowed for oral variation instructions (Sergeant,2016).

The verbal instructions also will become as valid when they are confirmed by the contractors in writing within a certain period from the date of its issuance. These are depending on the relevant condition of contracts. But most of the contractors misses to do the written confirmation (Sutan, 2011). Lack of understanding regarding the site instruction and ineffective administration of site instructions leads to unnecessary contract disputes and delays (Hewitt, 2018). There was no previous study that specifically discussed on the impact of ad-hoc site instructions. Hence, this study aims to minimise the effect of the ad-hoc site instructions of during the construction phase of construction projects.

1.2 PROBLEM STATEMENT

Contract disputes are becoming as the common features of construction projects (Ashworth, 2013). Construction disputes are gradually increasing in Sri Lankan construction projects (Illankoon et al., 2019). Wrong practices in issuing ad-hoc site instructions are one of the most significant reasons for construction disputes. Hewitt (2018) explained that lack of understanding about site instruction and ineffective administration of such instructions leads to unnecessary contract disputes and delays. In spite of the existence of highly professionals in the consulting team in the building projects in Sri Lanka, building projects are still burdened with ineffectiveness particularly on the subject of contract administration practices (GPMCM,2017). Site instruction is one of the systematised method and procedures established in the construction industry to administrate construction projects in the direction of an effective achievement. (Ehimen, 2019). In Sri Lanka though, this method slightly seems to be a cause of misinterpretations, burden, disputes, prolonged delays, and

occasionally project termination because ad-hoc site instructions are apparently not adhered to by contractors.

1.3 AIM OF THE RESEARCH

The aim of the study is to minimise the adverse impact of the ad-hoc site instructions issued during the construction phase of building projects.

1.4 OBJECTIVES OF THE RESEARCH

For this research, its objectives are

- To review the nature of the ad-hoc site instructions during the construction phase of building projects.
- To identify the reasons for the ad-hoc site instructions issued during construction phase.
- To identify the impacts of the ad-hoc site instruction on building projects.
- To propose strategies to minimise the adverse impact of ad-hoc site instructions on building projects in Sri Lanka.

1.5 RESEARCH METHODOLOGY

Firstly, a detail literature review was done in order to understand the nature of the ad-hoc site instructions, causes of site instructions, wrong practices in the issuance of site instructions and the impact of the site instructions during the construction phase. Mixed method approach was adopted during the research study to achieve the objectives of the research. Survey approach was the main research strategy of this research project.

A Representative sample of contract parties in the building construction projects that are registered with CIDA (successor to ICTAD) were surveyed. Five number of experts in the relevant subject were interviewed in 2 phases. In particular, interviews and questionnaires were managed on related parties such as project directors, contract managers and staff from the site office which formed the data collection basis of the research methodology.

Gathered data was analysed using appropriate statistical analysis tools and the content analysis. Finally, conclusions were drawn from the analysed data and recommendations for improvement and future study was formulated.

1.6 RESEARCH LIMITATIONS

This research is limited to the ad-hoc site instructions delivered during the construction phase of building projects construction in Sri Lanka.

1.7 CHAPTER BREAKDOWN

Figure 1.1 shows the chapter breakdown of the dissertation.

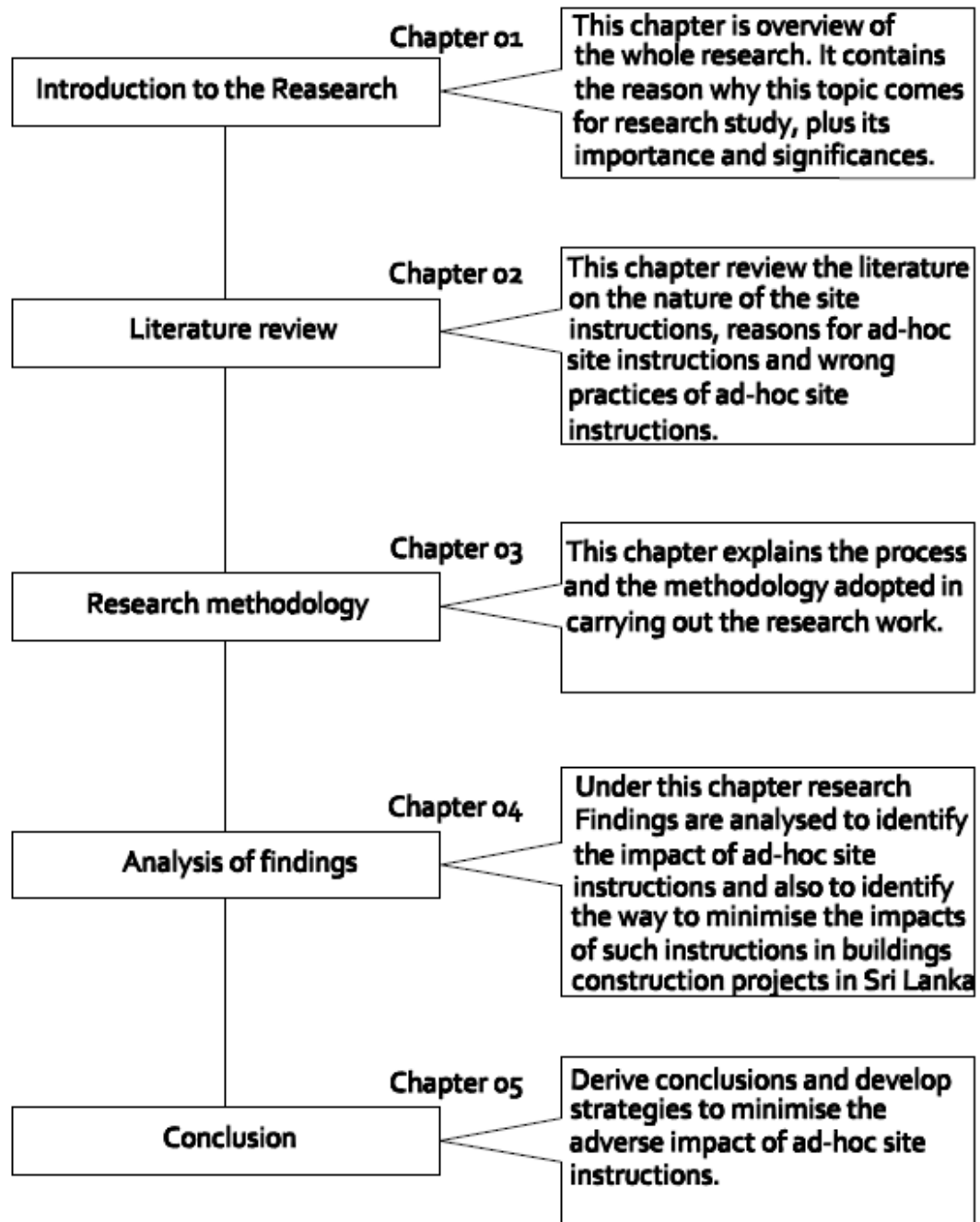


Figure 1.1: Chapter breakdown

CHAPTER 02

2.0 LITERATURE REVIEW

2.1 INTRODUCTION

This chapter was devoted to collect and study appropriate previous studies related to this research. Review of the literature was structured as explained by McCombes (2019) that “A literature review is a methodical, clear, and reproducible technique to search, evaluate, and identify the relevant literature produced by scholars, academics and other experts”. Literature about the key stakeholders of construction project, communication issues in contract management, ad-hoc site instructions by engineers, ad-hoc site instructions and contractors, wrong practices in administration of engineer’s site instructions and impacts of engineer’s site instructions on project delivery were reviewed and discussed in this chapter.

2.2. KEY STAKEHOLDERS OF CONSTRUCTION PROJECT

The key stakeholders of construction projects could be divided into three categories namely; clients, consultants and contractors (Jin et al., 2017). Communication amongst the different key parties in a building contract is specifically very essential construction management problem widely stated in most contract conditions clauses with regard to particular subsection expressly communication between the engineer and the constructor (FIDIC 2017, JCT 2016, CIDA/SBD/02 /2007). This study limits itself to those recognised communicating networks and processes of the employer, engineer and contractor with importance on Engineer’s ad-hoc site instruction as mentioned in CIDA, FIDIC and JCT.

2.2.1 Employer

One of the major partner to a construction project is the employer. As said by Ashworth (2013), employers shall be governmental organisations or private

companies or an individual and have various urgencies. (Developer, occupier or investor) that are amalgamation of execution (quality, operation and durability), duration (completion within intended completion date) and contract sum (as defined by tender figure). An employer's gratification with output of the construction project is depending on the level to which these three significances are comprehended according to the prominence they rest on those significance.

Employers are believed with numerous responsibilities, duties and conferred authority as defined in many conditions of contract such as FIDIC (2017), CIDA (2007). Some of the employer's duties and authorities include;

- Authorities related to insurance;
- Obligations related to giving out construction site to the constructor.
- Authorities related to Delay claims
- Straight involvement of clients of the constructors;
- Responsibilities in relation to the certificates and;
- Nomination of the engineer who employs his staffs of the supervising team later.

Engineer and the contractor shall be the other parties in a construction contract.

2.2.2 Consultant (Engineer/Architect/Quantity Surveyor)

The team members of a consultant be subject to the nature, magnitude and scope of the project envisioned and can comprise an Architect, quantity surveyor, civil engineers, structural engineer, electrical engineers, construction managers etc (Ashworth, 2013). The complication of the construction procedure and the lapse in the variety of expertise and knowledge by most clients ascertains that engineer shall be hired to counsel on finance, design, budget, project execution, etc. The consultant (Called as 'Engineer' for this research purpose) performs a huge sort of duties throughout the contract execution due to his participation in the contract from commencement to close the project. The initial participation of the engineer at primary phases of the building contract influences effectively on the construction

performance and ultimately assists the client since he (client) can be supported in matters such as engineering estimating and administration, feasibility study, site selection, environmental impact analysis on the environment (Samantha, 2009). The monitoring part of the engineer as the principal consulting party throughout the contract execution phase inspecting and monitoring the site, discussions at site and delivery of ad-hoc site instructions are all destined to ascertain that the set criteria and provisions in the contractual documents are obeyed to and letdown incidentally could lead to bad grade skillfulness of workers (Tembo and Blokhuis, 2004).

The responsibilities and obligations of the engineer in the precontract management and construction management includes organising for technological and discussions at site to an established schedule together with every key partners, providing all types of certifications and ad-hoc site instruction which could alter the construction activity; clear up design details or give observation statements on quality, contractual records, authorising, workshops, and evaluation during the occupation and functioning time (Mays, 2000, Samantha, 2009). Though, if any other staff from the consultant team involve in supervising, it is necessary to provide their instructions officially through the engineer as he is the chief of the consultant and similarly, ad-hoc site instructions delivered by any other officer level employee of consultant should be approved by the engineer (Mays, 2000). Such kind of every instructions are directed impartially to among the most key partner the contractor.

2.2.3 Contractor

The wide remark to the constructor in several contract condition clauses are commonly since, accompanied by client and engineer, he is among the most key partner in a building contract. The duty of the builder is to direct execution of all contract execution activities as directed by the specifications of the construction agreement and by arranging and managing the required strength of workmanship, resources, machineries and tools (Tembo and Blokhuis, 2004). So that, the constructor comes to an agreement to stand as per the clauses of the contract conditions, specifications and ad-hoc site instruction of the engineer while undertaking the construction activities (Tembo and Blokhuis, 2004). There is

correspondingly the contract by the constructor to perform the construction activities within a specific period and cost as accepted in the contract agreement, fulfil the all conditions of contract, guidelines and manuals of relevant professional organisations and it is essential to confirm that all personnel at site stand according to these regulations. The contractor should also obey with the ad-hoc site instructions given by engineer, obey with the provisions defined in the contractual documents, obligation to post a responsible one at site, must provide the engineer access to the site any times, need to follow industriously by the construction activities, accountability to put on for documentations (payment certificate, completion certificate) in the specified days as per the contract clauses, obligation for payment to nominated subcontractors and suppliers, insurance and obligation for injuries to personnel and possessions etc (CIDA).

The constructor is continually and liable of all construction fault as per the contract that can occur since the date of taking over by the employer up to the agreed as per the contract agreement which is called as Defects Liability Period. The positive understanding of these responsibilities by the numerous players as set out above could only attained if they appropriately communicate amongst them through the recognised ways and methods as agreed and recognised each contract parties. Thus the level of effectiveness in the role of a key partner is subjected on the degree of realisation of each partners particularly when he is straightly connected to it. For example, the engineer gives the constructor with the resources in the type of order and the level of effectiveness of that instruction is significantly subjected on the constructor and the way in which that is passed to contractor. As presumed by Maslej (2006), the effective outputs of building contract are subjected on the superiority of communicating relationship amongst the different parties.

2.3 COMMUNICATION ISSUES IN CONTRACT MANAGEMENT

Conflicts in the execution of contract mostly come due to poor communicating practices (Latham, 1994) as a result of the disjointed, spirited and project-oriented

characteristic of the construction projects and it leads to a multifaceted communicating scenario since most of the parties function in varying number of dealings often that drives on the basis of contractual arrangements (Dainty et.al, 2006). As stated by Maslej (2006), communicating in effective way is vital to the contract administration and consequently the effective output of the construction is subjected on the superiority of communicating way amongst the numerous partners. He declares that quality of communicating as well subjected on which manner an anticipated achievement is attained afterward the instruction was communicated to the targeted role player. So, better-quality communication among contract parties is essential for effective output of construction. Better communication between the contractor and the consultant shall lessen failure, increase transformation and enhanced technical clarifications and high excellence and making the healthier decisions (Emmitt and Gorse, 2003).

As said by Ashworth (2013), communicating in contract administration comprises collecting data to make certain the requirements of the parties who engaged in the construction contract as an essential contract administration tool to take part the operations of sectors and as an essential connection between administrator and his supporting officer with the purpose of getting the work completed. Moreover, He expresses that the efficiency of work shall depend on the capability to pay attention, speak, and communicate and writing skill. Most essentially, efficiency shall be noticeable in being realised by another person and to comprehend in other's perspective. For continuous flow of information and instructions and successful communication, promptness, clearness defined ways in that those shall be communicated is a key prerequisite (Tembo and Blokhuis, 2004).

Communicating the information and instructions in construction projects arises in different methods and as such, the method selected shall be governed by an individual, the targeted receiver and the contractual provisions comparative to that communication. Some ways of communicating the instructions in the project site as per (Mehra, 2009) defined below.

- **Written:** pertaining to complex characteristic, when prospect basis is necessary or when possible, lawful outcomes are expected, this way is followed e.g. log books, meeting minutes, letters, etc.
- **Visual:** This frequently effects in a high impact on the receiver and this is most efficient particularly in the event of minimal complexity subject problem e.g. construction drawings and work method statements.
- **Oral:** this form of communication is considered suitable for problematic or argumentative issue since it permits for the observation of behaviour and approaches and confrontational occasioning in prompt and instant response. This may also be used to modest, informal and not as much of significant information.

The key method of communicating the instruction in building contracts that is importance to this study is betwixt the engineer and the constructor. The engineer communicating the instructions with the constructor through orders delivered as ad-hoc site instruction. These ad-hoc site instructions are passed to the contractor through different ways such as site meetings, site log books, approval documents etc. Through these ways information is communicated to parties of the construction project, consultations are carried out on how to confront issues and difficulties that arises, decision is taken and the other parties are convinced to various forms of resolving issues (Cooke and Williams, 2012). Engineer's obligation is to decide which, when and how a way of communication must be used to pass information and instructions across to the targeted party with the purpose of ensuring that the construction is going on track. One of that kind of causes of dispute is in relation to the instructions delivered by engineers to contracting firm officer. Ndihothubwayo and Huapt (2009) speak out that the extreme existence of variation orders because of faults in the planning stage or oversight can destabilise the moral of the professional who performed the planning.

2.4 AD-HOC SITE INSTRUCTIONS BY ENGINEERS

In earliest primordial period, the engineer has been defined as the dominant in construction who was having expertise in all phases of design and building. The engineer's obligation protracted from planning to supervising of the whole construction from beginning, planning, designing, estimating over and done with project (Ashworth, 2013). This destined that the engineer and the employer are the key partners in a contract in that period and consequently engineers delivered ad-hoc instructions straightly to their contractor. Though, with the growth of the construction industry and its rising complicated nature, the necessity for expertise has become impending and consequently other professionals developed. As outcome of this growth, the engineer surrendered the operations of contract execution to the constructor then overseen the designing and administrative performance (Hodgin and McCutchen, 2004). For the purpose of making sure effective construction output, engineer delivered ad-hoc site instructions to the contractor occasionally.

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 remedy of any defects, all in accordance with the Contract (FIDIC, 2017). The Architect/Contract Administrator (A/CA) is given the power to issue instructions through clause 3.8 and the Contractor is under an obligation to comply with them forthwith. It is important to remember that the right of the A/CA to issue instructions is determined by the contract conditions and he can do so only in conditions allowed for by the contract. (JCT, 2016). The contractor shall comply with the all instructions given by the Engineer in respect of the works including the suspension of all or part of the works (CIDA, 2007). Already there are standard instructions to contractors in contract drawings and specifications. But the site instructions stipulated in the above general condition of contracts are delivered by the contract administrator to the contractor occasionally in an ad-hoc manner. Because of this ad-hoc nature, author of this research termed the "site instruction" as "Ad-hoc site instruction" for the purpose of this study.

To effectively plan, organise and effectively deliver the construction projects, a sound and methodical application of trial and error techniques is necessary and a realisation of principles, practices with procedures in construction field which manages and executes the construction activity along with effect of them (Cookke and Wiliams, 2012). Consultant and contractors obey to numerous interconnected processes to communicate among each other and the contract conditions assurances a management strategy to ascertain that these processes are tracked (Murdoch and Hughes, 1992). Those processes that were consistent all over the construction industry and commonly established and agreed as way of weakening, illustrating and determining problems one of those is the providing ad-hoc site instruction by engineer.

A study of most contract conditions clauses such as CIDA, FIDIC and JCT illustrate potential differences in subject of contract provisions such as dispute management practices, terms and conditions related to payment. Though, which rests as similar in various relations of all those conditions of contract seems as the sections of provisions which relevant of ad-hoc site instructions delivered from engineer or else mentioned as the Engineer's ad-hoc Site Instruction. Literature is replete with studies on the ad-hoc site instruction, then again detail literature review expresses that various researches time to time concentrated only on one element of the ad-hoc site instruction namely. Particularly, those researches always focus upon this meaning and characteristic of changes in works, reasons with effect through planning phase till the contract execution phase. Menon et al., (2014), deliberated those reasons for changes and Ndihoobwayo and Huapt (2009) and both of them revealed that employer is being as major offender in this respect. One important thing that seems not considered in the previous studies are detailed research that focus on the ad-hoc site instruction as an entire element and its whole impact on success of the construction project, Particularly from the perspective of main parties of contract such as the employer, consultant, contractor. Even if variation order was to be agreed as only engineers are authorised to deliver the site instruction, impact of ad-hoc site instruction on accomplishment of building projects from the perspective of the contractor was not taken proper manner in previous studies until now. It serves to

comment that, variation orders set up as part of the ad-hoc site instruction and in practice are usually issued by the engineer to make additional works, deductions, alterations and substitutions with respect to qualities of work, quantities then programme (Ndihothubwayo, 2008). Every direction at site delivered from engineer are not comprising works changes as example, an order for the purpose of rectifying a defect (FIDIC, 2017).

Ad-hoc site instruction is an order in written format with authorised signature issued by the engineer or any other nominated officer who has been given the authority by the employer to strengthen, make right, influence slight variations as per the engineer's given power and also to instruct the use of provisional sums (Chapell, 2017). It is usually recognised that the engineer may use his discretionary authorities often by providing revised drawings, modified design details and ad-hoc site instructions in written format to the contractor in respect of:

- The modification in the design quality or quantity of B.O.Q item or the addition or deduction or swaps of any work;
- Any contradiction between Drawings and B.O.Q
- The elimination at field, of any supplied or unloaded items afterwards and replacement by substitution resources;
- Exclusion and rectification of already constructed component.
- Suspension of construction activity which was instructed in the scope as per the contract agreement.
- Elimination of any worker from the field
- The altering and making good of any works which are not complying with the specification after completion of construction.

2.4.1 Reasons for issuing Ad-hoc Site Instructions

Issuing site instruction is very essential and main obligation of the contract administrator. That is not the responsibility of the employer, site manager, site engineer or any other officer in site to deliver site instruction (Ehimen, 2019). Widely talking and as designated in the preceding topic, the ad-hoc site instruction is

whichever a request to change the work or a meagre order referred to strengthen a given clause of contract agreement. Among the most reasons for postponements in building construction is delivering site instructions particularly where those are not administered prudently. Kaming et al. (1997) stated that poor instructions as another reason of re-executions. Flow of construction work is blocked if instructions particularly those that reason for occurrence of changes, since they are having the tendency to impact on the intended completing date of those works (Menon et. al., 2014). Where orders were delivered for built elements of re-works, dismantled or demolished throughout the construction process of any project, a substantial duration and money is expended to do this particularly when in some scenarios such need to be rebuilt (Cloough and Saers, 1994).

Orders to re-work, dismantling, demolition works which were already built impose big cost and time problems on builders. If these instructions are regular, they can significantly include the excellence of performance since contractors can put efforts on providing for damages. Furthermore, in managing projects in potential degree for likelihood of struggle and undecided variances (when a considerable number of orders are delivered), contract managers can make effort to hire simple ways to consider about qualities and quantities for the purpose of increasing earnings (Patick and Toller, 2008)

2.4.1.1 Instruction for varying construction activity

Engineer is authorised to propose changes concerning deviations in specifications, qualities and quantities. The direction can give as an inclusion of additional work, modification and to avoid considerable hunk of building activities that mentioned where none of those are being as reason for considerable deviations in planned construction activity and no eventual changes in construction as example change of an office building as a hotel. A variation order and site instructions are not identical words. But, variation in the construction activities is one of the reasons for site instructions (Maczko, 2019). Change orders are especial case of engineer's instruction because of they may change the design, vary the quality and quantity specified in the bills of quantities and contract drawings (Willoughby, 2005).

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2.4.1.2 Instructions for resolution of inconsistencies

Consultant has the responsibility to prepare and issue the drawings and specification to the contractor with right design details. It is not contractor's responsibility to look over the contract documents for any inconsistencies. But, inconsistencies due to the design fault are inevitable. Mostly design faults are caused by the complication of the design attached with human limitations. During the planning stage, the first step in the design process, client discuss their requirements and preferences for the construction with the consultant. This planning phase is often theoretical and mathematical, and is administered by a few parties, permitting some errors. The engineer can issue instructions to correct the faults in the design or specification of particular realities of documents which are comprised in the agreement (Chappell,2017).

2.4.1.3 Instructions to restate provisions of contract agreement

These ad-hoc site instructions are not for the purpose of varying the contractual provisions but slightly restate them particularly where previously performed construction activities or materials which were unloaded at the construction site are identified as not comply with the specification. These ad-hoc site instructions shall comprise the following:

- Swap of materials which are considered as inappropriate for the construction
- Demolishing any structures which noncompliance to the design or which are not according to the engineer's specification.
- To reveal hidden faults while inspection
- Quality inspection
- Safeguard the construction.

2.4.1.4 Dealing with budgetary Allocation

This set of instructions are not for altering the prevailing contract provisions. However slightly authorises the engineer to instruct how under provisional sums allocated for subcontractors and suppliers who directly nominated by distributed. Such directions, though, develop variation instructions which for example, the provisional item provided for supplies where the supplier has been nominated by the employer may not provide for alterations or modifications done for the purpose of best standard of material (Sutan, 2011). Mostly, provisional sums are allocated in the BOQs, for the items where the actual cost that could not be exactly determined. In the construction stage, contract administrator or other authorized person have the obligation to give site instruction to explain in which manner the provisional sum have to be efficiently expended. (Ehimen, 2019)

2.4.1.5 Ad-hoc site instructions when changes in employer's preference

The prevailing contract provisions does not change by this category of instructions. They are way to free the construction from undesirable materials and works and staffs of the contractor who may be involved in unlawful actions or may be corrupt impacts on the self-esteem of other staffs (Ehimen, 2019). Such ad-hoc site instructions contain:

- Exclusion of any individual or contractor's staffs from construction work
- Exclusion of somebody who does not involve or attached with the working team.

It is obvious from abovementioned statement that the orders to change the specification and amount of works or differ the design comprise variation instructions. Another type of instructions such as directions to restate the contractual arrangements, preserve the employer's preference, and solve inconsistencies in contract documents and to manage the financial budget are not deliberated as a variation order (Maczko, 2019)

2.4.2 Instructions for Variations

A considerable amount of changes are predictable in building projects because, the complicated nature of operations engaged creates precise earlier identification most problematic (Segawa *et al.* 2002) and so that sufficient clause is necessary for the purpose of furnishing predictable variations (Finsan, 2005). Typical procedures of construction document comprise a section that permits the client to be able to change works by delivering ad-hoc site instructions to the builder to do alike although differs from what was stated in the agreement. Variation of scope, introducing different materials, revised programme and order of the construction activities are all typically provided for by the variation clause. It shall often comprise a tactic for appraising the monetary implication of the variation and there is generally clauses for alterations in the contract conditions example, intended completion date and contract price (Memon *et al.*, 2014). Those adjustments are being attained by delivery of an instructions for changes from engineer.

Instruction for ordering a change shall be in way of written format which issued from engineer to constructor mentioning a variation requested in a construction (Oldapo, 2007). Essentially the variation order shall include suitable clause of contract conditions that is base for Engineer's power to deliver that kind of instructions that is another obligation of constructor when just receiving a reminder from engineer to perform the construction activity as mentioned in the original contract documents (Ndihoobwayo and Huapt, 2009). Once the characteristic of construction activities specified in variation order is mentioned significantly dissimilar of which was

included in original agreement, the constructor shall later prepare a rate to submit to engineer to obtain his sanctioning.

Once contractor have received the approval from the engineer, the he shall then proceed to undertake the construction activity as directed. A constructor may startup an instruction to change the scope. Identical process shall be practiced similar to earlier but initiation of variation is from the constructor. High attention must yet practice because as stated by Mohammed (2001), much occurrences of directions for changes in building contract execution upsurge the possibility of cost overrun and time overrun.

2.4.3 Need for Engineer's ad-hoc Site Instructions

Design specifications and drawings are not implemented as planned, for the reason that those are not formed by stone and by itself, the additional contribution of the engineer in the management and supervision of the contract particularly throughout the building works is to make sure that the essential modifications can be done for the purpose of preserving design quality, economy and integrity of the construction (Mays, 2000). The engineer shall just perceive to the effective realisation of these targets by means of regular site monitoring activities and site meetings that will eventually lead to issuance of additional work orders or directions to the contractor. There are numerous reasons for the necessity of these instructions and can comprise specifically the followings:

- Inadequate output of Smaller Scale builders because of administrative insufficiencies (Amoaah et al.,2011)
- Imperfect and clumsy characteristic of design details (Gao et al., 2006; Makulawatudom and Emsley, 2003)
- The predictability of variations throughout contract execution phase (Segawa *et al.* 2002; Mouergues and Fischier, 2008)
- The necessity for contract activity to commence together with the design process lead to provide the design details and information regularly time to time when required (Skoyiles and Skoyiles, 1987).

2.4.4 Management and Potentials of Engineer's Ad-hoc Site Instructions

Generally, it was specified in most contract conditions that orders as ad-hoc site instructions by the engineer for the consideration of the contractor should be delivered in written with date and signature. Chappell (2017) concurs with most condition of contracts to the result that an effective instruction in writing is one which is delivered according to the specified provisions of contract agreement and it is necessary to comply with defined conditions specifically:

- Issued by the engineer
- In written format
- With the date and signature
- Not go to the further side of the authority of the issuing party i.e. Engineer to the contract
- Served appropriately on constructor or official representative of him
- Could refer a section or subsection of the condition of contract which permits for the ad-hoc site instruction.

As stated by Finsen (2005), "written instruction" contains sketches, facsimiles, e-mails and telegraphs in which texts and illustrations may recorded and are possible to converted as text and drawings on paper. Alternatively, oral instructions mention to pass information with the use of general speaking symbols and comprises direct, phone, consultations, and demonstrations. Ashworth (2013), stating about the contract clauses with reference to oral directions, strengthens the process to be approved as:

- Approval must be granted in written format within one week from constructor to the engineer.
- If engineer does not disagree in written within a further week, the instruction may be acknowledged as an ad-hoc site instruction within the terms of the contract.

- On the other hand, if the engineer approves in written format the verbal order or direction within a week, at that point the contractor needs only to admit this as an ad-hoc site instruction.
- The documents for Confirmation of Verbal Instruction (CVI) was formed to support contractors in remedying the negative impact coming because of oral orders (JCT, 2016) and necessary to forward through documented conveyance (through staff or via postal communication)

Preferably, ad-hoc site instructions shall be produced in three set of copies using format that can be delivered to site officers through log diaries or templates as triplicate. One copy is issued to the contractor while the other two copies are for the engineer's record and for the file which is maintained. Though, Chappell (2017) demoralises this exercise by declaring that occasionally additional discussions must be needed prior to an ad-hoc site instruction could be illustrated and that at any degree, the engineer shall not be limited by any clause of the conditions of contract to make that.

2.5 AD-HOC SITE INSTRUCTIONS AND CONTRACTORS

An engineer's instruction is an official written order delivered to constructors to improve workmanship and material quality that are not in compliance with the specification. Contractors are obligated to obey to engineer's direction within a certain specified duration. The important of an engineer's directive is to remedy the defects on site (Ehimen,2019). The delivery of ad-hoc site instructions from engineers to constructors does not novel in building projects. This shall be relatively comprehensible to practically predict certain degree of ad-hoc site instructions by the engineer at the contract execution phase of each projects. This may be similarly practically predicted which builder will analyse the prevailing contract dealings and completely familiarise players engaged in the construction while making sure that they just perform on ad-hoc site instructions delivered by single authority that the authorised officer who is the engineer to the contract (Alkarmi, 2013). The contractor

is anticipated to depend on his own skill, awareness and decision during the performance of the construction activity and shall not unseeingly carry out all ad-hoc site instructions issued by the engineer without consider satisfaction of himself regarding the accuracy and completeness of the instructions (Ndiokubwayo and Haupt, 2009).

One of the roles of the engineer is to carry out site monitoring regularly by inspecting the construction site repeatedly to answer to any questions from the contractor side and to supervise the noticeable symbols of poor construction performance and deficient in the quality of workmen (Lewiss, 1985). Such regular site inspections, still, shall not affect an ineffectual contract firm a capable one, nor shall it safeguard it from its duties to deliver best qualities of workmen performance as said by the necessities of the agreement. It is essential that contractor's site in charge to understand that the engineer is not accountable for the day to day construction works of contractor's team that duty comes under the contractor's side responsible officer. A industrious contract firm is one which may be aware to have well consideration on engineer's specifications and design details and to communicate him for additional explanations when he have ambiguities in the directions to be delivered (Ndiokubwayo and Haupt, 2009).

Leviy (2002) specifies that contractor and representative of them can come across in methodological complications or inconsistencies, faults, or struggles in the contractual documents and can request engineer for examine that kind of inconsistencies. The contract firm executes the contract related performance to stand and comply with all instructions delivered by the engineer if a realistic protestation in written is made in relation to the non-compliance, for example a rejection to agree the appointment of a nominated suppliers due to the presence of a substandard relation on an earlier contract (CIDA 2007). The contractor is having the authority to practically object or question on an instruction in his general justification where he considers the instruction is out of the limits of the contract and appeal for interpretations from the engineer on the related sections of the condition of contract from where they are authorised to provide such instructions (JCT 2016).

2.6 WRONG PRACTICES IN ADMINISTRATION OF ENGINEER'S SITE INSTRUCTIONS

Upcoming sequence in building contract execution is governed by bureaucratic basics set down in beginning and level to that they followed by different role players (Asworth, 2006) and thus the guidelines formed related to ad-hoc site instructions would clearly bait to the advantage of the construction if firmly followed to. Although those guidelines were obviously formed there shall be severe practical wrong practices hindering and obstructing the handling of ad-hoc site instruction. Disputes and prolonged court proceedings were risen as an outcome of those wrong practices and lead to strenuous document analyses, enormous claims and counterclaims (Alkarimi, 2013). Previous studies reviewed exposed varying manners in communication, imperfect documentation, non-adherence to form communication procedures in the construction site and key assumptions regarding the different players of the contract etc. by way of few of the wrong practices. Few of these wrong practices are deliberated further below.

2.6.1 Simplicity of Instructions

Degree of specifications mentioned in an engineer's order is as significant as the explanation of direction. An order tense with uncertainties, hints with suggestions may cause conflicts and court proceedings although no every direction in written are obvious as few others are definitely unclear (Chapell, 2017). As said by Charoengam et al (2003), conflicts amongst the players of a construction project may happen when ad-hoc site instructions (particularly variation orders) are not handled prudently. Written instructions should be as unambiguous which are intending to instruct something although it can be inferred from what is expressed in the instruction. Though, it will be harmless from the contractor's perspective to confirm that the texts in the instructions perceptibly are destined to direct an order (Chapell, 2017).

2.6.2 Unconcern the Documentation

During commencement of construction specially during tender phase, contract role players express honest attention in obeying to the guidelines. Example, obedience to communication procedures. Though, as the project is going on and burden starts to give struggles on them particularly during the construction phase, joined together on personal inspirations to display perceptible output, obedience to procedures and rules having tendency to have the behind bench (Alkarmi, 2013). So, a most significant role such as the obedience to recognised practice in the administration of ad-hoc site instruction to and after is demoted to the margin of the construction contract. Moreover, early attention in document preparation too loses and consequently it converts apparently hard to solve conflicts which may lead to disputes (Mays, 2000). That shall be authoritative to notice that evidently keeping and maintaining proof of orders have better advantage to the contract team since most of them feel most significance afterward the occasion it was happening.

2.6.3 Source and Target of Engineer's Site Instructions

Among the general sources of from where a conflict rise in construction project is once direction of work are delivered from different officer than the authorised officer from the consultant firm, or the client (Powel-Smith et.al., 2000). Basis of an order limits if intention of that instruction would be misplaced, weakened or misunderstood. Main difficulties endure to rise on construction contract where the contractor feels (correctly or mistakenly) indebted to take instructions from the employer or any others from the supervising team. Different members cannot be engaged in the construction always and mostly when all of them are not present in single place whereas instructions are delivered, contradictory instructions if entertained can cause delayed programmes and cost overrun (Lavender, 1996). The contract conditions authorise the employer to represent to the engineer the power to deliver ad-hoc site instructions on behalf of him. Though, some employers have a tendency to block the engineer from delivering site instructions, when employer feels such instructions may result in time overrun or additional cost than the budget (Alkarmi, 2013).

2.6.4 Verbal Instructions

Although Carlsson et. al., (2001) recommend that in a construction atmosphere, direct communication is the suitable method to pass the instructions on time and for quick response, instant synthesis of communication, and promptly end, it seems to abruptly deny the situation in general construction contracts that instructions should be given in written. The engineer is having the power to deliver instructions in written format to the contractor to confirm successful project execution without time overrun (Chappell, 2017). Numerous reasons shall promote engineer to have a tendency to deliver oral instructions on site with the potential to put those in the written manner afterward to forward issuance to the contractor's authorised person (example. the chestnut allow works completed rapidly). Those assured directives are occasionally not ever in writing and where the contractor appeals an entitlement that shall be disputed. One more aspect that creels the communication of instruction of engineer to the contract is the cap of communication because of the engineer's office is far away from the construction place mostly causing orders being delivered via telephone, pretty than further brief written instructions being delivered.

The verbal instruction which is not backed up by a written instruction should not be accepted in any situations. The engineer with the authority on the contract issues a verbal instruction in urgent situation and he backs it up promptly in written format (Willoughby,2005). At the time of site visit by the engineer, site instructions shall be given both verbally and written. These instructions are needed to be written in the site log book under the headline of site instructions. But it should be kept in mind that every instruction should finally be in written format to be as valid instructions (Ashworth, 2013).

Instructions to perform extra work to be given in written format. Following will be the issues if such instructions were executed solely on the basis of a verbal instruction (Brooks et al.,2011).

- No evidence for the given instruction
- Who issued the instruction?

- Whether the client was aware or not about this extra work
- Was there any signal from the client or engineer that severe obedience shall not be needed?

In the JCT 2016 Standard Building Contract there is a provision for instructions to be delivered verbally by the contract administrator as well as in written. In this circumstance the contractor is to confirm the verbal direction contract administrator within seven days of the receipt of that instruction. If the contract administrator was not refusing that confirmation within seven days from the written confirmation, the instruction then can be considered as valid.

2.6.5 Differences in Format

Construction experts and the numerous associated specialised bodies in Sri Lanka e.g. CIDA (Construction Industry Development Authority), Institution of Quantity Surveyors, Sri Lanka (IQSL) have published standard books and procedures to their associates to practice in the implementation of construction contracts. It is however not unusual to determine that over and above these forms, an engineer on a specific construction would deliver instructions by means of various formats, for example, Letters, filled out typical formats, phone communications, further drawings and sketches, in site log books etc (Sutan,2011). This collection of templates when not practiced correctly can be a reason for the misperception of the contractor and can affect adversely on the project (Sergeant,2016).

2.6.6 Instruction Time

Where faults and oversights in initial plans or inconsistencies/contradictions in contractual documents are exposed, it is the obligation of the engineer to deliver remedial actions. Gaeo et al., (2006) states that contract firms are infrequently conscious regarding the complications till constructions have proceeded considerably owing to recognised standard of delivering design details after some days from the commencement of the construction. Thus when engineers postponement in delivering instructions to elucidate circumstances such as these, sufferings in relation

to idling of workers and machineries are come across whereas awaiting of engineer's instruction (Ndihothwayo and Haupt, 2009). Adverse effect on output could only be removed if instructions are finalised and issued promptly. Inopportunately, requirements by contractors are rarely provided the anticipated consideration they deserve for the reason that engineers feel greater than contractors and this delays the step in where conclusions are arrived (Ndihothwayo and Haupt, 2009).

2.7 SUMMARY

The key points from the literature findings are instruction for varying construction activity, instructions for resolution of inconsistencies, instructions to restate provisions of contract agreement dealing with budgetary allocation changes in employer's preference are the major reasons for ad-hoc site instructions in construction projects. Lack of clarity in instructions, verbal instructions, differences in format and instruction time delay are the wrong practices in the administration of ad-hoc site instructions.

CHAPTER 03

3.0 RESEARCH METHODOLOGY

3.1 INTRODUCTION

The research methodology is the method used to achieve the aims and objectives of the study. The purpose of this chapter is to provide an outline view of the methods which are used throughout this study. The chapter explains the research methodology, research design and the reasons for choosing the appropriate methodology. The chapter go into detail regarding the research methodology using the research process under the headings of; background study, research design, research approach, research techniques, data collection and data analysis techniques.

3.2 BACKGROUND STUDY

Initially a background study has been carried out in a broader perspective with the purpose of familiarising in the area of “ad-hoc site instruction” and “impacts of the site instructions” in the construction industry. This initial study discovered that various researches have been carried out on the area of ad-hoc site instructions in construction industry. But the study has identified that a lack of research to identify the adverse impact of site instructions in construction projects and, to minimise such impact. Especially in Sri Lanka there is a dearth of research in this area and therefore this research aimed to identify the impacts of the ad-hoc site instructions issued during the construction phase of building projects and to suggest recommendations to minimise the adverse impact of site instructions in construction projects in Sri Lanka

3.3 RESEARCH DESIGN

Research design has defined as the process of carrying the research problem to the conclusion (Tan, 2002). Research design consists of research approaches and research techniques. The research design of this research has been discussed here under the headings of research approach and research techniques. Research

approaches represent that the way of doing the research. Research techniques demonstrate that how the data has been collected and analysed.

3.4 RESEARCH APPROACH

Research approaches can be categorised mainly in to two as Quantitative and Qualitative. Quantitative approach have the tendency to relate to certainty and pursue to collect realistic data and to study relations between facts and how such facts and relations concur with philosophies and the results of any studies done earlier (Fellows and Lui, 2003). Survey studies and experimental studies are coming under quantitative approaches. The author researched on whole population by using a qualitative method and it is possible to identify opinions, understandings, thoughts and interpretations of people (Fellows and Lui, 2003). Case study, ethnography, action research and concept approach may be engaged under qualitative approaches.

This research aims to identify the impacts of the ad-hoc site instruction and to suggest recommendations to minimise the adverse impact of site instructions in building projects in Sri Lanka. This research takes a mixed methods approach. Mixed methods approach is a method for carrying out the research that comprises collecting data, analysing the findings and mixing quantitative (example, questionnaire surveys) and qualitative (example, expert interviews) research. Mixed method approach is applied where this combination was effective one for a better understanding of the research problem than using the each method separately (Judith and Burke, 2017). By integrating both quantitative and qualitative approach and data, the researcher gathers in extensive and depth of understanding and validation, while avoiding the drawbacks of using each approach alone.

In this research the qualitative approach is adopted by expert interviews and the quantitative approach is adopted through the questionnaire surveys.

3.5 RESEARCH TECHNIQUES

The method of data analysis is essential for the reason that there must be a technique to analyse the findings and to arrive a conclusion. The data analysis technique perform as the way to understand the statistics. Expert opinion technique,

questionnaire survey, content analysis, statistical analysis, and descriptive analysis are the data analysis methods which are generally used. (Igwenagu and Chinelo, 2016). This study has used semi structured interviews and questionnaire survey as the main data collection, and content analysis and statistical analysis as the data analysis techniques. These techniques are discussed below.

3.5.1 Data Collection Techniques

Based on the research heading and the research question, this research is in the view of mixed method approach. Therefore, this research was intended to achieve the objectives through the expert interviews and questionnaire survey to collect data from the construction industry in Sri Lanka.

3.5.1.1 Sampling

Sampling shall be defined as the way of choosing a representative sample from a population. However, selecting most fitted sample for the research purpose is fairly a challenge full (Tan 2002). Sampling methods are categorised as either probability or nonprobability. In probability sampling, every member of the population has a known non-zero probability of being selected. Probability methods comprise random sampling, systematic sampling, and stratified sampling. In nonprobability sampling, members are selected from the population in certain nonrandom way. These comprise convenience sampling, purposive sampling and quota sampling.

In case of this research, purposive sampling is used for expert interviews. A purposive sample also called as a judgmental or expert sample, is a category of nonprobability sample. The main objective of a purposive sample is to form a sample that may be rationally assumed to be representative of the population (Sanders et al 2016). This is mostly skilful by using expert knowledge of the population to choose in a nonrandom method a sample of components that represents a cross-section of the population (Kothari, 2004). In this research five experts in the field of construction industry with the knowledge in the construction law and disputes resolutions are purposively selected for expert interviews.

Stratified sampling is used for the questionnaire survey. Stratified random sampling (commonly known as simply as stratified sampling) is a category of probability sampling that permits researchers to increase accuracy (lessen mistake) in relation to simple random sampling (SRS). The population is classified into non-overlapping groups, or strata, along a related dimension such as gender, ethnicity, political connection, and so on. The researcher then collects a random sample of population members from within each stratum. This sampling method ascertains that observations from all related strata are comprised in the sample (Mishara and Bhushan, 2017). Hundred and twelve (112) practitioners in the construction industry in Sri Lanka were randomly selected and questionnaires were distributed to them. There were fifty (56) contractors, thirty-six consultants (36) and twenty (20) clients amongst the 112 construction practitioners as shown if Figure 3.1. A total of forty-five questionnaires were responded and the response rate is 40.2%. Most of the professionals were able to be approached were from Northern Province, Eastern Province and the Western province.

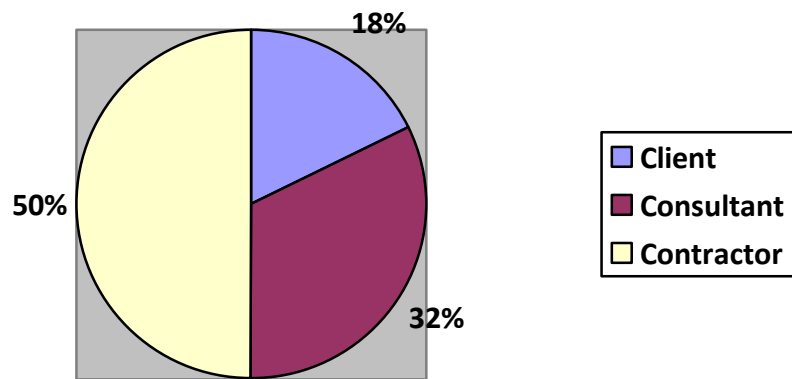


Figure 3.1: Type of Organisations of selected professionals

3.5.1.2 Expert interviews

Expert interviews were done in two phases. In Phase I the data were collected from the experts to prepare the initial development of questionnaires. The identified

reasons from the literature review for ad-hoc site instructions were reconfirmed through the experts.

The phase II of the Expert interview was done after collecting the data through the Questionnaire survey. In phase II the experts were interviewed to develop recommendations.

3.5.1.2.1 Interview Structure

The kind of interviews used for data collections are structured interview, non-structured interview and semi structured interview. In structured interviews, questions are well-planned and readily available in advance. All experts were asked the similar identical questions in the same way. An unstructured interview is a kind of interview in which the researcher asks questions that are not planned and created in advance. Instead, questions are asked spontaneously in a free-flowing discussion, it means that different experts were asked different questions.

A semi-structured interview is a category of interview in which the experts are asked few questions which were pre-planned while the remaining questions are not predetermined in advance. As semi-structured interviews integrate both the structured and unstructured interview methods, they may provide the benefits of both ways. They permit for the impartial comparison of experts, whereas offering a chance to spontaneously research the topic related to that particular expert as well. Sekaran (2003) stated that, when interviews are conducted in semi-structured manner, it enables to make the questions as appropriate for the purpose, clarify ambiguities and ascertain that the response is appropriately understood by reiterating and restating the questions. Moreover, he emphasised that, if the interviews are carried out face-to-face manner, researcher can pick up the nonverbal cues from the respondent and it is beneficial to understand the response effectively and evaluate whether the respondent's mental condition is suitable to answer the question clearly. Therefore, the interviews were executed directly in semi structured manner.

3.5.1.2.2 Interview Process

The interviews were performed with five Experts in the building construction field; employer or his representative, contractor's site manager, structural engineer, architect and the cost consultant (quantity surveyor). This permitted to have a constancy within an expert sample of each case. To improve the rationality of collected data, experts had been chosen according to their qualification and experience. During the interview, note taking (with permission of the experts) were done to keep up the accurateness of data collection.

3.5.1.5 Questionnaire Survey

Questionnaires were prepared with the guidance of literature synthesis and expert interviews, to fulfill the aim and objectives of this research topic. The questionnaire was structured to the get perception of two main sections. The opinions were collected from the practitioners and the professionals who involve in the administration of ad-hoc site instructions in building construction projects. The findings of both literature and Phase I expert interview were used to develop questionnaire. The questionnaire survey was used to identify the current practices of ad-hoc site instructions in building construction projects. Further, the adverse impact of ad-hoc site instructions in term of their frequency and severity were investigated.

3.5.2 Data Analysis Techniques

3.5.2.1 Content Analysis

Content analysis is generally used as a qualitative research technique. and is a research methodology to analyse the textual meanings of phrases, images, symbols or audio data. (Gheyle and Jacobs, 2017). According to Krippendorff (2004) content analysis is a research technique for producing valid interpretations from meaningful texts or any other contents. In this research the content analysis was used to analysis the qualitative data gathered from the expert interviews. Interviews were recorded, transcribed and analysed using the manual content analysis technique. Semi structured interview was conducted during the phase I and phase II of expert interviews. The interview guidelines are shown in Appendix 01 and Appendix 03.

3.5.2.2 Statistical Analysis

Statistical analysis describes the relationship between variables in a sample or population. Descriptive statistics provide a summary of data in the form of mean, median and mode (Ali and Bhaskar,2016). In this study the descriptive statistical analysis was use to describe the profile of questionnaire survey respondents through pie chart and bar charts.

The response categories of the questionnaire survey were ranked in relevant order by using likert scale. As well as quantifying the questionnaire data, likert scales can measure other variables such as occurrence, importance, and severity, etc. (MCleod, 2019) Mean value and RII value were calculated to analyse the response categories.

3.5.2.2.1 Mean Value

Mean value is the general measure of the average value of a group of numbers. Sum up all the figures, divide by the number of values, and that is the average or mean (Sykes et al., 2016).

$$\mu = \Sigma X / N$$

ΣX = The sum all the scores in the distribution

N = Total number of scores

3.5.2.2.2 Relative importance index

With the consideration of the conditions of this specific research, particularly needs of the identification and minimisation of adverse impacts of ad-hoc site instruction between contract parties, questioner survey selected as the ad-hoc site instruction technique to collect data. In this questionnaire analysis Relative important index (RII) was used as a statistical analysing tool for the purpose of analysis the data collected through the questionnaire. The relative importance index (RII) was calculated using the following formula (Fagbenle et al., 2004).

$$RII = \frac{\sum P_i U_i}{N(n)} \dots\dots\dots (1)$$

Where, RII = relative importance index

P_i = respondent's rating

U_i = number of respondents placing identical rating

N = sample size

n = the highest attainable rate

3.6 Research Process



Figure 3.2: Research process

3.7 SUMMARY

This chapter considered the methodology of this particular research. In this research mixed method approach was used. Quantitative approach was used in questionnaire survey and qualitative approach was used in expert interviews. Data collected from the expert interviews were analysed by using the content analysis technique and the questionnaire findings were analysed by using statistical analysis method. Forty-five samples of respondents were selected from the Northern, eastern and western provinces of Sri Lankan construction industry to fill the questionnaire where they witnessed adverse impact of the ad-hoc site instruction.

CHAPTER 04

4.0 ANALYSIS OF RESEARCH FINDINGS

4.1 INTRODUCTION

In a building contract, which is deemed to be carried out and completed effectively with successful project deliveries, cost should be controlled within the budget and must be completed within the intended completion date which mainly be influenced by the technology supported with effective decision occupied by the consultant (Aashley *et al*, 1987).

This chapter shows a comprehensive analysis of the result of the questionnaire survey and findings of the research as per the gathered data and also target to detail the key objectives. This chapter is classified as three main sections. Section (I) presents the Phase I expert analysis. Section (II) presents the question with appropriate sub heading and section (III) presents the Phase II experts analysis.

4.2 ANALYSIS OF EXPERT INTERVIEWS PHASE I

Main purpose of the expert interview phase I was to find the qualitative data related to the objectives those are to identify the nature of the ad-hoc site instructions, reason for the ad-hoc site instructions and the impacts of ad-hoc site instructions in the building construction projects. The second main purpose was to develop the questions for the questionnaire survey. Interviews were recorded, transcribed and analysed using the manual content analysis technique. Semi structured interviews were conducted as per the Expert interview phase I guidelines (Appendix 01).

4.2.1 Profile of Experts

Five experts from different professions related to the construction industry were identified by considering their expertise in the field as shown in Table 4.1.

Table 4.1: Profile of Experts

No	Experts (E)	Profession	Experience	Type of firm
1	E1	Chartered Architect	35 years	Consultant
2	E2	Chartered Civil Engineer	38 Years	Contractor
3	E3	Arbitrator	40 years	Independent consultant
4	E4	Chartered Quantity Surveyor	35 years	Consultant
5	E5	Chartered Civil Engineer	30 Years	Client

Experts were approached with the following major questions.

- What are the reasons behind the ad-hoc site instructions in the construction projects?
- What kind of mediums used to communicate the ad-hoc site instructions
- What are the barriers to effectively administrate the ad-hoc site instruction?
- What are the outcomes of ad-hoc site instructions in building construction projects?

4.2.2 Reasons for issuing ad-hoc site instructions- Expert interview Phase I

Table 4.2 shows the reasons for the ad-hoc site instructions in Experts point of view.

Table 4.2: Reasons for ad-hoc site instructions in Experts point of view

Reasons for Instruction	Experts				
	E1	E2	E3	E4	E5
To instruct the variation of work	✓	✓	✓	✓	✓
To correct faults in design/specifications	✓	✓	✓	✓	✓
To manage the financial allocation	-	- ✓	-	✓	-
Changes in the client's requirement	✓	✓	✓	✓	✓
Instruct the work item of Provisional sum	-	-	✓		✓

Changes in the client's requirement, variations and rectify faults in design and specification were the reasons identified all 5 experts as the main reasons. In support of that E1 stated that *"In most building projects in Sri Lanka, we issue orders to contractor to delay or hold up a work item that need to change in design or specification. As a consultant, we often do this to protect the client interest. Further, we have to resolve design discrepancies during the construction phase by means of site instructions"*.

In point of E2's and E4's view in government projects the site instructions are issued to manage the financial allocations too. In support of that E2 mentioned that *"In government projects, sometimes, consultants are instructed by the client to change the scope because of the imprest fund received is less than the allocation"*.

Further, it was found that the ad-hoc site instruction in building projects are issued to explain the contractors how to execute the work item under the provisional sum. E5 specified that *"Certain items are included in the B.O.Q with provisional sum"*

because of the unforeseen nature at the design stage. Then, Engineers issue the instruction about to such items during the construction stage”.

Further to this, few other reasons such as instruction to test new materials, instruction to address the defect issues were specified by E3 and E4 receptively. E3 expressed that *“Sometimes, engineers need to give site instruction to test any kind of new construction materials to test new materials to ensure the quality and compliance with the specifications”*. E4 stated that *“Engineers are giving site instructions during the construction phase to inform about the defect works, when they observe any works not up to the required standard”*.

The opinions of the experts regarding the reason for ad-hoc site instructions was almost comply with the findings of the literature review. According to them, to instruct the variation of work, to correct faults in design/specifications, changes in the client’s requirement were the main reasons.

4.2.3 Medium of Ad-hoc site instructions – Expert interview phase I

As per the opinions of all experts, verbal instructions and written instructions are the current practice in communicating the instruction. All of them strongly believe the verbal instructions which does not recorded leads to construction dispute. E3 mentioned that *‘Oral instruction is risky to all contract parties. If ad-hoc site instructions are given in written there is less chance to contract disputes’*. *If any additional work instructed by the engineer, Contractor should document instructions prior to start the work including the same essential details and submitted to the approval of Engineer”*.

E4 stated that *“In these days most consultant issue the site instruction verbally from the head office over the phone. Though it is easy and quick, there should be supportive e-mail as an evidence to avoid unnecessary disputes”*.

4.2.4 Barriers for the effective administration of ad-hoc site instructions - Expert interview Phase I

According to E3 oral instructions are the severe barriers to effective administration of ad-hoc site instruction. To support this point, he stated that *“all site instructions should be confirmed in written format to be effective. Site instructions have a habit of being verbal and are ineffective up until they confirmed in written”*

E2 mentioned that *“In most building construction projects of our country, necessary instructions are not issued to the Contractor within a specific time. If the instruction is not issued within the required time and the project will be delay and it shall lead to disputes and claims”*. Further he stated that *“Delayed response of the Engineer is a big barrier in effective administration of ad-hoc site instruction”*.

According to the common view of all five experts' oral instructions, delayed instructions, clearness and simplicity of instruction, less interest in documentation and nonstandard format the followings are the barriers for effective administration of ad-hoc site instructions.

4.2.5 Outcomes of ad-hoc site instructions- Expert interview phase I

All five experts stated that the project time delay and cost overrun are the major outcomes of ad-hoc site instructions and E1 and E4 specified that the poor-quality construction is also an outcome of building construction projects in Sri Lanka. In support of that E4 expressed that *“In Sri Lanka, in some projects, employers of contract directly issue the site instruction to the contractors. But those instructions cannot be counted as a valid instruction without the approval of Engineer”*. Furthermore, he stated that *“Site instruction by the client will affect the quality of the building”*.

E3 stated the ruined contractual relationship also was outcome of ad-hoc site instructions in some cases. E3 stated that *“if there are no of site instructions issued to*

effect many minor changes to the proposed contract, contractors often inflate the rates because of minor variations lead to reasonably high cost. Because in terms of materials and workmanship. Contractors do not go for low rate during the construction stage. So that, the construction cost highly exceeds the initial contract sum". Similarly, E2 mentioned that health and safety issues also one of the outcomes of ad-hoc site instruction in rare cases. He stated "*Sometimes, the Engineers instruct the minor changes or variations in some work items after the completion of that specific item. If such item is come under work at height, contractor have to repeat the erect scaffoldings and other safety arrangements. But in some cases, contractors are unable to provide proper safety mechanism for such minor works. It leads to health and safety issues*".

E5 mentioned that "*continuous changes through ad-hoc site instructions obstruct the contractor's work progress. Interruption through engineer's site instructions mostly delays the building construction projects in Sri Lanka and that lead to project cost overrun too*".

E3 believes that the if the ad-hoc site instruction goes wrong, it may damage the professional relationship. He mentioned that "*Continuing a better contractual relationship with the contract parties is essential to achieve the project goals of each contract parties. But, if contractor suffers due to the ineffective ad-hoc site instruction or if the employer disappointed by the response of contractor in relation to an ad-hoc site instruction, it will definitely affect the professional relationships.*"

On the whole, they pointed out the following as the outcomes of the ad-hoc site instructions

- Project time delay
- Project cost overrun
- Ruined contractual relationships
- Health and safety issues
- Low quality construction

The following literature discussions shows the impact of above out comes which were mentioned by the experts. The constructions contract execution and completion within the planned duration is among the most main needs for employers since anticipation of them to save some amount of finance in this respect (Ndihothubwayo and Huapt, 2009). With the intention of this most contract firms were seriously charged more where those firms fail to complete the construction within the intended completion date (Pink Form, 2010). Delay charge enforced is proposed to make improvements for any delay which can be carried on the employer by means of the failed milestone of work programme.

Building contracts experience several recognised stages of that is just a combination of specific keen to this study, specifically the planning stage and execution stage (Bennet, 2003). Superior consideration of financial management is mostly centered on the execution stage of the construction project since more resources are used in this stage when comparing to the planning (Ndihothubwayo and Huapt 2009). Employer's desire in keeping an awareness regarding the total expected cost in early stage according to the completed contracts they are engaging in and according to that familiarity will desire at that time to have the finalised construction costs associate to the initial estimate. Inopportunately, additional cost in construction work is a general matter for the reason that mostly contracts experience additional expenses than expected (Rahmaan et. al. 2013; Menon et. al. 2014).

Quality construction is a most essential aspect that improves worthiness in respect to the expended cost (Arditi and Gunaaydin, 1997). Professional relations are established among the contract parties and some of these relationships can survive until the end of the project. The experience and status of the different parties support while they are effectively carrying out the construction (Ndihothubwayo and Huapt 2009). But, conflicts shall rise amongst the parties in the sequence of carrying out the construction because of different reasons. Some of those complications may be most influential on the contractual relationship among the contract partners and their agents (Bower, 2000). Moreover, they discuss that the self-esteem of employees are negatively impacted where they need to accelerate construction for inspection

(particularly because of the irregular site inspections of the consulting supervisor), re-works or demolition of already constructed components.

4.2.6 Development of Questionnaire survey

Second main purpose of the expert interview phase I was to develop question for the questionnaire survey. According to the expert advice, the questionnaire survey had been developed with following three parts.

- Current practices in terms of administration, medium and wrong practices of the site instructions.
- Reasons for ad-hoc site instructions
- Impacts of the ad-hoc site instructions in terms of frequency and severity.

The reasons, current practices, barriers, outcomes revealed through the expert interview phase I were included in the questionnaire for the confirmation. Experts recommended to find the followings from the respondents through the questionnaire.

- Whether all ad-hoc site instructions are recorded or not.
- Are all ad-hoc site instructions followed to and executed fully.
- Whether there are practicing a follow-up mechanism to track ad-hoc site instructions or not
- Is there any officer with relevant skills assigned to manage ad-hoc site instruction?
- What is the frequency of occurrence and impact of each outcomes resulting from ad-hoc site instruction that the respondents experienced in their construction projects

4.3 ANALYSIS OF QUESTIONNAIRE SURVEY FINDINGS

4.3.1 Profile of Respondents

Contractors' point of view regarding the ad-hoc site instruction is very important to this research study. Therefore, the results of the questionnaire survey as shown in Figure 4.1 illustrate that the most of respondents involved have been from the contractor's firms. Figure 4.1 depicts that 56 percentage of respondents have been with contract organisations whereas 24 percentage and 20 percentage have been from consultancy organisations and client's firm respectively.

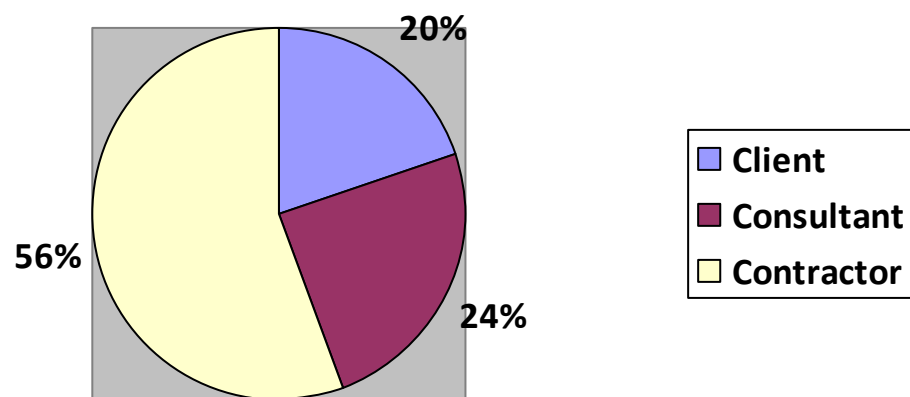


Figure 4.1: Category of firms of respondents

Engineers shall be anticipated to deliver ad-hoc site instructions to the contractor's authorised officer at head office or site office. Thus, it has been essential to form through the questionnaire the designations carried by the different respondents with the intention of ensuring that they were within the circle to response questions on ad-hoc site instructions delivered by the consulting engineer. Incidentally it has been illustrated by Figure 4.2. that every respondents were at best in posts where they can

rationally be anticipated to possess certain idea regarding ad-hoc site instruction and it shows the composition of different professional involved in the survey.

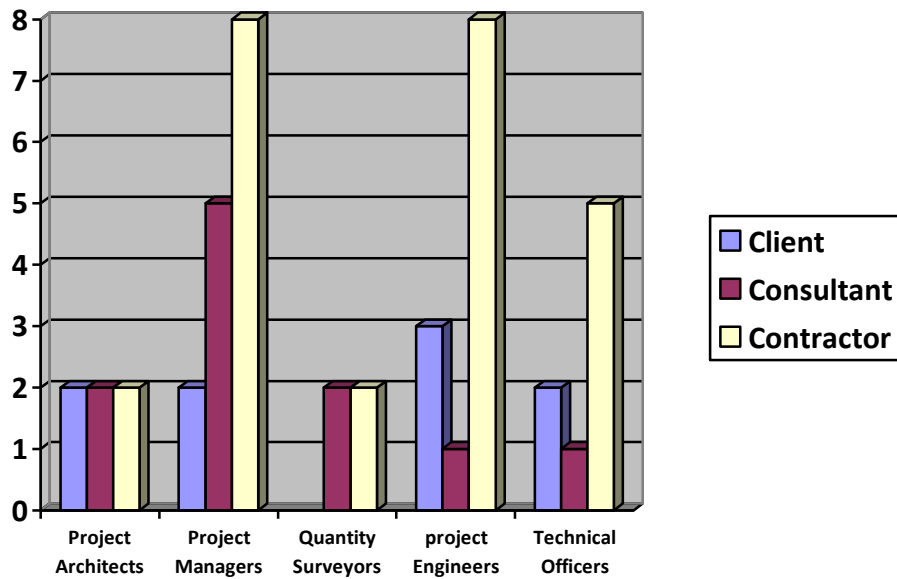


Figure 4.2: Respondents' position in the organisation

The questionnaire requested from construction practitioners their different designations in their organisations and practice in the field of construction. It has been interpret as essential in order to be able to gain factual and substantial responses to the questionnaire distributed. 40 percentage out of the 45 respondents were in the construction field for over a decade as shown in Table 4.3.

Table4. 3: Experience of Respondents in the construction industry

Experience	Classification	Frequency	Percentage
No of years practicing in the construction field	0-1 years	1	2.22%
	1-5 years	9	20%
	5-10 years	17	37.77%
	10-20 years	12	26.66%
	Above 20 years	6	13.33%
	Total	45	100%

To establish respondents' familiarity with Ad-hoc site instructions, they were requested to specify the level of their participation in handling the ad-hoc site instruction. Table 4.3 displays that all respondents were handling the Ad-hoc site instruction one way or the other.

4.3.2 Current practices of Administration of Ad-hoc site instructions

Experts suggested different approaches are practiced by the construction professionals in different aspects of handing of Ad-hoc site instructions. Accordingly, issuance, receipts and implementations were identified as the main three aspects as shown in Table 4.4. Before the responses were received it was ensured that all the respondents were involving themselves in the practice of ad-hoc site instruction in building construction projects in Sri Lanka.

Table 4.4: Level of respondents' involvement in the administration of Ad-hoc site instruction

Level of involvement in the administration of ad-hoc site instruction	Aspect involved in			Total
	Issuance	Receipts	Execution	
Contractor	-	25	18	43
Consultant	11	7	-	18
Client	9	-	-	9
Total	20	32	18	70
Percentage	28.5 %	45.7%	25.8%	100%

Out of 45 respondents, 9 were from client firms, 11 from consultant firms and 25 were from contractors' firms. All 9 clients involve in issuance of ad-hoc site instruction. 11 consultants involve in the issuance of ad-hoc site instruction. As far as the administration of ad-hoc site instructions are concerned issuance is administered only by the client and the consultant. Receipts and executions are done only by the

contractors. According to the 7 consultants response they involve in both issuance and receipts, because of they were involved in the contract where the representative of the employer to the contract was an Engineer, for instance university building projects, Bank building projects. Out of 25 contractor's firm respondents all 25 involves in receipt and 18 directly involves in the execution at site too. It shows that the receipt and executions of ad-hoc site instructions are the main jobs of contractors.

The current practices in handling the Ad-hoc site instructions are listed in the Table 4.5

Table 4.5 Handling of Ad-hoc site instructions

Practices	Responses	Frequency	Percentage	Total
Every ad-hoc site instructions by Engineers are recorded	TRUE	40	89%	100%
	FALSE	5	11%	
All instruction by Engineers are followed to and executed exactly	TRUE	23	51%	100%
	FALSE	11	24.5%	
	UNSURE	11	24.5%	
There is a tracking mechanism for tracking Ad-hoc site instructions	TRUE	12	26.66%	100%
	FALSE	28	62.22%	
	UNSURE	5	11.11%	
An officer with relevant skills is assigned to handle the Ad-hoc site instruction	TRUE	19	22.22%	100%
	FALSE	18	60%	
	UNSURE	8	17.77%	

1 respondent from consultant firms and 4 respondents from the contractors' firm refused that all ad-hoc site instructions are recorded. 7 consultants, 2 clients and 2 contractors refused that all ad-hoc site instructions are executed exactly. 16 contractors, 5 consultant and 2 clients accepted that all ad-hoc site instructions are executed exactly. 5 clients and 6 contractors are unsure about the exact execution. All these 6 contractor's firm respondents are technical officers and they just executed it at the site. They are directed by the engineer to the contract and they do not have much knowledge of what instruction was actually received.

4.3.3 Medium of Ad-hoc Site Instructions

Various media of transmitting Ad-hoc site instruction were used in exchangeable manner on building contracts as found out from the previous studies. Experts too had explained the necessity of the medium of ad-hoc site instructions and they strongly recommended to study the current practices in the medium of ad-hoc site instruction in the building projects in Sri Lanka. Thus, it is essentially deemed to reveal from respondents the frequency of occurrence of these different mediums in which the instructions are issued and their level of importance. The respondents has been requested to rate the degree of occurrence and degree of importance using 5-point Likert scale. The analysis is shown in Table 4.6

Table 4.6: Medium of administration of Ad-hoc site instruction

Medium of Administration of the Engineer's Site Instruction	Occurrences in %							Degree of importance in %						
	<i>Least frequent</i>	<i>Medium frequent</i>	<i>Frequent</i>	<i>Very frequent</i>	<i>Most frequent</i>	<i>RII</i>	<i>Rank</i>	<i>Not important</i>	<i>Least important</i>	<i>Important</i>	<i>Very important</i>	<i>Most important</i>	<i>RII</i>	<i>Rank</i>
	1	2	3	4	5			1	2	3	4	5		
Written	51.11	15.55	13.33	11.11	8.88	0.422	3	-	-	4.44	17.77	77.77	0.940	1
Oral	-	4.44	20.00	20.00	55.55	0.852	1	-	11.11	40	48.88	-	0.676	3
Oral and Written	-	4.44	22.22	24.44	48.88	0.836	2	-	4.44	11.11	17.77	66.66	0.893	2

In terms of how the practice of handling the ad-hoc site instructions presently, it has been revealed that delivered instructions are ineffectively managed. 48.88 percent of respondents has stated that engineers give both verbal and written instruction at the field. This may not be a poor practice however Chapell (2017) recommends as the best practices that engineers must every time put efforts to keep photocopies of directions they deliver for future references.

It was revealed majority of the respondents practices verbal instruction and the verbal instruction is the highest barrier to the effective administration of ad-hoc site instruction. It is necessary to engineers to deliver all instructions as written to the contractor or his authorised officer at sites (Chapell, 2017). When orders are delivered orally, they shall be apparently confirmed later in writing within a specified period of time as specified in the general condition of contract of that particular project.

It has been revealed that contractors desired circumstances when written instructions are received first with thorough verbal interpretation and illustrations by engineers. They discuss that casual ways such as direct communications between engineers and constructors are considered as the best way of communication within the construction field which will lead to successful project delivery.

4.3.4 Barriers in Administration of Ad-hoc Site Instructions

Literature shows that there are several wrong practices such as ambiguity in the instruction, delayed instruction and improper documentations come across while administrating the ad-hoc site instructions building construction (Alkarimi, 2013). In the expert interview, experts concurred that the wrong practices are the barriers for effective administration of Ad-hoc site instructions and they classified those barriers in five categories which were listed and used for the questionnaire survey. Respondents have been requested to rate the level of severity of each barrier by using 5 point Likert scale. The severity levels of those barriers were analysed by using the mean value and Relative Importance Index (RII) and ranked as shown in the Table 4.7.

Table 4.7 Barrier for Effective Administration of Ad-hoc Site instruction

Barriers	Level of severity in %					RII	Rank
	Not severe	Least severe	severe	Very severe	Most severe		
	1	2	3	4	5		
Lack of clarity or simplicity of instruction			11.11	28.88	60	0.898	2
Less interest in documentation			11.11	42.22	46.66	0.871	3
Oral instructions				35.55	64.44	0.928	1
Nonstandard format		4.44	40	24.44	31.11	0.764	4
Delayed instruction		15.55	44.44	24.44	15.55	0.68	5

Verbal instruction has been ranked (RII is 92.88 percent of respondents) as the most severe wrong practices which barrier for effective administration of ad-hoc site instructions.

It was discussed previously also that most instructions have been revealed to be recorded in log books which (not standardised template) provided by contractors and kept at the site.

4.3.5 Reasons for Ad-hoc Site instructions

The five main reasons of ad-hoc site instruction recommended by the experts in the interview were used for the questionnaire survey and examined using mean value and relative importance index to find out their degree of importance on building contracts as shown in Table 4.8

Table 4.8: Reasons for ad-hoc site instructions

Reasons for ad-hoc site Instructions	Degree of Importance (%)					RII%	Rank
	Never	Seldom	Sometimes	Often	Always		
	1	2	3	4	5		
To instruct the variation of work	–	–	13.33%	35.55%	51.11%	0.875	1
To correct faults in design/specifications	–	–	20%	68.88%	11.11%	0.782	2
To manage the financial allocation	13.33%	51.11%	20%	8.88%	4.44%	0.466	5
Changes in the client's requirement	-	22.22%	42.22%	28.88%	6.66%	0.64	3
Instruct the work item of Provisional sum To instruct the variation of work	–	35.55%	48.88%	13.33%	2.22%	0.564	4

Instruction to correct faults in design/specifications has been ranked by 68.88 percentage of respondents as often on construction site. This can be because of the reason that most constructions in Sri Lanka are performed in very restricted durations and design, drawings and bid documents are done under burden circumstances because of the urgent needs by this means allow ground to these faults.

4.3.6 Impacts on the outcomes of ad-hoc site instructions in building construction projects

Commonly talking, instructions delivered by the engineer are anticipated to direct to an expected outcome or impact on building construction based on concerns. These impacts are obviously anticipated to be effective at all times even if this is occasionally not the situation in practice. These impacts were categorised through the expert interviews under five classes such as project time delay, project cost overrun, ruined contractual relationships, health and safety issues and low quality construction as mentioned in Section 4.2.5 and the respondents have been asked to rate the

frequency of occurrence and severity of impact for each effect caused by instructions delivered from engineer by using a 5-point Likert scale for the purpose of revealing their impact factor. The frequency and severity for the outcomes are shown in Table 4.9 and Table 4.10 respectively. The capital letters H, M, L are used to represent the terms High, Medium and Low respectively. The ranges for L, M and H are classified based on their RII values where ranges of as 0-0.4, 0.4 – 0.7, and 0.7 - 1.0 were considered for Low(L), Medium(M) and High(H) respectively.

Table 4.9 : Frequency of occurrence of each outcome resulting from ad-hoc site instruction

Outcome	Frequency (%)					RII	High/ Medium/ Low
	Never	Seldom	Sometimes	Often	Always		
	1	2	3	4	5		
Project time delay	-	-	4.44%	40%	55.55%	0.902	H
Project cost overrun	-	-	2.22%	42.22%	55.55%	0.906	H
Ruined contractual relationship	-	22.22%	42.22%	31.11%	4.44%	0.636	M
Health and safety issue	22.22%	48.88%	28.88%			0.413	M
Low quality Construction	15.55%	35.55%	42.22%	6.66%	-	0.453	M

Table 4.10: Severity of each outcome resulting from ad-hoc site instruction

Outcome	No Impact	Slight impact	Medium impact	Major impact	Severe impact	Mean Value	RII	High/ Medium/Low
	1	2	3	4	5			
Project time delay			6.66%	17.77%	72.55%	4.69	0.938	H
Project cost overrun			6.66%	13.33%	80%	4.73	0.947	H
Ruined contractual relationship	37.77%	35.55%	17.77%	8.88%		1.97	0.396	L
Health and safety issue	44.44%	42.22%	13.33%			1.68	0.338	L
Low quality construction	35.55%	37.77%	15.55%	11.11%		2.02	0.404	M

Based on the probability impact matrix shown in Figure 4.3 the frequency and severity were mapped in order to determine the impact factor of each impact.

		Frequency		
		L	M	H
Severity	L	L	L	M
	M	M	L	H
	H	H	M	H

Figure 4.3: Probability impact matrix

Accordingly, Table 4.11 provides the determination of impact factor for the outcomes of ad-hoc site instructions.

Table 4.11: Impact factors of the Outcome

Adverse impact	Frequency	Severity	Trigger
Project Time delay	H	H	H
Project cost overrun	H	H	H
Ruined contractual relationship	M	L	L
Health and safety issue	M	L	L
Low quality construction	M	M	M

Through this analysis, it was found that the project time delay and cost overrun are the highly occurring outcome due to the ad-hoc site instruction and those outcomes have adverse impacts on the building construction projects in Sri Lanka.

In spite of the strict provisions and procedures established in the contract documents to rationalise communication among the different contract parties, the ad-hoc site instructions still caused in unwanted outcomes. Project time delay and project cost overrun and ruined contractual relationship directing to conflict between contract parties was the major negative impact of Ad-hoc site instructions on effective project delivery.

This can be thought to be the exact outcomes of occurrences in construction projects in our country, for the reason that there is 52 percent possibility that engineers will deliver instructions to change the tasks, that instructions shall not be followed to (24.5 percent) and monitored (37.78 percent), supremacy of oral instructions and non-standardised format.

4.4 ANALYSIS OF EXPERT INTERVIEW PHASE II

Purpose of the expert interview phase II was to validate the questionnaire findings and propose strategies to minimise the adverse impact due to the ad-hoc site

instruction in building construction projects in Sri Lanka. The questionnaire survey results were presented to the same experts who have taken part in the expert interview phase I. Interviews were transcribed and analysed using the content analysis technique. The strategies to minimise the adverse impact of ad-hoc site instructions in the building construction projects of Sri Lanka were developed under the following key themes.

- Knowledge improvement
- Effective Pre-contract management
- Competent contractor
- Engineer's duty of care

4.4.1 Strategies proposed to minimise the adverse impact

4.4.1.1 Knowledge Improvement for construction practitioners in Sri Lanka.

Experts advised that the adverse impact of ad-hoc site instruction can be minimised through improving the knowledge of construction practitioners. **E2** mentioned that “*CPD and seminar should be regularly conducted to construction professionals regarding the important of administering the ad-hoc site instructions effectively and about the adverse impacts of them on the project deliveries*”. Other experts also support this matter, and they recommend that the construction professional institutions in Sri Lanka such as IQSL, IESL, SLIA and CIDA should take responsibility in this matter to improve the knowledge of their members regarding the ad-hoc site instruction. In perspective of the **E3**, most of the smaller scale contractors in Sri Lanka have not knowledge about the Confirmation of verbal instruction. **E3** mentioned that “*Confirmation of verbal instruction should be practiced by the contractors when engineer failed to give the written instruction*”.

4.4.1.2 Effective pre-contract management by the contract administrators

Project proposal with feasibility studies, proper site investigation and well-planned designs are come under effective pre-contract management. Effective pre-contract management will have a greater influence in the ad-hoc site instructions in the building construction projects in Sri Lanka. In support of that **E4** mentioned that *“Greater attention should be paid by the Employer and consultants to the planning and design process and contract documents to minimise errors and omissions”*. According to most of the experts’ point of view discussions and corrections related to the design of particular building should be done through the pre-technical evaluation committee to minimise the errors and discrepancies.

4.4.1.3 Awarding the project to competent contractor

In expert views incompetency of the contractors also a major reason for the adverse impact of the ad-hoc site instructions in Sri Lanka. Most of the minor contracts are awarded to incompetent contractors, because of not considering the post qualification verification seriously. But then it leads to unnecessary disputes. **E1** specified that *“most technical evaluation committee are not considered about the post qualification verification for minor contracts (SBD/03) works in Sri Lanka and some others for SBD 01 works too. But this led to award the contract to a less competent contractor who may not have experience in handling the ad-hoc site instruction. Thus, Post qualification verification should be performed to every project during the bid evaluation properly according to the clauses of CIDA (2007)”*.

Qualification requirements through the post qualification verification during the tender evaluation must be considered strictly to award an experienced contractor to ascertain that only competent contractors are finally awarded the project to perform the construction. Adverse impact of the ad-hoc site instruction could be minimised by carrying out the project through a competent contractor.

4.4.1.4 Seriousness on engineer's duty of care

All five experts believe that though the ad-hoc site instruction is unavoidable, the engineer can minimise the adverse impact through his duty of care. E1 stated that *“pre-construction orientation must be conducted for contractors to make them clarify their ambiguities in design details. Engineers should have more awareness of specifying and explanation of designs and contract documents to minimise faults and oversights”*. Above statement show that because of the design of the building ultimately effects on whole contract period and budget, engineers must provide better consideration to the design details and explanation of designs and contract documents to minimise the design faults and oversights.

E3 stated that *“engineers should perform regular site visits and clients should confirm that engineers practicing regular site inspection with the purpose of notice faults, nonconformities, bad quality work performance, as earliest phases to avoid the time overrun and cost overrun, quality degradations can be avoided”*. E4 expressed that *“Engineers should limit the ad-hoc site instructions to a most standard template. For example, CIDA's (Construction Industry Development Authority)”*. In his view the site instruction template during the whole construction would eliminate misperceptions in the contractor's point of view. Thus, engineers must issue the ad-hoc site instructions in a more standardised format e.g. CIDA's (Construction Industry Development Authority).

In E2's point of view, engineer's must issue the written instruction, but they can precede their instructions by verbal explanations before putting them into writing to improve understanding. He stated to support his point that *“Engineers must issue the instruction firstly as explanations orally, illustration of ideas to builders prior to the written instruction for the purpose of enhancing the interpretation and comprehension of instruction. However, written instruction should be given and maintained to avoid unnecessary disputes.”*

E5 expressed that *“A system to follow-up instructions delivered by the Engineer must be formed to monitor the progress of delivered instructions”*. There are possibilities

to missed the item of work which instructed through the ad-hoc site instruction while tracking and monitoring the work progress which was under initial scope. Thus, a strict follow up system should be considered for such works.

CHAPTER 05

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

This chapter deliberates the conclusions of the study in respect to each objective and suggests proper recommendations, final notes and recommendation for future researches. The conclusions were written according to the key findings which are then related to each objectives of the research study. The recommendation section clearly talks about the realistic suggestions from the study and provide suggestions for future research studies as well.

5.2 CONCLUSIONS

Conclusions were written based on the objective which were planned to achieve through this research study.

5.2.1 Objective 1: Nature of the ad-hoc site instructions during the construction phase of building project

This analysis of the findings ascertains the occurrence of ad-hoc site instruction on building construction projects in Sri Lanka. There are evidences to the impact that all projects (100 percent) of which respondents are engaged had the input of the engineers throughout construction directly or indirectly. Advance analysis still found out that most of these instructions caused in variations, qualities and quantities of work.

It is obvious that ad-hoc instruction from engineer is practically inevitable in building contracts and thus, there exists the requirement for enough preparation by both the engineers and contractors for its effective management. On the whole, the occurrence of ad-hoc site instruction has been revealed as predominant on building construction projects.

5.2.2 Objective 2: To identify the reasons for the ad-hoc site instructions issued during construction phase

To vary work, to resolve discrepancies, to deal with monetary allowance, to protect client's interest, to enforce contractual provisions were found as five main reasons of ad-hoc site instruction through this study. Analysis of the findings revealed that to vary the work, to resolve discrepancies and to protect client interests are the most potential reasons for the occurrence of ad-hoc site instruction in building projects in Sri Lanka.

5.2.3 Objective 3: To identify the impacts of the ad-hoc site instruction on building projects

Project time delay and project cost overrun were found as high severity which have high frequency too. Low quality construction is the medium impact which occurs in medium frequency. Ruined contractual relationship and health and safety issues are low impact outcomes and they have medium frequencies.

5.2.4 Objective 4: To propose strategies to minimise the adverse impact of ad-hoc site instructions on building projects in Sri Lanka

Based on Expert interviews Phase II the strategies developed as discussed in Section 4.4.1 are summarised below under key themes.

➤ **Knowledge improvement**

Improving the knowledge related to the administration of ad-hoc site instruction to the construction practitioners in Sri Lankan construction industry through CPD programs and seminars.

➤ **Effective pre-contract management**

Greater attention should be given by the to the planning and design process by the technical evaluation committee.

➤ **Awarding the project to competent contractor**

During the tender evaluation, post qualification verification should be done properly to make sure the project is awarded to a competence contractor.

➤ **Seriousness on engineer's duty of care**

Engineers should conduct pre-construction orientation programme, perform regular site visits, issue site instructions in a consistent format, issue written instructions and practice a system to follow up the progress of the output of ad-hoc site instructions.

5.3 FINAL NOTE

Ad-hoc site instruction is mostly prevailing on all building construction project in Sri Lanka and as such must be taken in to account as element of the construction process and so expected that sufficient arrangements must be done by each contract parties in its expectation so that it shall be successfully managed (issued, received and executed). When ad-hoc site instruction is delivered in written in understandable manner, in a standard pattern and at the correct time, adverse impacts such as project time delay, cost overruns, low quality construction and ruined contractual relationship will be minimised. Moreover, when building construction projects are well planned by engineers and performed by most experienced contractors, the occurrence of Ad-hoc site instruction on such projects will be greatly reduced.

5.4 FUTURE RESEARCH

This research study was limited to building construction projects in Sri Lanka. However, the most of the respondents for questionnaire survey were from Northern Province Western province and Eastern province. It is recommended to do a research in future to get the data from respondents of all provinces. If construction professional from all nine provinces will be approached for questionnaire survey, the number of respondents will be increased and the validity of the findings could be improved. Further, this research looked at the building construction projects. A similar research can be conducted in the context of civil engineering construction.

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Appendix 01

Expert Interview Phase I - guide Lines:

A STUDY ON THE IMPACTS OF THE AD-HOC SITE INSTRUCTIONS ON BUILDING CONSTRUCTION PROJECTS IN SRI LANKA

(30 min. expert interview)

Introduction

Hi Sir/Madam,

Thank you for accepting this interview on such short notice that is highly appreciated. I am a post graduate student in the Department of Building Economics, Faculty of Architecture, and University of Moratuwa. I am conducting a research study on minimising the adverse impacts of the ad-hoc site instructions in the construction projects in Sri Lanka. I am trying to get a better understanding of on the adverse impact of ad-hoc site instruction in building construction projects in Sri Lanka.

Before we get started, could you provide me with an introduction to your own background so I can tailor my questions accordingly?

Key questions to cover

1. Could you please walk me through the ad-hoc site instruction practices in Sri Lankan construction industry?
2. What are the reasons behind the ad-hoc site instructions in the construction projects?
3. What kind of mediums used to communicate the ad-hoc site instructions?
4. What are the barriers to effectively administrate the ad-hoc site instruction?
5. What are the outcomes of ad-hoc site instructions in building construction projects?

Development of questionnaire

Can you please comment / improve the questionnaire draft to conduct my primary data collection regarding minimising the adverse impact of the ad-hoc site instructions?

Conclusion

Now before we hang up, is there anything important that you would like to add / suggest to my research?

Thank you for your time.

Appendix 02

QUESTIONNAIRE SURVEY

This research study titled “**A STUDY ON THE IMPACTS OF THE AD-HOC SITE INSTRUCTIONS ON BUILDING CONSTRUCTION PROJECTS IN SRI LANKA** ” is being undertaken by a final year MSc in Construction Law and Dispute Resolution student from the Department of Building Economics at University of Moratuwa. Please kindly answer **all** the questions below and thank you in advance for your contribution to this research study.

SECTION A: RESPONDENT’S PROFILE

1. What type of organization do you belong?

- a) Contracting firm
- b) Consulting firm
- c) Client
- d) Others (Please specify).....

2. Which of the following best describes your position?

Organization description	Professional
Construction professional employed by Contractor Project Director/ Project Manager/ Architect/ Engineer / Quantity Surveyor	
Construction professional employed by Consultant Project Director/ Project Manager/ Architect/ Engineer / Quantity Surveyor	
Construction professional employed by Client Project Director/ Project Manager/ Architect/ Engineer / Quantity Surveyor	
Other, Please specify	

3. How long have you worked in the construction industry?

- a) 0-1 year
- b) 1-5 years
- c) 5-10 years
- d) above 10 years

4. How long have you worked for your present organization?
- a) 0-1 year
 - b) 1-5 years
 - c) 5-10 years
 - d) above 10 years

5. What is your current position in your organization?
- a) Project Director
 - b) Project Manager
 - c) Architect
 - d) Engineer
 - e) Quantity Surveyor
 - f) Other (specify)
-

6. How long have you been in your present position?
- a) 0-1 year
 - b) 1-5 years
 - c) 5-10 years
 - d) above 10 years

7. Have you ever been involved in the administration of the **AD-HOC SITE**

INSTRUCTIONS?

- Yes
- No

8. If yes, what was your specific involvement?
- a) Issuance
 - b) Receipt
 - c) Implementation
 - d) Other (specify).....

SECTION B: ISSUES ADDRESSED AND HANDLING OF THE AD-HOC SITE INSTRUCTIONS

9. From your personal experience, how frequent are the following types of Ad- Hoc site instructions encountered on construction projects?

Instruction	Never	Seldom	Sometimes	Often	Always
	1	2	3	4	5
To instruct the variation of work					
To correct faults in design/specifications (<i>e.g. correct errors, omissions</i>)					
To manage the financial Allocation.					
Changes in the client's requirement					
Instruct the work item of Provisional sum e.g. (<i>instruction indicating how to spend money budgeted under prime costs</i>)					
Other, please specify					

10. Indicate which of the following is true of your organization.

Activity	True	False	Unsure
We record all instructions issued by the Engineer			
All instructions issued by the Engineer are adhered to and implemented to the fullest			
There is a tracking mechanism to monitor the progress of all instructions issued by the Engineer			
A specific person with the relevant skills is specifically assigned handle and manage all instructions issued by the Engineer before implementation e.g. cost implication			

If you answered “**False**” or “**Unsure**” to any of the above, please explain your response below.

We record all instructions issued by the Engineer:

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All instructions issued by the Engineer are adhered to and implemented to the fullest:

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There is a tracking mechanism to monitor the progress of all instructions issued by the Engineer:

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.....

A specific person with the relevant skills is specifically assigned handle and manage all instructions issued by the Engineer before implementation e.g. cost implication:

.....
.....

.....

SECTION C: Impact of Ad-hoc site instructions on Building construction projects

SECTION C: MEDIUM OF ADMINISTRATION OF AD – HOC SITE INSTRUCTIONS

11. From your experience, please indicate by ticking the appropriate cell to **rank** in terms of the frequency and importance of the following media of administration of the Ad - Hoc site instructions.

Medium of Administration of the Engineer's Site Instructions	Frequency					Degree of importance				
	<i>Least frequent</i>	<i>Medium frequent</i>	<i>Frequent</i>	<i>Very frequent</i>	<i>Most frequent</i>	<i>Not important</i>	<i>Least important</i>	<i>Important</i>	<i>Very important</i>	<i>Most important</i>
	1	2	3	4	5	1	2	3	4	5
Written										
Oral										
Oral and Written										
Other, please specifies										

12. Below are potential barriers for effective administration of Ad - Hoc site instructions in Sri Lanka construction projects. From your experience, please indicate by ticking the appropriate cell to show how severe each barrier is in preventing effective administration of Ad - Hoc site instructions on Sri Lanka construction projects.

Barrier for effective Administration of Ad-hoc site instructions	Level of severity				
	Not severe	Least severe	severe	Very severe	Most severe
	1	2	3	4	5
Lack of clarity or simplicity of instruction					
Less interest in documentation					
Oral instructions					
Nonstandard format					
Delayed instruction					
Other, please specifies					

13. From your experience with ad-hoc site instructions, please indicate how Ad - Hoc site instructions have influenced the frequency of the following outcomes.

Outcome	Never	Seldom	Sometimes	Often	Always
	1	2	3	4	5
Project time delay					
Project Cost overrun					
Ruined Contractual relationship					
Health and safety issue					
Low quality construction					
Other, please specifies					

14. From your experience, what was the impact of Ad - Hoc site instructions on the following outcomes of construction projects?

Outcome	No Impact	Slight Impact	Medium Impact	Major Impact	Severe Impact
	1	2	3	4	5
Project time delay					
Project Cost overrun					
Ruined Contractual relationship					
Health and safety issue					
Low quality construction					
Other, please specifies					

15. Please add any other comments

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16. If you wish to be contacted please provide the following details

Name.....

Place of working

.....

Telephone Number.....

Appendix 03

Expert Interview Phase II - guide Lines

A STUDY ON THE IMPACTS OF THE AD-HOC SITE INSTRUCTIONS ON BUILDING CONSTRUCTION PROJECTS IN SRI LANKA

(30 min. expert interview)

Introduction

Hi Sir/ Madam

I am happy to meet you again in this interview phase II and I extremely thank you for your support to me in the Expert interview phase I and thank you for accepting for this Expert interview phase II. which is highly appreciated. Purpose of the expert interview phase II is to validate the questionnaire survey results and to develop strategies to minimise the adverse impact due to the ad-hoc site instruction in building construction projects in Sri Lanka.

I am trying to get a better understanding of the best ways to minimise the adverse impact of ad-hoc site instructions and to develop the strategies to minimise the adverse impacts of ad-hoc site instructions in the building construction projects of Sri Lanka.

Questions

1. Could you please express your opinions in relation to the responses of questionnaire survey?
2. Which shall be the best approach for administrating the ad-hoc site instruction?
3. How the adverse impacts of the ad-hoc site instruction can be minimised and please let me know your recommendations in relation to this?

Conclusion:

Now before we hang up, is there anything you would like to add / suggest to improve the research?

Thank you for your time