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Wishes for a refreshingly prosperous

2021

where safety and success will reign in the lives of all our valued members and well-wishers!

From **IQSSL**

Message from the IQSSL SECRETARY

Ch.QS. Senerath Wetthasinghe

LL.M., F.I.Q.S.SL, MAIQS, FQSi, FCIArb

Hony. Secretary

Institute of Quantity Surveyors Sri Lanka

I am very pleased to send this message to 'Focus' publishing at the dawn of the New Year 2021.

Year 2020 was a very eventful year, especially due to the outbreak of COVID-19 pandemic, which dealt a severe blow to the local and global economies as well as to the construction industry. As we are stepping into the New Year 2021, we need to develop a systematic process of defining goals to overcome the economic maladies and steps that need to be taken to achieve such goals for the betterment of the construction industry and our profession.

The Institute of Quantity Surveyors (IQSSL), being the regulating body of the Quantity Surveying profession in Sri Lanka, had already taken steps towards achieving such goals by participating in discussions with the relevant government authorities and informing them of our observations and suggestions in numerous occasions.

Further, IQSSL had organised webinars with practicing professional Quantity Surveyors to discuss above matters and conducted online CPD programmes to impart knowledge in Quantity Surveying and related subjects to the Quantity Surveying fraternity.

We fervently hope that in this New Year our current members, many of whom have supported us in numerous ways, rally round IQSSL to achieve the said goals and take IQSSL to greater heights.

I wish the members of IQSSL and their families a very happy, healthy and a prosperous New Year 2021.

Practicability of SLS 573 Measurement Rules for the Current Practices in the Construction Industry

Lalith Ratnayake, Subhashini Dasanayaka and Thisara Jayamanne

ABSTRACT

Standard Method of Measurement (SMM) has become one of the important standard documents in the construction industry providing several benefits in cost management functions. SMM facilitates consistency, accuracy and uniformity in taking off measurements. While most of the other countries updating their SMMs considering current practices and modern technologies, Sri Lanka lags behind and still using first revision of Sri Lankan SMM in 1999 that is SLS 573: 1999. As a result, practitioners encounter difficulties in application of SMM rules mainly due to the gaps exist with current technologies, associated pricing methods and new trends of the industry, resulting deviations required in practice.

Hence, this paper aims to expose such deviations identified from a recent building and infrastructure project in Sri Lanka through a case study and propose possible solutions to overcome those deviations. Initially this paper shares overview of current quantity surveying practice in Sri Lankan construction industry in relation to measurement, Bill of Quantities (BOQ) preparation and evaluation. Analysis of findings are then presented as item wise identification of deviation in practice when compared to the measurement rules of SLS 573 while proposing possible solutions to overcome those deviations based on industry experience of the authors.

Keywords: Construction Industry, Current Practice, Deviations, Solutions, Sri Lanka, Standard Methods of Measurement

INTRODUCTION

Standard Method of Measurement (SMM) for building and civil engineering works have evolved for a long period of time with the emergent needs and technologies of the construction industry. Prior to the development of SMM there had been frequent disputes as to how the items shall be measured for payments as per the literature. As stated by Seeley and Winfield (1999):

One of the major problems was to reconcile the amount of material listed on invoices with the quantity measured on completion of the work. Some of the craftsmen's surveyors made extravagant claims for waste of material in executing the work on the site and the architects also engaged surveyors to contest these claims. (p. 2)

Construction works have always been considered as complex undertaking where there are numerous inputs in terms of; materials, human resources, plant, equipment, consumables, other expenses and management which are inter-dependent inputs that influence each other. Measurement of works is equally complex and standard for measurement is therefore imperative.

SMM is one of the most important standards in the construction industry, that provides uniform principles in measurement allowing both employer and contractor to have same perspective in measuring the work (Hansen and Salim, 2015).

The SMM will have influence on the award of the contract and on the post contract payment administration. Therefore, the comprehensive and systematic breakdown of the Contract price is a critical requirement. To fulfil this requirement, the Bill of Quantities (BOQ) is used and it forms part of the tender / bid document as well as the contract. It also provides a valuable aid to the pricing of variations and for payment management.

Several countries have already published their own versions of Standard Methods of Measurement, while SLS 573 published by Sri Lankan Standards (SLS) become Sri Lankan Standard Method of Measurement which is not revised since 1999. Sri Lankan quantity surveying practitioners are facing several issues with the use of SLS 573 of 1999 for taking off measurements due to its deviations with the practice and when complying with other standard documents. Thus, this paper aims to expose such issues that the practitioners experienced when using SLS 573 of 1999 as standard method of measurement. This paper will share experience gained by the authors from measurement activities of other projects in achieving aim of the paper. A case study was done with respect to a recent building and infrastructure project in Sri Lanka to gather data.

QUANTITY SURVEYING PRACTICE IN SRI LANKAN CONSTRUCTION INDUSTRY: AN OVERVIEW

The complexity of the construction works inherently give exposure to risks in pricing and be viable in the business of the construction industry. With regard to estimators' purview of pricing of tenders / bids they take such risks in to consideration in pricing amidst the competition. If estimators are doubtful about the measurement procedure, coverage rules, method of construction, design details and inclusion of ancillary items in a measured BOQ item and the like, he may add margin for such uncertainty in pricing.

On the other hand, Quantity Surveyor (QS) who write BOQ descriptions, tend to make the items all-inclusive to minimize variations by passing the risk to the contractor. Regrettably, designers in the local context usually produce limited details at the time of tender / bid or for tendering / bidding process. The limited time availability and inadequate fees could be reasons for that. Hence, it is very difficult to find fully detailed design drawings even otherwise during the tendering / bidding stage in Sri Lanka. Nowadays this can be seen as an industry culture and required to be changed if Sri Lanka to move into digitalization. Since, there is no published common standard for level of details required in tender / bid designs and drawings in Sri Lanka, there is no logic of including "notes for preparing a Bills of Quantities" only in the Section 8 of ICTAD/SBD/02. Interestingly, in the Section 10 – Drawings, there is no any "notes for preparing designs and drawings."

Consequently, QSs compel to keep composite items when preparing BOQs, if designs are incomplete, without measuring them into separate items as per SMMs or as required by Section 8 of ICTAD/SBD/02.

Unlike Sri Lanka, the tender / bid stage designs and drawings of overseas projects such as Middle East, other Asia pacific and European countries where Sri Lankan QSs provide their services on\BOQ preparation, are much more detailed to a certain standard. It should also be noted that specially Mechanical, Electrical and Plumbing (MEP) drawings of those overseas projects are well detailed and drawn to layers enabling taking of quantities very easily with software packages, whereas in Sri Lanka design drawings are mostly conceptual at the time of bidding / tendering.

Accordingly, there is a mismatch between SMM requirements and industry culture of Sri Lankan construction industry where QSs in cost advising role and tender / bid pricing are in the receiving end of this dilemma. With the inclusion of SMM to the proposed amendments to the Construction Industry Development Act, the use of SMM will become law. However, still the proposed amendments to Construction Industry Development Act is silent about the level of design details required to prepare BOQs as per SMMs. Moreover, the amendments required to be given attention for which type of contracts, it has to be used. As per the current proposals to the Construction Industry Development Act, violation will become a legal / criminal offence leading to jail term as a punishment. This will redouble the Quantity Surveyors' challenge with legal consequences.

Further, Sri Lankan construction industry professionals and authorities not yet managed to provide proper publication of pricing guides and cost information required for the industry which they are responsible for. However, some other countries in the region, UK, Australia and international Quantity Surveying professional institutions have published such information for pricing tenders or bids. In Sri Lanka traditional term called "engineering estimate" was used to advice project cost in the mid and later parts of 19th century in public sector works. Unfortunately, the same practice appears continuing without any updating. There is a doubt that whether this crucial and important cost advice for public sector budgeting and costing is done by Qualified Persons in the Quantity Surveying field, as Quantity Surveying is not yet a public service. However, it is noted from a recent research study that there are more than 1400 personnel get qualified as QSs in different levels annually from both government and non-government education institutions in Sri Lanka (Ramachandra, 2020).

EVOLUTION OF STANDARD METHODS OF MEASUREMENT

In the beginning of 20th century, the estimators were frequently left with doubt as to the true meaning of the items in the BOQ. The Quantity Surveyors' Association and Quantity Surveyors' Institution of United Kingdom (UK) were also recognized the requirement of accuracy of work and uniformity of measuring works (The Royal Institution of

Chartered Surveyors [RICS] & The Building Employers Confederation [BEC], 1988).

As a result, the Quantity Surveyors' Association appointed a committee in 1909 and they prepared and published pamphlets setting out method of measurement recommended by the Association for disputed trades (RICS & BEC, 1988). Then the Standard Rules of Measurement was published in UK in 1918 which was evolved subsequently as Standard Method of Measurement First Edition in 1922. The sixth revision of SMM published in 1979 was the first SMM used in Quantity Surveying Education in Sri Lanka.

A separate measurement standard for Civil Engineering (CESMM) was also published in UK initially the first edition in 1976 and forth edition in 2012. In Sri Lanka also a civil engineering standard method of measurement was published in 2017 by Construction Industry Development Authority (CIDA) as CESMM-SL.

Sri Lankan Standards (SLS) published the first building measurement standard for Sri Lanka in 1982 and first revision was published in 1999, under SLS 573 which is still using as the SMM for measuring quantities of many Sri Lankan projects. Now the requirement of a further revision is being discussed by a committee appointed by the Construction Industry Development Authority (CIDA).

While Sri Lanka being a traditional systems follower, the development of SMM has continued in the rest of the word. The New Rules of Measurement (NRM) was published by Royal Institution of Chartered Surveyors in 2012 which consists three volumes;

- **NRM 01**, provides guidance on the quantification of building works for the purpose of preparing cost estimates and cost plans for capital building works.
- **NRM 02**, can be used for taking detailed measurement for building works and preparation of bills of quantities (replacing the Standard Method of Measurement, seventh edition SMM7).
- **NRM 03**, gives guidance on the quantification and description of maintenance works for the purpose of preparing initial order of cost estimates.

Further, the International Construction Measurement Standards (ICMS) have now been developed where Institute of Quantity Surveyors, Sri Lanka (IQSSL) also took part as a coalition member. In its second edition of September 2019, it is stated;

ICMS offer a high-level framework against which construction costs and other life cycle costs can be classified, defined, measured, recorded, analysed, presented and compared. The hierarchical framework has four levels; Level 1: Project or Sub-Project, Level 2: Cost Category, Level 3: Cost Group and Level 4: Cost Sub-Group. (p.6)

ICMS applications include, global investment decisions, international, national, regional or state cost comparisons, feasibility studies and development appraisals, project work including cost planning and control, cost analysis, cost modelling and the procurement and analysis of tenders, dispute resolution work, reinstatement costs for insurance, and valuation of assets and liabilities (International Construction Measurement Standards [ICMS], 2019).

MEASUREMENT PRACTICE IN THE SRI LANKAN CONSTRUCTION INDUSTRY

The comprehensive and systematic breakdown of the contract price will depend on many factors, such as method of measurement for the items, availability of well detailed drawings and specification, intended method of construction, phasing, specialist trades, provisional sums, prime costs and the like. It is an enormous task to use measurement standard when preparing BOQs in Sri Lankan context as mentioned above due to need of information. In local context, SLS573 is the standard publication which could be used by QSs when preparing the BOQ.

Generally, SMM minimizes the disputes among parties, in interpretation of items of the work as it provides defined terms for the terminologies, checklist of work breakdown with respective unit of measurement, guidelines to write descriptions, method of calculation of quantities, coverage rules under each and every item. However, the absence of estimating guideline along with the standard method of measurement and inadequate training for the estimators are some of the deficiencies for the improvements of this process within the construction industry, Sri Lanka. Hence, in the local context, the cost of construction is proportional to the number of BOQ items, more the items higher the cost. In many instances single rate is inserted with a large bracket for group of items by the estimators. For examples reinforcements in different diameters and formwork to various elements.

Though the SMM does not recognize measuring and including quantities for each floor level, traditionally it has been the practice, as it is quite useful for valuations, procurement, subcontracting and planning. The method of measurement of works for labour payments also has some deviations. They are paid on different units of measurement mainly on operational related methods. As examples; foundation footings in numbers, concrete columns in meters, excavation including working space, block works in number of blocks, rubble in delivered loose volume and handling in dayworks. This practice may also be investigated to understand how industry operates in measurement of works in different sectors.

The measurements are taken in preparation of BOQs and valuations of works from the designs. Works are supposed to be carried out as per the designs. Any subsequent changes are ought to be issued as design revisions. If there is an instruction changing the designed details, that instruction become a design revision. Site measurements for valuations are basically to obtain completion level of items of works. When the design is not very clear, the quantities can be verified at site for measurements.

However, measurements for quantities are not taken merely based on the works that are carried out at site, but works are carried out as per the designs. For instance, if a concrete column is completed to the size of 240mm X 240mm at site instead of 225mm X 225mm in the design what will be measured is what is in the design, unless it is rejected to redo by the Engineer.

Sub Clause 12.1 of the CIDA/SBD/02 Second Edition January 2007 under Measurement and Evaluation states "except as otherwise stated in the Contract, whenever any Permanent Works are to be measured from records, these shall be prepared by the Engineer"(p.73). Hence. site measurements are to agree jointly for the quantities of works completed at site. It is also important to note that measurements are not taken off from the shop drawings prepared by the contractors even if those are approved by the consultants or the Engineer to the Contract. The salient underlying principle of measurement is that quantities are measured based on what works specified to be carried out, but not on how works are carried out. What works specified to be carried out are in the design documents and how works are carried out are in approved shop drawings, method statements and other related submissions of the contractor. The way of carrying out works by different contractors are based on different methods. Hence, quantities are measured net based on what works to be carried out on a uniform basis, but not on how different contractors execute and complete the works. This principle is there to ensure that the BOQ, bid evaluations and payments are made based on quantities that are measured on a uniform basis, and to avoid taking control of increasing or decreasing of quantities by others based on how the works are carried out. If that is allowed, the desiring party can influence to carry out the high rate items based on a method which increase the quantities, whereas low rate item quantities could be made minimum.

Another principle is that measurements shall be made of the net actual quantities (Refer SMM and Sub Clause 12.2 of CIDA/SBD/02). It cannot be measured gross. Simple examples are; working space is not measured for quantities and only designed laps are measured but not the construction method related laps. This also signifies what is measured is what is in the design.

Why design and build contracts shall never be re-measurement type but lump sum? Reason is that the design can be changed to increase or decrease the quantities of items to increase the price and there is a conflict of interest. However, it can be seen that there are such misconducts happening in Sri Lanka seldomly. For instance, authors have come across a design and build contract where the piling works was on a re-measurement type. In that project, the rock socketing item was a small quantity with a high rate. But, the rock socketing depth was increased substantially during construction and thereby increased the price, exceeding the allocated budget of the developer.

Even in re-measurement type contracts the design revisions can be done to penalize the contractor or to accrue benefit to the contractor with design changes. Such misappropriations can be minimized if designs are done to a certain level at the time of bid / tender. Also, a technical audit shall be done by the Quantity Surveyors during the interim payment certification process itself on the increased quantities than the BOQ to minimize such misconducts.

Therefore, it is useful to appoint Quantity Surveyors independently to the projects rather being appointed as sub-consultants of the design consultants, so that cost reporting will be independent and proper.

With the digitalization trends and modularization of the industry with more off-site production and construction, the measurement and quantities take off practice will change substantially in future. Estimator would price the composite modules than items. The quantities of materials in a module would be analysed through software packages. Then the inputs of transport costs, mechanical plants for lifting and placing would be high. Therefore, the trend would be to have composite items categorized into standard method of cost grouping, as done by ICMS.

Even at present, though we measure formwork in m^2, in High-rise buildings where the formwork systems are used, the rates are not determined based on area unit. There, the contractor sends the structural details to the vendor who provides formwork system and they design the system accordingly and price. The contractor then transforms that price into unit rate considering buyback arrangements and repetitive use. The aluminium systems used in doors and windows are also similar kind of examples. Moreover, there are many other aspects in dealing with high rise buildings' concrete grade separators, finishing inside of ducts, machine bases, vertical transport, building services mains, preliminary items and the like which require practical approach in measurements for taking off quantities and BOQ preparation.

ANALYSIS OF CASE STUDY FINDINGS

The standard methods of measurement need updating in time to time due to the changes in use of materials for the construction, the changes in construction methodologies and mechanization, use of innovative technologies for construction and the like. In considering all the above aspects, the case study was conducted using a recent building and infrastructure project in Sri Lanka and analysed gathered information for achieving aim of the paper.

Table 1 shows the findings of the case study in relation to deviations in practice with SLS 573 measurement rules and suggestions for possible solutions for conflicts with the practice. The deviations in practice when compared to SLS 573 were identified based on the BOQ items of the selected project. Table 1 gives work sections of SLS 573, measurement rules of which did not follow in the items of selected project due to deviation in practice. Possible solutions to overcome those deviations are also suggested as depicted in Table 1. Moreover, some items were found in the project for which there are no specific items and measurement rules in SLS 573. Those items separately highlight in *italic* under "Work item" column (second column) of Table 1.

Table 1: Deviations in Practice compared to SLS 573 Measurement Rules and Suggestions to mitigate those deviations

Work Section as per SLS 573	Section Name as per SLS 573 / Work Item	Existence of deviation in Practice	Absence of Specific Item in SLS 573	SLS 573 Measurement rules/ deviation in Practice/ Suggestions to mitigate deviations
A	General Rules			Not Applicable
B	Preliminaries			Not Analysed
C	C1 – Demolitions C2 – Alterations C3 – Repairs and Maintenance			Not Analysed
D.2.2.1 & D.2.2.2	Excavating to reduce levels	√		As per the SLS573, the excavating to reduce levels to be categorized according to the average excavation depth. If the average depth is not exceeding 300mm to be measured in "m^2", and exceeding 300mm to be in "m^3". However, in practice the supply chain works in "m^3" in Sri Lanka, including labour subcontractors.
D.2.3 to 5	Excavation depths	√		As per the SLS573, excavation to be categorized in 1.0 m stages. However, in practice the excavating depth is considered from commencing level to bottom of the excavation. When pricing this kind of item, it goes as operational estimating rather than unit rate estimate as the process in more mechanized operation than manual. Hence advisable to keep without depth categories. if it is to be indicated, it should be optional.
	Excavation for Swimming pool, Ponds and the like		√	This item has not been clearly specified in the SLS573.
D.2.3				Like in NRM2, this category may be clearly described as "Basements, Pools, Ponds and the like"

Work Section of SLS 573	Section Name as per SLS 573 / Work Item	Existence of deviation in Practice	Absence of Specific Item in SLS 573	SLS 573 Measurement rules/ deviation in Practice/ Suggestions to mitigate deviations
-	*Excavation in driven cylinders*		√	This item has not been clearly specified in the SLS573. New category may be advisable as it is common in Sri Lanka and the method and the cost is different from other excavations.
-	*Excavation for pile caps*		√	This item has not been clearly specified in the SLS573. The method and involvement are different to other excavations. Depending on pile layout excavation is for a cluster of pile caps or individually. Pile caps excavation is method related and measurer will not know how excavation will take place. Thus, method how it is measured must be clear for bidders to include his method related aspects in the rates. Earth work support quantities too are affected accordingly. It may be included under foundation as a subcategory.
D.6.1 to 4	Working space allowance to excavation	√		As per the SLS573, the workspace to be measured separately for the face of the excavation is <600 mm from the face of formwork, rendering, tanking or protective walls. It may be specified that, the above-mentioned criteria is used due to the design and not due to the contractor's method of construction.

Work Section of SLS 573	Section Name as per SLS 573 / Work Item	Existence of deviation in Practice	Absence of Specific Item in SLS 573	SLS 573 Measurement rules/ deviation in Practice/ Suggestions to mitigate deviations
D.7.1 to 3	Earthwork support	√		As per the SLS573, earthwork support to be measured separately according to the depth categories (1.0m stages). When pricing this kind of item, it goes as operational estimate rather than unit rate estimate. Hence advisable to keep without stage categories. if stages to be indicated, it could be optional. Consideration should be given to earthwork supports with micro piling commonly used with bracing system in this section or in piling section.
E.1 & E.2	*Empty boring, Pile boring, Concreting and Rock socketing*	√	√	As per the SLS573, these three work items grouped under single composite item by specifying maximum lengths for each and extra over item for "Obstructions". Advisable to have separate items as practically these shall be measured separately for obtaining separate rates, for management of cost, variations and claims.
	Rock Socketing			Advisable to add new item specifying the commencing level with suitable rock quality parameter. Additional cost claims are very frequent on what bidder assumed and what Engineer considered.
E.5.1	Items extra over piling, Breaking through obstructions	√		As per the SLS573, breaking through obstructions should be an extra over item & the unit of measurement is "h". May be changed the unit of measurement to "m" describing the obstructing material such as concrete, rock boulders etc.

Work Section of SLS 573	Section Name as per SLS 573 / Work Item	Existence of deviation in Practice	Absence of Specific Item in SLS 573	SLS 573 Measurement rules/ deviation in Practice/ Suggestions to mitigate deviations
-	*Foundation level Concrete; Wall base, staircase base, walls, staircase shaft and pile caps.*		√	As per the SLS573, there are no categories for these listed items. May be added new categories or to specify to include with existing categories.
-	*Above ground level Concrete; Concreting of vanity or work counter slab, kerbs, concrete screeds for waterproofing, filling to make up levels, ledges.*		√	As per the SLS573, there are no categories for these listed items. New categories are to be added. New categories may be added or group together with existing categories.
-	*Concrete weather strips, core cutting,*		√	As per the SLS573, there are no categories for these listed items. New categories may be added.
-	*Stiffener columns, decorative columns, stiffener beams, capping beams, decorative beams,*		√	According to the SLS573, there are no categories for these listed items and measured under existing categories as "columns" and "Beams". New categories may be added or specify to group together with existing categories
F1.3 to 7	Slabs	√		As per the SLS573, slabs to be categorized as per thickness not exceeding 150mm, 150-300mm and exceeding 300mm. With the mechanization of the concreting process thickness categories may not be appropriate. But thickness may be stated in the description in to thickness ranges such as <250mm thick, >250mm

Work Section of SLS 573	Section Name as per SLS 573 / Work Item	Existence of deviation in Practice	Absence of Specific Item in SLS 573	SLS 573 Measurement rules/ deviation in Practice/ Suggestions to mitigate deviations
	Transfer slabs		√	Advisable to add new categories
F1.8	Walls	√		Measurement rule about the height of the wall may be added.
F1.9	*Filling (Concrete filling on slab and voids)*		√	As per the SLS573, there is no category for concrete filling on slab and voids. New categories may be added as it is a common BOQ item for most of the projects.
F1.12	Concreting of Beams (Measurement rules M1.e)	√		As per the SLS 573, in calculating the beam concrete, the concrete volume to be measured in net volume without deducting beam intersections. Advisable to indicate criteria like "concrete volume of beam intersections will not be duplicated for intersections with concrete volume which is < 0.05 m3.
F1.12	Concreting of Beams (Measurement rules M7)	√		As per the SLS 573, item M7, the length of beam to be measured between face of columns. Advisable to indicate the criteria for; 1. If the width of the column > width of the beam 2. If the width of the column < width of the beam
F1.12	Categorization (Shape, sectional area, isolated or attached)	√		More categorizations make a BOQ with more item categories for a single item. Advisable to use categorization as an option only.
F1.27	Gutters	√		As per the SLS 573, concrete gutters are to be measured in 'm'. Advisable to indicate the criteria like, 1. Measure it in "m" where the width of the gutter < 200mm 2. Measure it in "m3" If the width of the gutter > 200mm

Work Section of SLS 573	Section Name as per SLS 573 / Work Item	Existence of deviation in Practice	Absence of Specific Item in SLS 573	SLS 573 Measurement rules/ deviation in Practice/ Suggestions to mitigate deviations
F1	Definition rules D1. d	√		As per the SLS573, superstructure quantities should be grouped together irrespective of no of storeys. Height categories like may be added, up to 5th floor from ground floor, from 6th floor up to 10th floor etc, as the unit rate will differ accordingly for handling materials and etc. Further BOQ quantities of each level are commonly used for progress and planning measurements.
F2.1.1	Formwork for screed concrete	√		The thickness categories may be indicated as most of the screed concrete with lesser thicknesses laying without having formwork.
-	*Side Formwork in foundation level – Pile caps, lift pits, lift walls, staircase footings, staircase shafts, retaining wall base*		√	As per the SLS573, there are no categories for these listed items. New categories are to be added. New categories may be added.
-	*Formwork for landing beams*		√	With reference to the in-situ concrete section, there is a separate category for this item. However, under formwork section no separate category for the same. Advisable to follow the same categorization for concrete and formwork trades.
F.11	Sides of walls	√		As per SLS573, the categories are (i) height ≤3.5m above floor level (ii) height >3.0m above floor level. Item (ii) may be corrected as height > 3.5m

Work Section of SLS 573	**Section Name as per SLS 573 / Work Item**	**Existence of deviation in Practice**	**Absence of Specific Item in SLS 573**	**SLS 573 Measurement rules/ deviation in Practice/ Suggestions to mitigate deviations**
-	*Formwork for stiffener columns, decorative columns, stiffener beams, capping beams, decorative beams,*		√	As per the SLS573, there are no categories for these listed items and measured under existing categories as "columns" and "Beams". New categories may be added or to specify to include with existing categories
-	*Formwork of vanity or work counter slab, kerbs, concrete screeds for waterproofing, slab drops, decorative staircases, and ledges (Above ground level)*		√	As per the SLS573, there are no categories for these listed items and new categories may be added. New categories may be added or to specify to include with existing categories
F3.1 to 3	Reinforcement	√		As per the SLS573, reinforcement to be categorized as per size of bar. However, in practice such categorizations are not followed. This may be categorized as , ≤ 10 mm and ≤ 10 mm ≥ 25 and ≥ 25 mm advisable to add separate items under large diameters (more than 25mm) to count "couplers" or to include the same within the coverage rules.
F3.4	Special spacers & chair supports	√		As per SLS573, the special spacers & chair supports to be measured separately. Advisable to mention that the said "special spacers and chair supports ***specified in design***"

Work Section of SLS 573	Section Name as per SLS 573 / Work Item	Existence of deviation in Practice	Absence of Specific Item in SLS 573	SLS 573 Measurement rules/ deviation in Practice/ Suggestions to mitigate deviations
-	*Chemical Anchoring*		√	According to the SLS573, there are no specific category for this item. May be specified to include under "special joints, in "coverage rules".
F3.6.1 to 4	Special labour / treatment	√		As per the SLS573, Welding, Galvanizing, Bitumen dipping and the likes are to be measured as items. When pricing this kind of item, it goes as operational estimate rather than unit rate estimate. Operation would be carried out by manufacturer in his factory or warehouse. Hence advisable to have composite item rather than having separate items.
-	*Pre-cast pergolas*		√	According to the SLS573, there are no specific category for this item. This item may be added as new category or specify to include under "beams, in "coverage rules".
-	*Pre-cast decorative mouldings*		√	As per the SLS573, there is no category for this item. A new category may be added
-	*In-situ Post-tensioned concrete items*		√	As per the SLS573, there is no category for this item. A new category may be added
G2.1.1.1.1	Rubble stone walls	√		As per the SLS573, this item should be measured in "m^2" stating wall thickness. When pricing this kind of item, it goes as operational estimate rather than unit rate estimate. Hence advisable to keep unit of measurement as "m^3"

Work Section of SLS 573	Section Name as per SLS 573 / Work Item	Existence of deviation in Practice	Absence of Specific Item in SLS 573	SLS 573 Measurement rules/ deviation in Practice/ Suggestions to mitigate deviations
H.1 & 2	Tanking and Damp proofing	√		As per the SLS573, this item should be categorized according to the width; as not exceeding 300mm, and exceeding 300mm. Advisable to have categorization according to the method of application rather than the width. ????
-	*Protective screed*		√	In the SLS573, the protective screed is not clearly mentioned. This may be specified in D3, to include under the waterproofing item itself.
-	*Heat insulation*		√	In SLS573, there is no category for heat insulation work, New category for heat insulation to be added under this section A new category may be added
J.1.10 & 11	Anchor bolts and base plates, etc.	√		As per the SLS573, the Anchor blots and base plate are to be measured separately. When pricing this kind of item, it goes as operational estimate rather than unit rate estimate. Operation will be carried out by the manufacturer in his factory or warehouse. Hence advisable to have composite item rather than having separate items.
J.4, 5 & 6	Surface preparation, surface treatment and localized protective coating	√		As per the SLS573, these items are to be measured separately. In practice, these items are not measured separately, and measured as composite item with related structural metal work item by stating it in the description. When pricing this kind of item, it goes as operational estimate rather than unit rate estimate. Operation will be carried out by manufacturer in his factory or warehouse. Hence advisable to have composite item rather than having separate items.

Work Section of SLS 573	Section Name as per SLS 573 / Work Item	Existence of deviation in Practice	Absence of Specific Item in SLS 573	SLS 573 Measurement rules/ deviation in Practice/ Suggestions to mitigate deviations
L1.1 to 4	Floor framing, wall framing, ceiling framing and roof framing	√		As per the SLS573, all timber members should be measured separately in "m". However, in practice, all members measured as composite item in "m^2". Both options may be made available
L1.7 to 10	Straps, nail plates, metal connector and bolts	√		As per the SLS573, these items should be measured separately. When pricing this kind of item, it goes as operational estimate rather than unit rate estimate. Operation will be carried out by manufacturer in his factory or wherehouse. Hence advisable to have composite item rather than having separate items.
-	Painting works	√		As per the SLS573, painting works to joinery is not specified in joinery work section, and it should be measured under "Painting" section. When pricing this kind of item, it goes as operational estimate rather than unit rate estimate. Operation will be carried out by manufacturer in his factory or wherehouse. Hence advisable to have composite item rather than having two separate items.
-	*Painting of partition works*		√	Painting works has not been clearly mentioned in this section. A new category may be added
N.7	Suspended Ceiling	√		As per SLS 573, suspended ceiling to be measured under Section N. In practice, this item measured under Section T (Floor, Wall and Ceiling) and related painting work is measured under Section V (painting)

Work Section of SLS 573	Section Name as per SLS 573 / Work Item	Existence of deviation in Practice	Absence of Specific Item in SLS 573	SLS 573 Measurement rules/ deviation in Practice/ Suggestions to mitigate deviations
	Abutments, Eaves, Verges, Skirtings, Ridges, Hip, Aprons, Gutter linings, Vertical angles, Valleys and likes	√		As per SLS 573, this item to be measured separately. When pricing this kind of item, it goes as operational estimate rather than unit rate estimate. Hence advisable to have composite item rather than having separate items.
T1.1 to 4 T1.6 to 16	Cement sand screed, concrete, In-situ terrazzo & In-situ granolithic Granite, Marble, Tile & etc.	√		As per the SLS573, these items should be categorized as per "level and to slope not exceeding 15^0 from horizontal" and "to slope exceeding 15^0 from horizontal". Advisable to use the words "designed levels" rather than allow for any additional slopes need due to the construction.
	Measurement rules M4	√		According to this measurement rule of SLS573, wall and ceiling finishes should be separated as "work to ceiling and beams over 3.5m above floor and herein after 1.50m stages (except in staircase areas)". With the currently available technology. The height categorization may be revisited. It could be increased to 4.5m
T2.1 & 2	Walls and ceilings	√		According to the SLS573, these items should be categorized according to the width 'not exceeding 300mm' and 'exceeding 300mm.' Categorization may not be required as there will not be any deviations in the method of construction and the unit rates. ???
T2.3 & 4	Isolated beams and columns	√		According to the SLS573, should be categorized as per width not exceeding 300mm and exceeding 300mm. ??? Categorization may not be required as there will not be any deviations in the method of construction and the unit rates.

Work Section of SLS 573	Section Name as per SLS 573 / Work Item	Existence of deviation in Practice	Absence of Specific Item in SLS 573	SLS 573 Measurement rules/ deviation in Practice/ Suggestions to mitigate deviations
	Vanity and work top finish		√	This item has not been clearly specified in the SLS573. A new category may be added
U.1 & 2	Ordinary and Special glass	√		As per the SLS573, all glazing should be categorized as per panes (nr) area not exceeding $0.10m^2$, $0.10\text{-}0.50\ m^2$, $0.50\text{-}1.00m^2$ and thereafter $0.50m^2$ stages. When pricing this kind of item, it goes as operational estimate rather than unit rate estimate. Operation will be carried out by manufacturer in his factory or warehouse with the frame. Hence advisable to have composite item for the frame and the glass.
U.6	Sand blasting	√		As per the SLS573, sand blasting to be measured separately. When pricing this kind of item, it goes as operational estimate rather than unit rate estimate. Operation will be carried out by manufacturer in his factory or warehouse. Hence advisable to have composite item with glass rather than having two separate items.
	Measurement rules M2	√		According to this measurement rule(M2) of SLS573, paining works should be categorized as "work to ceiling and beams over 3.5m above floor and herein after 1.50m stages (except in staircase areas)". With the currently available technology, the height categorization may be revisited. It could be increased to 4.5m.

Work Section of SLS 573	Section Name as per SLS 573 / Work Item	Existence of deviation in Practice	Absence of Specific Item in SLS 573	SLS 573 Measurement rules / deviation in Practice/ Suggestions to mitigate deviations
V.1	Plastered work (Isolated surfaces - Isolated beams, piers, mouldings and the like)	√		As per SLS 573, plastered work to be categorized as 'girth exceeding 300mm in "m2" and isolated surfaces girth not exceeding 300mm in "m"'. The word width is more reasonable to use for the categorization than girth.
	Painting for unplastered concrete surface.		√	No item in the SLS573. A new category may be added
V.4	Woodwork painting	√		As per the SLS 573, the painting for wood works to be measured separately under "Painting" work. When pricing this kind of item, it goes as operational estimate rather than unit rate estimate. Operation will be carried out by manufacturer in his factory or warehouse. Hence advisable to have composite item rather than having two separate items.
V.5	Metal work painting	√		As per the SLS 573, the painting for metal works to be measured separately under "Painting" work. When pricing this kind of item, it goes as operational estimate rather than unit rate estimate. Operation will be carried out by manufacturer in his factory or warehouse. Hence advisable to have composite item rather than having two separate items.

CONCLUSIONS

BOQ forms a part of the tender / bid document as well as the contract which is one of the key documents prepared by the Quantity Surveyor. In Sri Lanka, many deviations can be observed in the industry practice when compared to measurement rules of SLS 573 in preparation of BOQs. One of the reasons behind these deviations is difficulty in finding fully detailed design drawings for preparing BOQs at tender stage. As a result, there is a mismatch between SMM requirements and industry practice of Sri Lankan construction industry. Meanwhile, the use of SMM will become law with the proposed amendments to Construction Industry Development Act, redoubling the challenges to Sri Lankan QSs.

By analysing issues with a recent project, this paper exposed item wise deviations occurred with SLS 573 measurement rules and industry practice. Further, concerning industry experience of the authors possible solutions were suggested to mitigate such deviations. Ultimately, it was found that there is an urgent requirement of revision for SLS 573 considering all these matters and other changes in the industry such as; the changes in use of construction materials, the changes in construction methodologies and use of innovative technologies. At the same time, this paper highlights the importance of publishing estimating guideline along with the standard method of measurement in Sri Lanka.

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Last Planner System to Mitigate Risks in Construction: Barriers for Implementation in Sri Lanka

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1. Introduction

Since the construction sector is large and responsive and maintains strong linkages with other industries, government and private institutions are constituently seeking for ways to improve the performance by maximizing the value while eliminating the barriers that are risky (Durdyev & Ismail, 2012). Global concepts like '*Lean*' have the potential to improve the performance of the overall construction industry especially in developing countries such as Sri Lanka. Most construction personals conquer that the industry is vulnerable to multiple waste proceedings i.e. time delays, cost over runs and production inefficiencies (Al-Aomor, 2012). Even though reworking has become common it adds barriers for the better delivery of the project. A study conducted by Anjum and Bakar (2015) has identified the volatile background around construction industry as the root cause for often subjection to risk prone activities and competitive environment.

However, due to the vigorous nature of construction industry, it has been found to be in a constant mission of finding strategies with potential to mitigate risks. The high number of delays, budget overruns and claims experienced in infrastructure construction indicates the critical need for adaptation of risk mitigation procedures. Risk mitigation strategies offer an opportunity to the construction industry in enhancing efficiency and profitability. According to Churchill and Coster (2001), the process of taking calculated risks and reducing its likelihood of occurrence which would end up in loss is termed as risk management. Risk management is aimed at improving decision making by reducing the risk effects against objectives of the project. Issa (2013) stated that lean concept has a potential to be used reducing risk effects for construction projects in developing countries. The study was investigating the impact of Last planner system (LPS), a lean tool to risk mitigation in construction industry. However, the impact of LPS implementation need to be investigated in terms of drivers as well as barriers for implementation. Thus, this paper is focusing to identify and rank the barriers in implementing LPS as a risk mitigation tool.

2. Literature Findings

2.1. Risk Mitigation

Risk mitigation can be defined as the the process of identifying the risk that could occur, then reduce the probability of occurance and thus minimising the scale of loss in case if the uncertainity expected occurred (Baldwin & Bordoli, 2014; Churchill & Coster, 2001). Thus, risk management is mainly focused on prevention of potential isuues and enhancing achievement of project objctives while detecting real problems when they occur. Therefore, risk mitigation is an essential component to be implemented in construction projects so that the project objectives are achieved regardless of the size of a construction project (Chan, Chan, Chan & Lam, 2012; Hwang, Zhao & Toh, 2014). Moreover, risk management is a process which is assesed and analyzed by project managers to identify consequences and take appropriate actions. Nowadays, risk management has become much essential specially in construction projects since it has a critical impact over project success and thus assessed by the potential impact on project objectives (Issa, 2013). However, the contractors using high markups to cover risks which is no longer practicable. Thus, the industry is experiencing novelties in adopting LPS to mitigate risks in construction projects.

2.2. LPS in the Construction Industry

Issa (2013) in his studies has stated that Lean concepts have a potential to be used reducing risk effects on time objective for construction projects in developing countries. Many researches have been conducted based on LPS as a tool followed by lean concept in many countries i.e. Malaysia by Marhani et.al, Nigeria by Adamu and Hamid, Ecuador by Fiallo and Revelo. Based on the LPS pull flow construction management software has been specified in recent discussions that it has the capacity to identify risk factors in advance within the construction process which would therefore look forward to mitigate those (Sacks, Radosavljevic, & Barak, 2010). In addition, it was illustrated that in UK a prison construction project incorporated with lean thinking and work structuring has been successfully practiced improving the design and installation of metal doors frames (Tsao, Tommelein, Swanlund, & Howell, 2000). Falk (2017) asserted that there is a trend creating on construction firm adopting LPS which affects the bottom-line of the whole industry. Therefore, the industry need to be aware to adopt LPS in order to reduce risks while eliminating the hindrances that are risky.

2.3. LPS Application for Risk Mitigation

Last planner system can be utilized due to its potential in delivering the projects more safely at a reduced cost, creating more predictable program of production and to aid in overall construction process (Hamzeh, Ballard, & Tommelein, 2008). The last planner technique is construction planning tool that is focused over the people who makes decisions at the site; last planners. Moreover, the last planners are intensively committed towards the project through a pull session at the initially and forms a base for the master plan with the key tasks as well as the milestones (Pellicer, Cervero, Lozano, & Ponz-Tienda, 2015). There by the task implementers such as site managers would be able to improve the production flow by removing the constraints. Thus, the last planners ensure that the relevant tasks are well carried and thus the project would be serving to its optimum level and risk for the parties involved in terms of cost, time and quality would be reduced.

The planning tool LPS possessed several characteristics such as planning in greater level and reviewing of the details in a constant manner and addressing of the gaps between the performances expected and occurred, which made the LPS potential for a risk mitigation strategy. The LPS stages; master schedule, phase schedule, look ahead planning, weekly work planning and PPC could contribute in the contractors to identify the risks associated in a project at very initial stage (Hamzeh et al., 2008). However, many researchers argued that implementation of LPS is not free from barriers. Thus, a proper investigation will accelerate the LPS implementation in construction industry.

3. RESEARCH METHODOLOGY

The research problem was to identify the potentiality of the Last planner system to be used as a tool to mitigate risk in building construction projects. As there are a lack of experts in the Sri Lankan construction industry, and need of ranking the identified barriers, a mixed approach was adopted to carry out this study.

To identify in depth narrative explanations towards the barriers, a qualitative approach was followed during the round1 of the study. Then the identified factors were distributed among construction professionals to rank the importance of those barriers for LPS implementation. Marshall (1996) mentioned that sampling methods are much important when the data collection for the entire population becomes practically constrainable. Therefore, purposive sampling which is a non-random sampling technique was adopted as per Etikan, Musa & Alkassim (2016) argument of, there was no limit stating the minimum number of participants required. The population approached was middle level and executive managerial level personal related to the building construction projects. The collected data was analyzed using content analysis and using statistical tools.

Research Findings

4.1. Barriers to implement LPS as a risk mitigation strategy

The last two questions of the interview guideline was set up to figure out the enablers and barriers of implementing the LPS as a risk mitigation strategy and rank them according to the importance. An open-ended set of questions were raised to capture the valuable information from the respondents. Although the LPS has the potential to be implemented as a risk mitigation approach, some barriers were identified via the responses of the respondent. Hence the barriers need to be overcome to strengthen the driving factors. It was identified that the main barrier related to the implementation of LPS was the attitude of the team members.

Moreover, professionals having different views often deviate from the objectives of the project has further hindering the LPS application in the construction industry. Two respondents clearly stated that conventional practices in the industry, poor guidance from the top management and the policies and existing culture of the organisation as few barriers that need to be addressed. The other obstacles identified were the costly facilitation, poor resource allocation, and the lack of high skilled labor force. However, most of the barriers mentioned was based on the matters on personal perspectives. Therefore, those could be easily overcome by attempts to change the attitudinal directions of the people.

4.2. Barriers that hinders the LPS to be implemented as a risk mitigation tool

The respondents were required to identify importance of the identified barriers based on five-point Likert scale. The findings of this section have been summarized in Table 1.

Table 1: Assessment of barriers for implementing LPS to mitigate risks in construction

Barring for implementing LPS as a risk mitigation strategy	*∑(W.n)*	*RII*	*Rank*
Additional allocation of finance	211	0.844	1
Lack of updated project management skills and competencies	202	0.808	2
Fragmentation of construction works	202	0.808	3
Conventional procurement paths and contracts	197	0.788	4
LPS having a requirement of a cultural approach to remove waste	197	0.788	5
Sub-contracting of the construction contract (Fading of collaboration among parties).	194	0.776	6
Belief in adherence to traditional planning process	188	0.752	7
Lack of customer focused performance measurement systems	188	0.752	8
Poor commitment from senior management	183	0.732	9
Highly relies upon the management skills of collecting and analyzing information	181	0.724	10
Lack of adequate lean awareness and understanding by the managerial level	179	0.716	11
Incensements of the project risks and uncertainties	177	0.708	12
Lack of adequate lean awareness and understanding by the executive level	177	0.708	13
Additional cost on providing training on dealing with lean environments	176	0.704	14
Much attracted to conventional management concepts	173	0.692	15
Lack of knowledge competencies to differentiate between the stages of the last planner system	173	0.692	16
High level of trade information requirements	173	0.692	17
Lack of encouragement from the culture of the organization	173	0.692	18
Non- flexible Internal policies of the organization to implement lean concepts	173	0.692	19
Resistance to change in a radical manner	171	0.684	20
Lack of process-based performance measuring indicators	170	0.68	21
Difficulties in making relationships between the master schedule and weekly work plan	159	0.636	22

Requirement of high effort intensity	155	0.62	23

Most significant barrier for implementing LPS as a risk mitigation strategy is identified as "additional allocation of finance" with the highest RII value of 0.844. "Lack of updated project management skills and competencies" has perceived the next most significant barrier and has achieved a RII of 0.808. Moreover, the third ranked barrier "fragmentation of construction works" has gained a RII of 0.808. The forth most significant barrier which has 0.788 as its RII value is the "conventional procurement paths and contracts" where the fifth rank is possessed by the factor "LPS having a requirement of a cultural approach to remove waste" while having 0.788 RII. At the same time the factors; belief in adherence to traditional planning process, lack of customer focused performance measurement systems possessed their RII values as 0.752 where the factors of this study having RII values more than 0.75 were the most significant factors.

Furthermore, all the other negative factors that hinders the potentiality of LPS as a risk mitigation tool has received a RII more than 0.620 and less than 0.750 and the factors are sub-contracting of the construction contract, poor commitment from senior management, high reliability upon the management skills of collecting and analyzing information, lack of adequate lean awareness and understanding by the managerial level and increase of project risks and uncertainties.

Moreover, the factors; lack of adequate lean awareness and understanding by the executive level, additional cost on providing training on dealing with lean environments, much attracted to conventional management concepts, high level of trade information requirements, lack of encouragement from the culture of the organization were figured out as barriers.

Consequently, factors such as non- flexible internal policies of the organization to implement lean concepts, resistance to change in a radical manner, lack of process-based performance measuring indicators and difficulties in making relationships between the master schedule and weekly work plan and requirement of high effort intensity, were identified as the barriers for implementing LPS as a risk mitigation strategy in Sri Lanka.

Conclusion

The lean concept was recognised as a basis for numerous planning and productivity tools such as LPS. It was clearly identified that the LPS was attracted to many construction industries such as in PERU, Nigeria, Japan and UK and they were absorbing benefits in greater level of degree. Furthermore, the findings of the study revealed that additional allocation of finance, lack of updated project management skills and competencies and fragmentation of construction works as the most significant factors that hinder LPS implementation for risk mitigation in the construction industry Sri Lanka. Therefore, there is a need to investigate the strategies to overcome or minimize the identified barriers from a proper empirical study.

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Strategies to Minimise the Deficiencies in Contract Administration

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1. Importance of Contract Administration in construction projects

Contract administration is used to describe the functions performed subsequent to the signing of a contract by the relevant parties (Sherman, 1996). As stated by Pooworakulchai, Kongsong, and Kongbenjapuch (2017), construction contracts specify the rights and duties of the construction stakeholders stating the role of each stakeholder. As the obligations of each stakeholder are stated in the contract, effective contract administration is of high importance (Patel, Patel & Marvadi, 2015). Contract administration involves the activities that ensure the enforcement of contract terms and conditions. During the execution of the contract, attention should be paid to achieving the targeted output of the contract. According to Davison and Sebastian (2009), contract goals are established by first identifying the risks associated with the contract and the problems that may arise during contract administration.

Contract administration in a construction project involves the management of the project contract; the contract administrator is responsible for overseeing the contract. The rights and responsibilities of the different parties involved in the project are established through the contract and the success of the project depends on the intention and the performance of those parties (Kayastha, 2014). The execution of a construction contract of a project is monitored through contract administration to ensure the completion of the project on schedule within the estimated budget.

2. Hindrances to effective Contract Administration

Successful project delivery will be affected by factors that hinder effective contract administration (Rauzana, 2016). Therefore, hindrance factors that have a negative impact on contract administration have to be investigated. Contractor selection, construction changes, and the exclusion of any additional tasks from the contract are identified as the factors that significantly affect contract administration (Pooworakulchai, Kongsong, & Kongbenjapuch, 2017). Patel, Patel, and Marvadi (2015) classified the delays that occur in construction projects as critical, excusable, compensable, and concurrent delays. They have identified cost overruns, time overruns, disputes, negotiations, litigations, and project abandonment as the consequences of these delays and have mentioned that they s often cause problems. Thus, when implementing a construction project, attention should be paid to the factors that have the most adverse impacts on the project.

Delays and disputes are the main causes of contract failures (Patel, Patel & Marvadi, 2015). Mwanaumo et al. (2016) stated that time management has a significant effect on construction projects because it affects the programming, extension, and completion of the projects and the penalties imposed for any delays incurred in the execution of the projects.

In a similar study, Patel, Patel, and Marvadi (2015) stated that in a construction project, variations, alterations, additions, omissions, and unjust enrichments by the clients, would generally result in disputes while documentational and estimation errors also are responsible for disputes. Delays in making decisions during procurement have been identified as a huge problem (Kayastha, 2014). As mentioned by Aibinu (2008), delivery schedule failure is a recurring problem in the construction industry.

According to Akinsiku and Ajayi (2016), improper financial management, inability of the contractors to perform work, failure to select the standard forms of contract, poor coordination of the activities within the project team, and failure of the consultants in recommending the claims are the factors that adversely affect the delivery of construction projects. Chow and Cheung (2008) stated that conflicts in construction projects lead to disputes if not properly handled. While agreeing with Chow and Cheung (2008), Abeynayake (2008) stated that the four main reasons for the disputes in the construction industry in Sri Lanka are the breaching of the contract by a party to the contract; insufficient administration of responsibilities by the parties; specifications and plans containing omissions, errors, and ambiguities; and the sudden increase of taxes and costs. Kayastha (2014) elaborated that the lack of coordination among the parties to a contract has a direct impact on the progress of a construction project because it obstructs the smooth running of the construction activities, thereby hindering the workflow.

3. Strategies that will minimise the effect of hindrance factors

The hindrances of the successful delivery of construction projects need to be eliminated through effective contract administrative practices. Patel, Patel, and Marvadi (2015) identified several techniques and tools for effective contract administration that will ensure successful project delivery, namely using the principles of project management, developing a plan for contract administration, holding pre-performance conferences, observing the project progress, managing the payment process, and managing the dispute resolution process. Thus, effective contract administration is not just one procedure, but also a chain of procedures that should be implemented, monitored, and readjusted flawlessly.

The hindrances of contract administration, the factors that have negative impacts on contract administration, can be mitigated by the timely addressing of their indicators, such as, establishing a clear mechanism to obtain information, establishing proper communication among the team members, enabling proper supervision and proper management of the project (Rauzana, 2016). When a delay occurs, the project completion will have to be accelerated and the required changes made to the schedule. These measures will finally make the project cost to exceed its estimated value (Patel, Patel, & Marvadi, 2015). To mitigate the lack of coordination among the parties to the contract and ensure the smooth implementation of construction projects, Kayastha (2014) stated that the coordination should be done on time and ensure.

Disputes are one of the major factors that obstruct successful project completion. Kayastha (2014) stated that disputes could effectively be reduced through unbiased and clear conditions of contract. Record keeping and contract documentation are the important to complete s project as scheduled within the given budget and at the required quality. Record keeping and contract documentation will avoid disputes in construction projects (Mwanaumo et al., 2016). According to Rauzana (2016), the success of a construction project has to be measured in terms of time, cost, and quality. To maintain the cost of a project within the limits specified, the payments should be handled as stated in the agreements and the contract document, to meet the required quality, the works have to be performed to comply with the technical specifications mentioned in the contract document and the agreements. Finally, the project should be completed on time according to the schedule of work given in the contract document (Rauzana, 2016).

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If any member, including students, of IQSSL and the College of Quantity Surveying would like to get their research, technical, and other papers or articles published in the next issue of Focus and / or the website, kindly email the relevant article documents to "duleesha.wijesiri@gmail.com". These articles will then be subjected to review by the Committee Members of the BQSP and published accordingly.

Ch. QS Duleesha Wijesiri
Chairman - BQSP

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