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Study of Quantity Surveying Roles and Skills Requirement under Green Building Development in Sri Lanka

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Abstract—With the development of the construction industry, modern Quantity Surveyors diversify their roles as cost managers and perform multidisciplinary job practices at present. Green building is one of the recent trends in the construction industry. There is a tendency to adopt green concepts to building construction in Sri Lanka. When adopting green technologies to the buildings, a significant reformation to design, procurement, construction, and management processes is required. Therefore, the skills and activity requirements of construction industry professionals need to evolve with this recent development. Accordingly, this research attempted to identify principal quantity surveying duties and skills that continually evolve with the green building construction practices. At the outset, a detailed literature review and three preliminary interviews were carried out, and seven core skills and twenty-five roles of a quantity surveyor were identified that possibly to be influenced by green building development. Then, a questionnaire was formed and tested the same among fifty cost experts who work closely with the Green Building Council of Sri Lanka (GBCSL). At the time of the questionnaire survey, 76% of the experts responded, and later, the Relative Important Index (RII) formula was used to analyze the research findings.The ultimate results revealed that the ability of a quantity surveyor to appraise is the topmost skill requirement under green building development. Moreover, the results further denoted cost planning/controlling and bills of quantity preparation of green building as the prime quantity surveying activities to be performed as a cost specialist of green construction projects.

Keywords: *green buildings, quantity surveyor, skills*

I. INTRODUCTION

Construction is a mammoth industry all around the world that has a significant impact on the environment, economic and social development (Chan et al., 2009). The necessity for higher environmental consideration in the context of sustainable development has been confirmed by many governments, businesses, organizations and individuals (Cole, 2000). Consequently, sustainable development enhances quality of life and allows people to live in a healthy environment and improve social, economic and environmental conditions for present and future generations. (Chan et al., 2009). Hence, there is a consideration on how to acclimatize construction practices, in order to mitigate their negative impacts on the natural environment Holmes and Hudson (2000), Cole (2005), Pahwa(2007). The green building concepts develop and run simultaneously with sustainable development concept. Sustainable development means the development that meets the needs of the present without compromising the ability of future generations to meet their own needs and green building is a part of the concept of promoting sustainability (GBCSL, 2010)

According to Kats et al. (2003), major resources like energy, material, water and land use to construct green buildings more efficiently than conventional buildings and it will contribute to the improvement in employee health, comfort and productivity. Kats et al. (2003) further denote that green buildings help to achieve financial benefits during life cycle of the building in long-run.

Eventually, Sri Lanka as a country also adopt sustainable practices. To achieve the sustainable development goals in the country, the government of Sri Lanka developed a national programme named "Haritha Lanka" (GBCSL, 2015). As Abidin (2010) states, global interest on sustainability has increased steadily and therefore, the concept of green construction has emerged in to Sri Lankan construction industry as well. The term 'green buildings' generally refers to the buildings which are certified by green building assessment schemes such as BREEAM (UK); LEED (US); Green Star (Australia); Green Mark (Singapore) and GREENSL (Sri Lanka). Recently, a growing number of Sri Lankan green buildings obtain green certifications from the Green Building Council of Sri Lanka according to the Environmental Classification Systems for green buildings (GBCSL, 2009). One of the remarkable certified green building constructions in Sri Lanka is MAS Thurulie factory at Thulhiriya which became the winner of Globe Award for Sustainability Innovation 2010 (MAS Holdings Ltd, 2010).

However, according to Construction Holcim Foundation of sustainable (2009), the initial cost of construction of green factory building in Thulhiriya, Sri Lanka was 30% higher than the construction of a conventional factory building in Sri Lanka. Then a client may ask a question whether is it worthwhile to spend more money for the construction of green buildings than conventional buildings and that has to be answered by a quantity surveyor. Consequently, green building development is much more worthy and have future benefits in terms of economic, environmental and social dimensions (Waidyasekara, 2016).

According to the definition provided by the New Zealand Institute of Quantity Surveyors (2014), Quantity Surveyors are the construction cost professionals who measure and estimate the cost of resources for construction projects, and whose role have been laid among others to keep the projects within the budget, compromising the required quality and time. However, in 21st Century QS role has expanded to work with wider responsibilities in all stages of the building life cycle from project initiation, through design, procurement, construction, commissioning of the finished building, and to upgrade, convert, modify or alter of the building in the consuming phase (Ma & Luu, 2010).

The role of the quantity surveyor has therefore widened beyond measuring and estimating of the quantities and costs of the building project to include maturing roles such as project management, contract administration, dispute resolution, insurance and valuation. Ashworth (2011) depicts that modern day QSs play complex roles such as loss adjustment, auditing, dispute resolution and expert witnessing, advising for whole life costing, cost benefit analysis, advising for sustainable construction and green building approach etc., in addition to overseeing the financial commitments relate to construction projects. These wider roles bring questions to QSs, whether it is still required to maintain the traditional designations of the profession since it limits the capabilities of modern day QS practice or there is a necessity of bringing traditional quantity surveying profession into a diversifying profession (NZIQS, 2014). Quantity Surveyors should be able to meet changing needs of the clients and to grow the market for quantity surveying services depending on the knowledge, skills and competencies based on the profession (Nkado, 2020). Therefore, Skill based assessment of Quantity Surveying Profession is relevant in the changing built environment.

According to Green Building Council of Sri Lanka (2015), there is a growing demand for sustainable construction in Sri Lanka and therefore, the number of green buildings certified per year is rapidly increased as illustrated in figure 1 graph. Moreover, there are 29 buildings in Sri Lanka awarded the green awards until the year 2015.

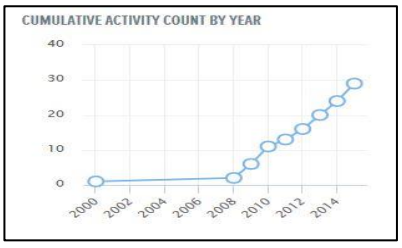

Figure 18: Rapid growth of green building development in Sri Lanka (GBCSL, 2015)

When adopting the sustainability principles into building construction projects, more changes to

be made to the design, procurement, construction and management processes (Chau et al, 2010). Concequently, construction industry professionals have often been experiencing challenges in moving from the traditional design and construction processes to a new method of delivery suitable for the green building development. Professional quantity surveyors are of no escape; they also have to keep up with the new trends in green building development. However, there's a gap in identifying the relavent quantity surveying practices that are to be evolved with green building construction.

Therefore, the objective of this research is to identify key quantity surveying duties and competencies that continue to be evolved with the green building construction practices.

Worldwide green building councils are trying to transform the construction industry towards green concept. According to Letchmiah (2015) modern quantity surveyors need to consider the driving forces of the green environment in which they operate (GBCSA, 2015). Green building council of South Africa (2015) have introduced modern roles to quantity surveyors in South Africa and that includes analyzing and advising on green capital costs, promoting the benefits of life cycle management, green financing, green leases, and cost-effective sustainable strategies. Quantity Surveyors involve the process of identifying and documenting all the costs involved over the life of an asset, which is known as Life Cycle Costing (Matai, 2021). The publication which investigating the financial benefits of green buildings (Smit, 2021) has been recommended that skilled construction industry experts such as Quantity Surveyors must consult and implement a general model pertaining to the various costing elements in green buildings. Moreover, online e-procurement which is practiced by Korean cost experts can be shown as a main tool for green procurement (Ali Hasanbeigi, 2020). Additionally, Quantity surveyors involve for comparing cost benchmarks such as $/m^2$ GFA against carbon benchmarks such as kg/m^2 of CO2 with carbon offset factors for green cover and carbon credits. (Min, 2021)

Therefore, Quantity Surveyor is one of the key stakeholders who contributes directly to the green building development (Ma and Luu, 2013). Role of quantity surveyor is diversifying with a greater tendency towards sustainable construction and green building construction (Maarouf & Hbib, 2011). Commercial management (of construction works) or Design economics and cost planning, Construction technology and environmental services, Contract practice, Procurement and tendering, Project finance (control and reporting), Quantification and costing (of construction works) Capital allowances, Commercial management (of construction works) or Design economics and cost planning (whichever is not selected as core competency), Conflict avoidance, management and dispute resolution procedures or Sustainability, Contract administration, Corporate recovery and insolvency, Due diligence, Insurance, Programming and planning, Project feasibility analysis and Risk management are the key areas of property and green building development which a Quantity Surveyor should be competent (RICS, 2018). By considering the above mentioned particulars, literature review and preliminary interviews outcomes, roles of a quantity surveyor having green construction influences can be listed out as in Table 1.

Table 1. Possible Quantity suryeyor roles required for green building development

Cost planning
Document preparation (Bills of Quantities)
Tender Documentation
Sub contract administration
Cost Engineering Services
Cost Control during construction
Preparation of financial statement
Risk analysis
Final Account preparation & agreement
Settlement of contractual claims
Advice on contractual disputes
Insolvency services
Procurement advice

Measurement and quantification
Working on green lease & green finance
Measuring of carbon footprint
Interim Valuation and payments
Investment Appraisal
Project management
Facilities management
Whole life costing
Value management
Environmental Services
Technical Auditing
Valuation of insurance purposes

In modern QS practice, roles and responsibilities of a Quantity Surveyor is diversifying with the development of sustainable construction practices. Accordingly, modern quantity surveyors have to improve the capabilities of managing maintenance costs, operational costs and life cycle costs, procuring green products and services, leases, Integrating information and green management systems (Letchmiah, 2015). Consequently, the skills requirement of a quantity surveyor cannot be limited and therefore ever improving.

As defined by Royal Institution of Chartered Surveyors UK (1992) core skills based of Quantity Surveying Profession can be identified as in the following Table 2.

Table 2. Core Skills of a Quantity Surveyor

Analysis
Appraisal / Evaluation
Communication
Documentation
Management
Quantification
Synthesis

II. METHODOLOGY

As the research topic is apparent, this research relies on primary data sources by collecting data from related professionals. The secondary data sources support for documentary evidences by responding to the research questions through published research articles, books, journals, conference papers and internet information sources…etc. (Chau, C. K.; Tse, M. S.; Chung, K. Y., 2010). As an initiation to this research, a detailed literature review was conducted. Here, available information from overseas sources is also reviewed in order to gain an adequate comparative perspective to achieve the objective.

Generally, a research methodology consists with research design and data collection methods. There are two types of data namely, Quantitative data and Qualitative data. Unlike qualitative research, quantitative research may be more familiar with and uses for numerical data collection processes, research designs and statistical procedures (Johnston, 2010). Moreover, quantitative method is used to gather data and opinions from a large group of people.

Here, a mixed method has been utilized. At the outset, key quantity surveing duties and competencies which are primarily influenced by green building applications were identified by conducting three priliminary interviews among senior quantity surveyors who had green construction experience. Further, a questionnaire was formulated and tested among 50 quatity surveyors & cost experts who closely work with Green Building Council of Sri Lanka. Among them, 37 experts responded and considered valid for further analysis. The rate of response is as cited in Table 3.

Table 3. Response Rate

Questionnaires delivered	50
Received Responses	38
Response Rate	76%

All the data obtained through primary and secondary data sources are inter-linked, summarized, analyzed and interpret the final outcome of the research for achieving the research objective and for making conclusions.

Though the responses in the questionnaire of this research are qualitative in nature, answers collected from closed-ended questions brought the same to a quantitative form by using a Likert scale as stated in Table 4.

Table 4. Likert Scale

Level of Importance	Scale
Extremely important	5
Very important	4
Important	3
Less important	2
Not important	1

Moreover, Relative Importance Index formula (RII) used to rank the duties and competencies. The same tool has been used by the Nkado (2001), Jhonson (2000), and Jayamathan (2005) for their researches and made significant results.

RII calculations are based on the following formula.

$$RII = \sum \frac{W}{A \times N}$$

Where:

RII – Relative Important Index

W – Weight assigned by the respondent

A – The highest weight

N – Total number of sample

Finally, Microsoft Excel and SPSS software were used as the data analysis tools in this research.

III. RESULTS AND DISCUSSION

As introduced by the New Zeland Institute of Quantity Surveying (2017) and (RICS, 2018) competencies are created with the amalgamation of Skills. Core skill base for Quantity Surveying profession with the development of green building concepts in Sri Lanka can be identified as in Table 5 and the results obtained through the analysis of questionnaire responses made by the experts.

Table 5: Skills required by the Quantity Surveyors working on Green construction projects in Sri Lanka.

Skills required by Sri Lankan Quantity Surveyors working on Green building projects in Sri Lanka.	RII	Rank
Appraisal / Evaluation	0.962	1
Quantification	0.962	1
Documentation	0.919	2
Management	0.908	3
Communication	0.892	4
Analysis	0.886	5
Synthesis	0.849	6

Moreover, quantity surveyor's duties identified through the literature review and preliminary interviews also tested with the use of expert's responses and the analysis results can be summarized as in Table 6.

Table 6: Quantity Surveying roles mainly influenced by green building costruction in Sri Lanka

Quantity Surveying roles mainly influenced by green building costruction in Sri Lanka	RII	Rank
Cost planning	1.000	1
Document preparation (Bills of Quantities)	0.983	2
Measurement and quantification	0.940	3
Tender Documentation	0.929	4
Sub contract administration	0.929	4
Procurement advice	0.913	5
Settlement of contractual claims	0.913	5
Cost Engineering Services	0.908	6
Preparation of financial statement	0.897	7
Risk analysis	0.897	7
Interim Valuation and payments	0.891	8
Value management	0.881	9
Cost Control during construction	0.875	10
Whole life costing	0.875	10
Final Account preparation & agreement	0.854	11

Valuation of insurance purposes	0.848	12
Working on green lease & green finance	0.848	12
Advice on contractual disputes	0.837	13
Investment Appraisal	0.827	14
Project management	0.794	15
Insolvency services	0.789	16
Measuring of carbon footprint	0.773	17
Facilities management	0.745	18
Technical Auditing	0.745	18
Environmental Services	0.664	19

After evaluating and ranking the received responses, 12 activities out of 25 provided in the questionnaire have been identified as the most essential roles of Quantity Surveyors under green building development in Sri Lanka as follows.

According to New Zeland Institute of Quantity Surveying (2017) and (RICS, 2018), Cost planning, Document Preparation (Bill of Quantities), and Tender Documentation are the key activities to be performed by a quantity surveyor under sustainable construction. Similar results can be observed in this research except the third rank. According to the results, Measurement and Quantification is the 3rd important activity to be performed under green building development in Sri Lanka. According to Matai (Matai, 2021), quantifications in life cycle costing is also important. Further, tender documentation is the fourth prominent role to be performed by a quantity surveyor in Sri Lankan green constructions.

According to New Zeland Institute of Quantity Surveying (2017) and (RICS, 2018), Cost Engineering services, Financial statement preparation, Risk Analysis, Agreement & Final Account preparation consecutively holds 6th to 9th places of the roles hierarchy. However in this research, Procurement advice, settlement of contractual claims, cost engineering services and preparation of financial statements are the other quantity surveying responsibilities claims 6th to 9th places in the order of ranking. However, green procurement advice is among the key duties of a modern quantity surveyor (Berry, 2011).

Settlement of contractual claims, advice on contractual disputes, insolvency services consequently ranked 10th to 12th position in New Zeeland Institute of Quantity Surveying (2017) hierarchy. According to the research findings, 10th to 12th positions of the activity hierarchy are held by Risk Analysis, Interim Valuation and Payments and Value Management.

IV. CONCLUSIONS

Though Sri Lanka is still a developing country, number of multi scale construction projects are carrying out at present. However, a considerable proportion of environmental pollution is evident with the works related to construction industry and building operation. Therefore, green adoption is very much essential to the present construction industry and professionals like quantity surveyors have to evolve their existing roles and competencies.

The Quantity Surveying is one of the leading professions which is evolving and diversifying its scope into new dimensions with the development of sustainablity and green building concepts. Professional and multidisciplinary job practices of Quantity Surveyors are generating from their core skills and activity base.

Difficulties behind green building adoption such as high initial cost, isuues in pricing of green materials, etc. may be the possible reason behind the selection of quantification and appraisal as the prominent skill requirements, and cost planning, controlling, and bills of quantity preparation as the key activity requirements of a quantity surveyor under green building development. The prominency of quantity surveying duties to be performed under the green building development is in the following order.

Cost Planning & controlling
Document preparation (Bill of Quantities)
Measurement and Quantification
Tender Documentation
Sub contract Administration
Procurement Advice
Settlement of contractual claims
Cost Engineering Services
Preparation of Financial Statements
Risk Analysis
Interim Valuation and Payments
Value management

However, key green concepts behind each of the mentioned Quntity surveying duties are required to analyse further in future research works. More researches have to be carried out to identify the possible reasons behind the skill & competency requirement under green building development by improving the number of responses and to generalize the findings.

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Adequacy of the Advance Payment to the Contractor: A Study in Sri Lanka

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Abstract- Payments are essential for the contractors to maintain their constructions. The accelerations and the decelerations of the constructions will depend on the way that the contractor receivs the payments. Advance Payment (AP) is crucial for a contractor as it is the first payment received by the contractor to commence the construction, and it is an interest-free loan received by the contractor from the employer to start the construction. Even though there are research that discuss the payment procedures, recovery methods, and the benefits of the AP, there is a research gap on the adequacy of the AP to the contractor to complete initial procurements and preliminaries for the mobilisation. Therefore, the aim of this paper is to investigate the adequacy of AP made for the mobilisation activities of construction projects in Sri Lanka. Following a mixed-method research approach, a questionnaire survey including both open ended and close ended questions was conducted to collect data in the Sri Lankan context. The qualitative data were analysed through manual content analysis, whereas SPSS, and Relative Important Index (RII) techniques were used to analyse quantitative data. Many respondents claimed that the AP is not adequate, and the allocation of AP percentage should be done according to the project value and further, it was recommended to have a range of 20-30% from project value. Moreover, the study revealed that the adequacy of AP is entirely dependant on the way that the AP is utilised by the contractor. The study can be continued with the perspective of employers and the consultants as further research.

Keywords- *advance payment, adequacy, contractor, employer, utilise, construction, Sri Lanka*

I. INTRODUCTION

Advance Payment (AP) is a specific monetary payment (Cao and Zang, 2012). Furthermore, the authors stated that AP is made for the contractor's initial expenditure in accordance with materials, plants, labour, and a fair proportion of job overheads. However, this is an effective method to solve many financial issues of the contractors in developing countries (Rameezdeen et al., 2006).

In Sri Lankan construction industry, most contractors operate with a low equity base (Takhtaei and Karimi, 2017). According to Eyiah and Cook (2003), several limitations have affected the successful involvement of contractors in the industry. The absence of access to funding has become a significant constraint (Cao and Zhang, 2012). Eyiah (2001) found that contractors may not have an adequate collateral to obtain financial support from a commercial bank. Therefore, it is safer to have an AP for the contractors to stabilise and strengthen their financial health (Hussin and Omran, 2009).

There are many research conducted locally and internationally on the topic of AP by describing its benefits, and the problems incurred, when issuing the AP (Wijekoon, 2009; Rameezdeen et al., 2006; Hussin and Omran, 2009). Many contractors in Sri Lanka intend to utilise the AP for mobilisations and initial procurement as well. However, the AP should be adequate for the contractors to achieve its benefits. Even though the previous reserach discussed the payment procedures, recovery methods, and the benefits of the AP, only a limited number of research discussed about the adequacy of the AP to the contractor (Aje and Adedokun, 2018; Aje, Olatunji, and Olalusi, 2017; Cao and Zhang, 2012; Hussin and Omran, 2009). Nonetheless, there is

no consensus on the adequacy of AP in the Sri Lankan construction industry. Therefore, the aim of the study was to investigate the adequacy of the AP for the mobilisation activities of construction projects in the Sri Lankan construction industry.

II. LITERATURE SYNTHESIS

This section included definitions, importance and purpose of AP, process of issuing AP to the contractor, way of recovering the AP, benefits to the contractor from the AP, challenges faced by the contractor due to AP and the factors affect for the utilisation of AP.

A. Definitions for AP

AP is described as an interest-free loan issued for the contractor to complete the mobilisation (International Federation of Consulting Engineers [FIDIC], 2017). Moreover, AP acts as the monetary value that is given by the employer to the contractor with respect to the Works to be done in the construction (Abubakar, 2004). CIDB (2008), identifies AP as a simple advance that is given for the contractor as a part of the Contract Sum while the remaining is paid after the completion of the works. Rameezdeen et al. (2006), described AP as the monetary value issued to the contractor by the employer for the initial expenditures in terms of mobilisation activities and preliminaries. Hussin and Omran (2009), described that the AP is a payment given for the main contractor by the employer for participation in the construction activities and complete the performance under the Contract.

B.Importance and Purpose of AP

According to Akanbiemu (as cited in Aje and Adedokun, 2018), AP is a policy that is introduced by the Federal government of Nigeria in 1979 to make relief for the local contractors from the financial burden. Hussin and Omran (2009), identified AP as a great support for the contractors to reduce the financial problems that can occur during the commencement of the construction. Further, the author explained that one purpose of the AP given for the main contractors as of giving advances to the subcontractors. The AP which is given by the employer to the contractor will be able to release the contractor from the financial incapability and assist the contractor to mitigate the difficulties that occurred during the period of mobilisation as expressed by Coggins (2011). Elazouni and Gab-Allah (2004) and Hussin and Omran (2009), have stated that i) reducing the financial burden of the contractors, ii) assisting the contractor in taking the challenges of project mobilisation, and iii) helping the smaller or newer contractor company to compare with the mature contractor company as the main three purposes of issuing AP by the employer to the project contractor.

C. Process of issuing AP to the Contractor

AP will be issued by the Employer within 14 days after submitting an unconditional guarantee by the contractor in which value is similar to the value of the AP and valid until the AP is repaid as stated in the contract document (Rameezdeen et al., 2006). Further, the authors have stated that the value of the guarantee is progressively reduced while the amount is repaid by the contractor. Employers calculated the AP as a percentage of Contract Sum by reducing the provisional sums and the contingencies upon the submission of AP guarantee by the contractor (Construction Industry Development Authority [CIDA]/ Standard Bidding Document [SBD] 2, 2007). The total value of the AP and the details about the installments are included in the Contract Data (CIDA/ SBD 2, 2017) and Appendix to Tender (FIDIC, 2017). According to CIDA/SBD 2 (2007) and FIDIC (2017), AP Certificate is issued after submitting the Performance Security (PS) and the AP guarantee by the contractor and the guarantee has to be issued by an institute which is approved by the Employer.

D. Way of recovering the AP

AP is recovered or repaid from the Interim Payment Certificates (IPCs) as percentage deductions (CIDA/ SBD 2, 2007). According to FIDIC (2017) and CIDA/ SBD 2 (2007) deductions would be started from the first IPC issued after releasing the AP. Deductions are made from the IPC to recover the total value while the total payments have been reached for 90% of the Initial Contract Price (ICP) without the value of provisional sums (CIDA/ SBD 2, 2007). However, when the AP has not been recovered until the issue of Taking Over Certificate (TOC) or before the Termination of the Contract by the Employer, Suspension and Termination by the contractor or Force Majeure

in accordance with the situation in the construction project the remaining value has to be paid immediately for the Employer by the contractor (FIDIC, 2017; CIDA/SBD 2, 2007).

E. Benefits to the Contractor from AP

AP provides a huge support for the contractors in the construction industry to stabilise them in the construction projects. Accordingly, AP provides access for the small and medium scaled contractors who have awaited effective participation due to the lack of financial capabilities (Eyiah and Cook, 2003). Greater support has been given by the AP to manage the cash flow by utilising the capital at the commencement of the projects (Maravas and Pantouvakis, 2012). However, informal security for the payments of the contractor is given through the AP by the Employer (Aje and Adedokun, 2018). Moreover, AP provides benefits for the contractors such as solving the problems related to the delay payments, speeding the process of construction, managing the risks, ensuring the quality of works, and motivating the contractors for their performances (Hussin and Omran, 2009).

F.Challenges faced by the Contractor due to AP

Contractor has to face various challenges while receiving and utilising the AP as described in this section.

G. Misuse of AP

Contractors can handle more than one construction project at the same time and as a result, the need for money is higher with the contractors to balance their construction activities (Hansen et al., 2017). Accordingly, the contractor would allure to use the AP for the needs of other construction projects and sometimes for non-construction activities as well (Choi and Kim, 2014).

H. Difficult to obtain the AP guarantee

Employers issued the AP after submitting the unconditional on-demand guarantee by the contractor from a commercial bank which has been approved by the employer (Akinseinde and Awolesi, 2015). The bank will issue a guarantee for the contractor by investigating the assets of the contractor to certify that the value of the assets is similar to the value of AP provided by the contractor (Schulz et al., 2015). Sometimes, the small and medium scaled contractors have difficulties while seeking the AP guarantee as they have not enough assets to value (Abubakar, 2004).

I. Additional cost

Even though, AP issued as an interest-free loan it would cause an additional cost for the contractor in terms of money and time (Sherif and Kaka, 2003). The contractor has to prepare and maintain bank documents to obtain the AP guarantee with the aim of acquiring the AP (Akinseinde and Awolesi, 2015). Accordingly, the contractor would have spent additional costs in relation to maintaining those documentations and they have to spend a considerable time in this regard (Aje and Adedokun, 2018). This challenge is highly affected by the small and medium-scaled contractors as they have less financial capacities to compete with other contractors in the industry (Rasak, 2012).

J. Factors affect to the utilisation of AP

Effective utilisation of the AP can be identified as a common problem that can be met in the construction industry. Some of the researchers believe that inadequacy of AP is occurred due to the impacts of the project environment (Memon et al., 2014; Ezeldin and Abdel-Ghany, 2013). Although, some other thought that inadequacy is caused due to the factors within and outside of the project which is irrespective with the building environment such as less assistance of the employer and extra control from the project outside entities (Love et al., 2015).

K. Internal factors

Aje et al. (2017) described that the culture of AP would cause overruns due to the inadequacy. Mainly, this would cause for the construction projects in which the design is incomplete or incorrect and while having reworks, delays, and extra costs (Love et al., 2015). Furthermore, the authors have stated that construction projects with complete designs also can cause overruns due to errors in documentation and often for delays, disputes, and extra works. When the different parties have been involved to manage their finance effectively, that can lead to a successful construction without overruns in the construction (Aje et al., 2017). According to

Olatunji (2010), there is both symmetrical and asymmetrical relationships between the employer and the contractor in the overruns due to the cost for the contractor can be the price for the employer. Accordingly, AP can influence several factors while utilising the payment with the construction (Aje and Adedokun, 2018).

Human resource management can be identified as another factor that can affect for the utilisation of the AP in case of having less motivated and dissatisfied staff (Love and Li, 2000). According to Olatunji (2010), when there are appropriate protocols with the staff to manage the performances with the resources, there would not be inadequacy in the payment. However, AP has been issued at the commencement to reduce the issues caused due to the price escalation of the materials and when AP would not be used properly which can be affected for overruns (Aje et al., 2017).

L. External factors

Apart from the internal factors of the construction projects, external factors can be affected for the overruns in the AP (Aje et al., 2017). Accordingly, the political environment related to the construction project, exchange rates, inflations, national income, and the monetary policies can affect the construction projects as external factors for the utilisation of AP (Baloi & Price, 2003; Olatunji, 2010).

III. RESEARCH METHODOLOGY

This research intends to answer the problem of "how does the adequacy of AP affect the contractors in the construction industry in Sri Lanka?" through a mixed method approach, as qualitative methods subsidies to implement systematic analysis on evolving beliefs and is more suitable, when the study has a trifling base of literature background and quantitative method useful to analyse the close-ended questions of a questionnaire survey. Fifty questionnaires were distributed among the staff members of the contractor organisations and 38 of them have been responded to the questionnaire to evaluate the adequacy of AP to the contractor. So that, the findings from the open-ended questions were analysed with the use of the manual content analysis method. The closed-ended questions were analysed using SPSS software and the RII ranking technique. The RII values were calculated by using the following equation.

$$RII = \frac{\sum PiUi}{n(N)}$$

Where,

n- Number of participants

Pi -Participant's rank

Ui- Number of participants ranking project factor

N- Highest rank

IV. RESEARCH FINDINGS

The findings gathered in the literature survey were included in the questionnaire survey and the respondents were asked to rank them according to 5 point likert scale. Further, they were encouraged to provide more factors relating to the Sri Lankan context as well.

A. Benefits of AP to the Contractor

Majority of the respondents stated that AP is the financial support for the contractor, which creates relief on them from the financial burden at the initial stage of construction projects. On the other hand AP gives an opportunity for experienced contractors as well as newer contractors to mobilise in the construction industry. More than 68% of respondents satisfied with the current recovery method. Table 1 presents ranking of benefits of AP to the contractor.

Table 1: Ranking of benefits of AP

Benefits of AP	Mean	SD	RII	Rank
Speed up the construction process	4.55	0.86	0.91	1
Solve the financial problem	4.37	0.75	0.87	2
Provide an interest free loan	4.37	0.75	0.87	2
Motivate the contractor	4.21	0.78	0.84	4
Manage the financial risk	3.74	0.69	0.75	5

Solved the problems related to delayed payments	3.39	0.89	0.68	6
Ensure the quality of the work	3.21	1.21	0.64	7

According to Table 1, 'speed up the construction process', 'solve the financial problem', 'provide an interest-free loan', and 'motivate the contractor' were identified as the top four benefits of AP by the respondents and RII value of each greater than 0.8.

B. Factors affect for the contractor on the utilisation of AP

Factors affect for the contractor on utilisation of AP according to the RII value are presented in Table 2.

Table 1: Ranking of Factors affect on utilisation of AP

Factors affect on utilisation of AP	Mean	SD	RII	Rank
Internal Factors				
Incorrect and incomplete design	3.76	0.79	0.75	1
Culture of AP	3.68	0.96	0.74	2
Documentation errors	3.37	0.94	0.67	3
Management of human resources	3.30	1.18	0.66	4
External Factors				
Monetary policies	3.92	0.75	0.78	1
Inflations	3.84	0.92	0.77	2
Exchange rate	3.53	0.89	0.71	3
National income	3.34	0.71	0.67	4
Political environment	3.18	1.04	0.64	5

According to Table 2, respondents believed that 'incorrect and incomplete design' and 'Monetary policies' as the main direct and indirect factors that negatively affect on utilisation of AP respectively.

The reworks and the extra works due to the incompleteness of the design will negatively affect the utilisation of AP. As a result of design errors, the purchases from AP will not suit to the design. Then, the AP will overrun and be inadequate to complete the initial works. Further, monetary policies are always affected by the financial works within the country. Similarly, it will affect the AP.

C. Application of advance payment in construction projects in Sri Lanka

All the contractors have applied AP as an interest-free loan for the commencement of the construction. The contractors in Sri Lanka are also using the AP to complete the activities of mobilisation by doing the initial procurements and basic preliminaries for the commencement of the construction projects as highlighted by many researchers. Accordingly, AP is used to maintain the balanced cash flow from the beginning of the construction. Moreover, the study reveals that in Sri Lankan construction industry, AP has been used for any work item that has to be fulfilled to commence the construction. However, the contractor has to repay the AP as agreed in the conditions of the contract. Misuse of AP, and utilisation of AP were identified as main challenges for contractors while using AP.

D. Adequacy of the AP

The responses received for the mobilisation activities of AP accepted as "sufficient" by 29% (11) of the respondents. Whereas 24% (9) of the respondents believed that the amount of AP was "not sufficient" and 47% (18) of respondents said that the adequacy of the AP will depend on the nature and the size of the project. Accordingly, 82% of the respondents are unwilling to change it. Moreover, the opinion of the contractors about the current allocation and the level of adequacy have been considered through the process of data collection according to the standard forms of contracts such as SBD1, SBD2, SBD3, and FIDIC red book. Accordingly, respondents view on the allocation of the AP based on the standard forms of contracts are summarised in Figure 1.

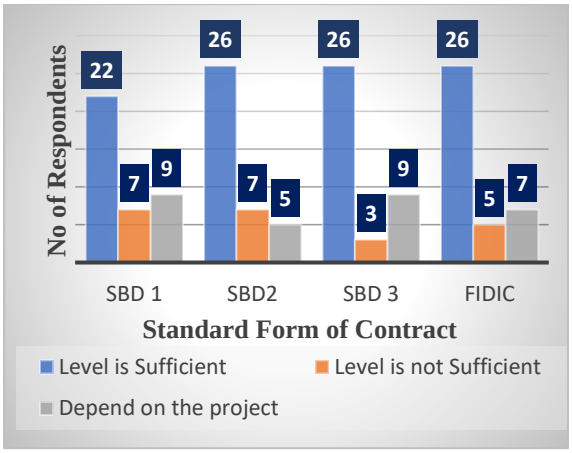

Figure 19: Level of satisfaction of AP as per form of contracts

According to Figure 1, around 60% of respondnets believes that existing AP amount is sufficient, where as some respondnets opined that it is not sufficient and the value of AP depends on the project value.

When considering the adequacy of AP, respondents have mentioned that it is the first payment for the contractor to mobilise, it should be at an adequate level. So, according to their views contractor and the Employer should negotiate and agree on a value that depends on the nature and the size of the project. Since the contractor has to maintain a better cash flow throughout the project, better consideration has to be given for the adequacy of AP. Majority of them believed that the value of the AP should be laid between 20%-30% of the contract sum. Further, respondents hope to have an amount of money that covers the initial cashflow of the project through the AP.

E. Recommendations to strengthen the AP procedures in Sri Lankan construction projects

According to the respondents, the AP has to be completely utilised by the contractor to get its maximum benefit in construction projects. It should be done in a planned manner by carefully monitoring the cashflow to reduce cost overruns.

The analysis included the respondents' reviews on the provisions given for AP in Standard Forms of Contracts as well. Accordingly, the industry practitioners were satisfied, dissatisfied, and stay as neutral by mentioning that it would depend on the nature of project and the mutual agreement between the parties about the procedures to be followed in AP. However, it has been suggested to use the formal methods mentioned in the Standard Forms of Contracts as the procedure of the AP without making adjustments for the procedure. Accordingly, responses were dissatisfied with the procedures that are followed besides the provisions in Standard Forms of Contracts.

Moreover, the respondents expressed that the AP should issue in an adequate percentage (which is not too low or too high) of the contract sum by considering the nature of the project as it is the initial financial support for the contractors to start up their workings by maintaining a better cash flow. So, before issuing the AP, it is better to consider the nature of the construction with the other environmental effects like social and political concerns. Further, the contractors should be able to utilise the amount received as the AP to achieve its maximum benefits and maintain a better cash flow.

V. CONCLUSION

AP is a significant payment received by the contractor from the employer to commence the construction works. There are standard procedures to be followed while issuing the AP for the contractors. However, the study has found that this would benefit in construction projects to speed up the construction process and solve the financial problems with some direct and indirect factors tht affect for the utilisation of AP. According to the findings, incorrect and incomplete designs and monetary policies are the major direct and indirect factors, respectively that negatively affect for the utilisation of AP. However, this study is limited only for the building construction projects, which used SBD and FIDIC as the form of contracts. This study will motivate the contractors to manage the amount received as the AP to maintain a proper cashflow and will provide knowledge on the benefits and the possible challenges laid with the AP. The study was conducted based on the perspective of contractors and it can be concluded that AP is adequate for the contractor for the mobilisation of his works at site. The research can be extended further to investigate the perspectives of employers and the consultants on the AP in construction projects.

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