

Acceptability of Lean Concepts to Functions of Quantity Surveyor in Sri Lanka

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Abstract

'Lean' is a newly addressed concept for construction industry, the core of this concept is segregating construction activities into Conversion Activities and Flow Activities, arguing that making conversion activities more efficient whilst improvement of non value-adding activities - i.e. reducing or eliminating them – should primarily be focused.. In addition to processes, Lean concepts can be adopted to professionals' activities in construction industry- i.e.Quantity Surveyor. Effectiveness and efficiency of their functions are essential for a profitable process with overcoming all inconveniences and difficulties that may arise. 'Lean' can be considered as a method of overcoming aforementioned situations. This study explores the acceptability of Lean Concept in functions of Quantity Surveyor in the Sri Lankan context, through an expert opinion survey using Delphi Method. The research finds that Sri Lankan Quantity Surveyors accept the core principles of 'Lean' and concludes that 'Lean' is an acceptable concept within the Sri Lankan Quantity Surveyors and recommended as a methodology to be adopted for the Sri Lankan context. The need of examining the Feasibility and the Suitability of the Lean concepts is suggested before implementing, while providing base for 'Suitability Test'. Several requirements and organisation related procedures are also proposed for successful implementation of Lean Concepts for the Sri Lankan Quantity Surveyors.

Keywords: Contracting Quantity Surveyor, Flow Activities, Lean Concepts, Sri Lankan construction industry

1. Background

Construction sector encompasses a wide spectrum of activities including provision of professional and technical. While providing them, construction industry is still renowned for its chronic problems such as low productivity, insufficient quality, time over-runs, and poor safety, which hinder customer delivered value.

Among the professionals who are involved in the construction process, to perform, to avoid above issues and provide a good quality service, Quantity Surveyor plays a major role. The Quantity Surveyors is one of the major characters of the construction team, a financial consultant [1] who is keeping accounts and controlling of all costs. The Royal Institute of Chartered Surveyors (1991) defines the role of the Quantity Surveyor as “ensuring that the resources of the construction industry are utilised to the best advantage of society by providing

financial management for projects and a cost consultancy services to the client and designer during whole construction process.” Duties of a Quantity Surveyor depend on factors such as nature of the project; organization context; and, procurement system adopted. However, the traditional role of the Quantity Surveyor was typically organised around the production of Bill of Quantities and final accounts [2]. In addition, [3] describes QS in a different way; as an amalgam of several other disciplines such as economics, law, accountancy, management, information technology and construction technology. In sum, the traditional services of the quantity surveyor were considered to be largely reactive, but necessary important which was mainly a technical back office operation has expanded his services to various paths [4] such as Real Estate Management, Contract Management, Project Management, Facilities Management, Risk Management, Value Management, Claims Management.

Through QS work, various problematic circumstances such as low productivity, insufficient quality, poor coordination and high expenses [5] can associated with the Quantity Surveyor, same as for any other construction professional. Thus, there is a need to apply some methodology to increase their productivity and efficiency in functions.

In the beginning of the 1990’s, the new production philosophy, which is known by several names(world class manufacturing, lean productivity, new production system) evolved in the European Construction Industry and in United States, adapting from Japanese manufacturing principles of Lean thinking; Lean Concepts, to provide solutions for such chronic problems arise in construction industry. The core of it is in the observation that there are two aspects in all production systems: Conversions and Flows. Conversion activities produce tangible outputs whilst flow activities bind such conversion activities together during the delivery process of the outputs. Although all activities expend cost and consume time, only conversion activities add value to the material or piece of information being transformed into an output, thus, the aim is to reduce or eliminate non value-adding flow activities and to make conversion activities more efficient [6].

In addition to processes, Lean concepts can be adopted to professionals’ activities in construction industry. According to traditional thinking consideration is paid only for the conversion activities and ignores flows. Many tools and techniques have been devised for implementation of Lean thinking in amplifying the performance of the professionals such as quality assurance, computerized integration of design and procurement and electronic data interchange and they can be implemented for the profession of Quantity Surveying also. According to [5], application of the Lean principles can be done several stages. Through such an application, cost and time reductions can be achieved; and hence productivity improvements can be achieved in number of circumstances which incorporates the benefits of competitive advantage.

Considering the current status of Construction Industry in Sri Lanka, this concept seems productive and effective, timely and appropriate at the outset. Still, since any type of an application may need to be customised to better suit the local setting, the acceptability of Lean Concepts to role of the Quantity Surveyors in Sri Lankan context, too, is indecisive. Therefore, the essentials of this new philosophy should be explored in the domestic environment in order to

test its acceptability to Sri Lanka, before the application. Thus, it seems necessary first to be clear on a main area of focus in Lean Concepts - such as the prevalence of non value-adding activities in the profession of Quantity Surveying in Sri Lankan construction processes and the awareness of such concepts amongst both consultant's and contractor's Quantity Surveyors in order to examine its relevance to the Sri Lankan context.

2. Acceptability of Lean Concepts to QS

For any process or activity, proper systematic implementation is essential to achieve maximum usage of the implementing concept. In adopting the Lean principles for the Quantity Surveying profession, proper consideration should be given, to gain the benefits and evaluation of the concept because it is important to check the adoptability to a particular organization, environment or a role. "Strategic Option Evaluation Tests" presented by Johnson and Scholes (1997) can be used to check the application of Lean for the profession of Quantity Surveying since it consist of three tests which are helpful in evaluating a strategic option. These are Suitability Test, Acceptability Test and Feasibility Test. Both Suitability and Feasibility Tests have been intentionally omitted from this study since they are more related to process and organisation context and results is hard to generalise for the whole Quantity Surveying population they cannot be accomplished through the scope of this study.

2.1 Acceptability

According to the Strategic Option Evaluation Tests, the Test of Acceptability considers whether the strategic option will gain crucial support from the people who involve in it or whether it will lead to opposition or criticism. According to general management theorists to check the acceptability of a philosophy, acceptability of its principles must be checked among involving people. Therefore, principles of 'Lean' and methodologies to attain the concept will be explored in the remaining part of this section.

2.1.1 Principles of 'Lean'

As stated above the core principles of 'Lean' should be analysed to check the acceptability and the core principles of Lean Concepts are elimination or minimising of non value-adding flow activities and making conversion activities more efficient. In addition to those core principles, According to [5] and [7], there are few other principles in 'Lean' related to construction professionals. They become the benefits gained by the involving professionals, as mentioned below.

- Increase output value through systematic consideration of customer requirements
- Reduce variability
- Reduce cycle times
- Build continuous improvement into the process
- Simplify by minimizing the number of steps, parts and linkages
- Increase output flexibility

- Increase process transparency
- Focus control on the complete process
- Balance flow improvement with conversion improvement
- Benchmark

Thus, if the construction professionals are to accept Lean philosophies, they also should believe in these principles, as mentioned above. For example, if a Quantity Surveyor is to accept major principles of 'Lean', he also should accept that only conversion activities add value and thus non value-adding flow activities should be eliminated whilst making conversion activities more efficient in all his activities and it gains benefits. Only if they are convinced and open to believe its benefits in implementation, they support in establishing Lean principles for their duties. If the Quantity Surveyors feel that application of Lean concepts may cause inconvenience to them, with the prevailing workload, they may hesitate to accept this philosophy. Since this application creates changes for the prevailing workflow or process, an extra attention and effort are needed for the procedure, this may creates less-responsive among Quantity Surveyors about them.

3. Selection of research approach for testing the acceptability

In this research process such opinion survey will be conducted for few functions of a Quantity Surveying role, which are mostly used in Sri Lankan Construction industry. According to [4], functions of a contracting Quantity Surveyor, can be identified according to their relative importance; pricing of Bill of Quantities, Interim valuations, Variation accounts, Cash Flow preparation and Final accounts are the five functions which are most common in Sri Lankan context. Above mentioned decomposition of activities can be done for them and then the acceptability of Lean principles can be tested by identifying flows and conversions included in them.

Since, this is an initial study on acceptability of Lean Concepts in Sri Lankan Quantity Surveying; it is needed to pay attention to a broader perspective rather than to in-depth analysis. Thus, considering all these facts it was decided to undertake an Opinion Survey based on the Delphi Method to check the acceptability of Lean Concepts for the Quantity Surveying, in the Sri Lankan context.

Since the M1 and M2 are considered as main contractors who carry out the major construction work in Sri Lanka while adopting profession of Quantity Surveying, expert panel from the Quantity Surveyors of M1 and M2 contractors was selected. Among all Quantity Surveyors involving in post contracting activities in the industry, managerial level Quantity Surveyors of the organizations were selected because since this 'Lean' is a managerial concept which can be successfully achievable with the level of experience through the industry. With the idea that, there may be many types of flow wastes in the functions of Quantity Surveying, but due to the fact that there may be flows either hidden or not given much attention, only well experienced personnel will observe and identify the most amount of them, it was decided to choose twenty

five (25) Quantity Surveyors who are currently involving in managing post contract activities, with high level of experience.

4. Delphi Method

As required by the Delphi Method , the mode of data collection was through questionnaires, and, were distributed in three rounds. Data collection steps were as follows.

STEP 1: The Delphi Round One Questionnaires will be distributed amongst the panel members, with the aim of identifying flows and conversions of the selected functions of Quantity Surveying.

STEP 2: As the second step, the Delphi Round Two Questionnaires were distributed to the survey sample, presenting the identified flows and conversions from the First Round. The participants were asked to provide their opinion on these identified flow activities, whether they can be eliminated or minimized, or not while make opinions on the given statements about the lean principles.

5. Data Analysis and Discussion

5.1.1 Identification of Conversion and Flow activities

In the First Round, the participants were asked to identify the Conversion and Flow activities separately, they had experienced in the Sri Lankan construction industry, out of given sets of sub activities, decomposed from the selected major five activities (see Figure 1) and to mention the additional types of activities they had experienced. After analysing the collected data from the First Round of the survey, the results were taken to the second round to check the opinions regarding the elimination and minimisation of flow activities. Out of the total results obtained from the Delphi Round One, the flow activities, which obtained less than fifty percent (50%) opinion, have been excluded as per the analysis criteria. When analysing the second round results, flow activities, which scored more than fifty percent (50%), as ‘can be minimised or eliminated’ were only selected in modifying the models of the selected functions of a Quantity Surveyor. The results obtained through the analysis can be presented according to the selected activities as follows.

(A) Pricing Bills of Quantities

All other sub activities relate to both flow and conversion activities, according to the opinions of the panel. Flow activities hold 86.96% of total activities, while emphasising that most of the sub activities were flows which consume time and cost, without adding value to the total process. Only ‘get site visit investigation report’ and ‘use pre-bid meeting records’ scored more than 75% of flow wastes which cannot be minimised, according to the results of the second round. Out of all fourteen (14) flow activities mentioned in the round two, eight are more than 50% saying that they can be minimised or eliminated. It emphasises that although they believe there

is a huge set of flow activities, they may have the problematic mentality on whether they can be minimised or eliminated in the real practice as illustrated in theories. Pricing Bills of Quantities is a critical activity of a contracting organisation, which decides the profit and the survival of the organisation in the industry. Quantity Surveyor is the responsible person in this task to perform it accurately, holding a great risk. Therefore, it is amply palpable that above mentioned flows- ‘get site visit investigation report’ ‘use pre-bid meeting records’ and also ‘Getting prices from suppliers’ hold a high percentage as ‘cannot be minimised or eliminate’, when considering the importance of information receiving from that steps.

All five functions were checked and analysed using decompositions of sub activities (see Figure 1) and activities, which can be minimised or eliminated, are presented in shaded boxes (see Figure 1). All the activities can be presented as this and figures of other activities are not been presented due to space limitations.

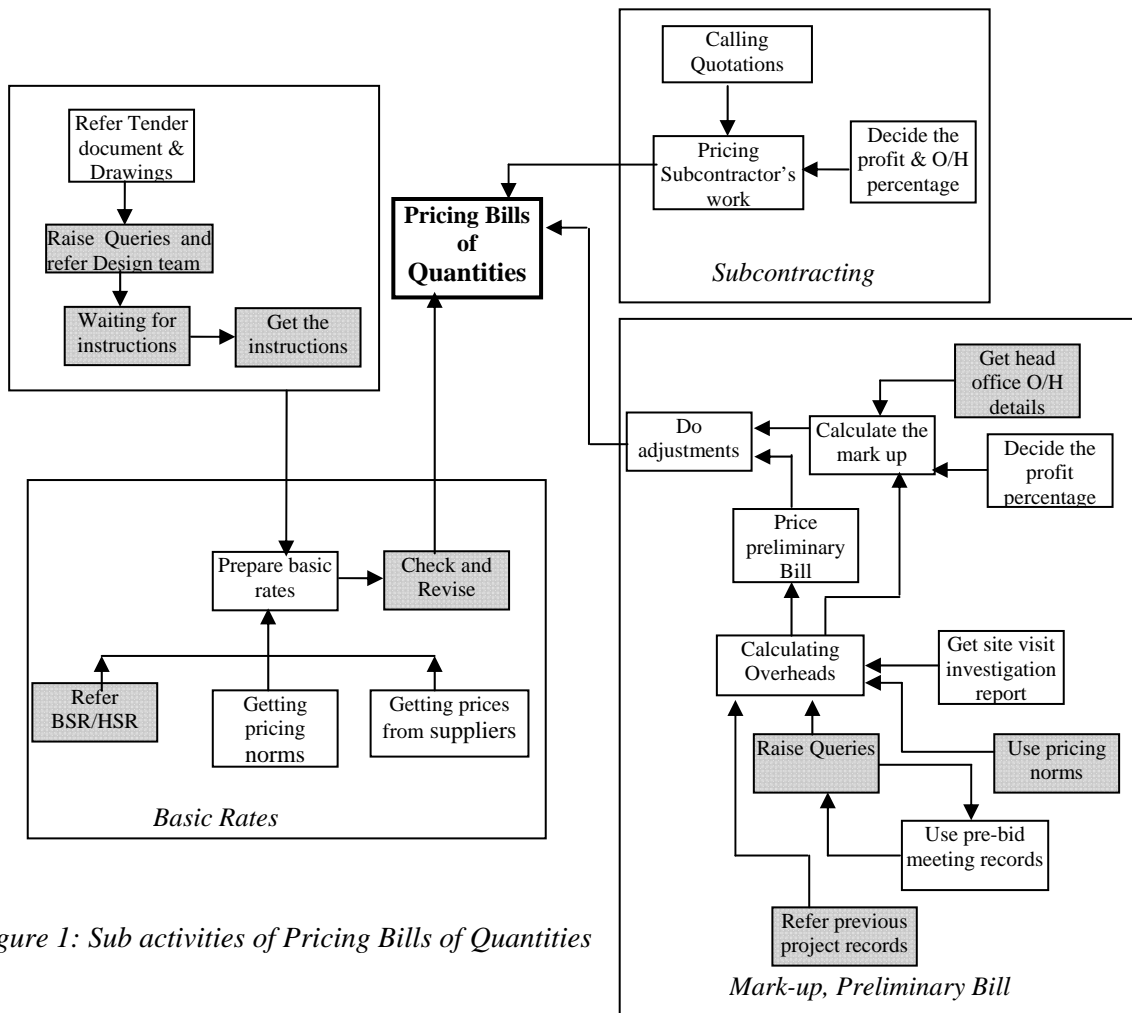


Figure 1: Sub activities of Pricing Bills of Quantities

(B) Interim valuation

In the function of Interim Valuation, only the ‘preparation of interim application’ acts as a pure conversion activity, as selected by the experts, resulting of 91.67% of activities as flows. Only ‘Joint measurements’, ‘Obtain items and rates from BOQ’ and ‘refer previous valuations’

obtained more than 50% out of all responses of the panel, which emphasizes that the most of the sub activities of the function act as conversions throughout the interim valuation process. Joint measurement is the only flow activity which gained higher percentage as 'cannot be minimized or eliminated' type, according to the second round results of the opinion survey. Other two activities can be eliminated or minimised according to the responses of the panel.

(C)Preparation of cash flow

Preparation of cash flow bears the highest percentage of 92.86% as flow activities, which leads to conclude that it, is the least significant out of given five functions, among the contracting Quantity Surveyors. There are five (5) flow activities which scored more than 75% in the first round while only 'Raise Queries gained more than 80% while others hold between 50%-65%. The results mentioned above, provides evidence to confirm the thought that most Sri Lankan contractors are not practicing standardize or proper cash-flow forecasting or controlling method.

(D)Pricing Variations

Pricing Variations, twelve (12) sub activities were presented and three (3) were selected as fully conversion activities with 100% of total while six (6) sub activities obtained 80% as flow activities which can be considered as high amount. In pricing variations, 'Submit the Quotation for Engineer's approval' is only activity which depict less tendency to be minimised or eliminated, while all others scored more than 50% as flows that can be minimised. As this holds the least percentage of flow activities; the panel has considered that most of the sub activities of the function are significant. There is a propensity to arise variations in any project and pricing is important from the view of both client and contractor.

(E)Final Accounts

When considering Preparation of Final Accounts, out of seven activities, only two activities scored more than 50%. It allows concluding that most of the sub activities in the final accounts are conversion activities, according to the opinions of the panel members. When considering second round results, both flow activities can be minimised or eliminated with a percentage ranged from 65%-70%. It is also a significant function of a Quantity Surveyor since it is the point that both client and the contractor view the total financial involvement of the product-leads to Quantity Surveyor to feel more on his responsibility than adopting new concepts.

Even though the Quantity Surveyors participated in the study were quite experienced and in managerial level of contracting organisations, they also had mentioned a considerable percentage of flow activities as 'cannot be minimised or eliminated'. The main reason for this might probably be the fact that a concept such as Lean Concepts, which pays attention to flow wastes, has not been applied in the Sri Lankan construction industry so far. If there had been such a concept, the whole workforce including Quantity Surveyors throughout the organisation, would have had knowledge and practice to some extent, regarding minimising of flow activities. Since these different professionals and other parties such as clients, statutory authorities and

suppliers have different roles to play in the construction setting, Quantity Surveyor needs to deal with them in fulfilling his/her tasks. Thus minimising or eliminating identified flow activities would cause changes to the procedure and influence other involving parties, which would lead to explicit problems. Also this procedure may incur additional resources such as time and other physical resources and new implementation may interrupt the existing process of the Quantity Surveyor including other organisational activities. If there would not be such barriers, there seems to be a demand for such a concept to be applied in the Sri Lankan construction industry in order to eliminate the earlier mentioned non value-adding flow activities.

Thus, it is very logical to argue that these non value-adding flow wastes should be a critical factor causing such cost and time overruns. Therefore, these flow activities seem to be a major weakness in contracting Quantity Surveying, also with the overall Quantity Surveying profession in the Sri Lankan construction industry.

From the above analysis of results from Delphi Round One and Two Questionnaires, it seems apparent that these non value-adding flow activities are a major weakness in contracting Quantity Surveying profession in Sri Lankan construction industry.

Thus, there needs to be a necessity for some methodology which can eliminate or minimise these non value-adding activities from the functional processes of the Quantity Surveying. Since Lean Concepts is a concept, that aims to eliminate or minimise non value-adding flow activities, it can be argued that Lean Concepts is appropriate in applying to renovate the processes of contracting Quantity surveyors in Sri Lankan context.

From the above discussion, it is quite evident that Lean Concepts is suitable to apply in the Sri Lankan context. Thus, it is then necessary to test how ‘acceptable’ this concept is, in the Sri Lankan context.

Before understand the ‘applicability’ of the Lean principles, it is needed to understand that there is a need of such theory, for the functions of Quantity Surveyors. With above opinion survey, panel members clearly understood about the flows and conversions in their functions and ‘need of Lean concept’ for their functions, to gain a more effective and efficient work procedure.

5.1.2 Acceptability of Lean Principles

In order to test the acceptability of Lean Concepts, through the Part ‘B’ of Delphi Round Two Questionnaire, the participants were asked to mark their opinion regarding twenty (20) statements which were compiled based on core principles of Lean Concepts.

Table 1: Results of checking the acceptability of principles of ‘Lean’

No.	Statement	Mean	St.Dev
Principle 1	‘Conversions add value for the process’		

01	All of earlier mentioned main functions of a Quantity Surveyor add value to the final output for the client	4.80	0.50
02	A majority of functions of a contacting Quantity Surveyor in the concepts industry are add value to the final output for the	4.64	0.64
03	Any Quantity Surveying function consist both value adding and non value adding activities	4.48	0.77
08	Conversion activities should be improved to gain an efficient and effective process	3.28	0.74
<u>Principle 2</u>	<u>'Flow activities, which are non value-adding, should be eliminated'</u>		
04	Most of the sub activities of main functions add no value to the final product of the client	3.48	0.87
05	Non value adding activities consumes both time and cost but adds no value to the process	4.24	0.60
06	The amount of value adding activities is less when considering the sub activities of single function of Quantity Surveying	3.88	0.73
07	The amount of conversion activities (value adding activities) are less inside all contracting Quantity Surveying functions	4.52	0.77
09	Flow (non value adding) activities should be minimised or eliminated to gain an efficient and effective process.	4.64	0.64
<u>Principle 3</u>	<u>'To increase output value, systematic consideration of customer requirements is essential'</u>		
10	The prime intention should be adding value to the client in every activity in the process	4.72	0.61
11	Systematic consideration of customer requirements should be given to increase output value of the functions	4.52	0.71
20	With these improvements, Quantity Surveyor can gain benefits through his/her functional processes which assist in achieving	4.68	0.56
<u>Principle 4</u>	<u>'Reduce variability'</u>		
12	These improvements reduce the variations which can be arise through the process	3.80	0.96
<u>Principle 5</u>	<u>'Reduce cycle time'</u>		
13	These improvements reduce the time of a particular process	3.80	0.87
14	Improvements should be continuous through whole process of the functions	4.64	0.57
<u>Principle 6</u>	<u>'Minimise the number of steps'</u>		
15	These improvements help to minimise the number of steps in a function of a Quantity Surveyor	4.04	0.79

<u>Principle 7</u>	<u>'Increase process transparency'</u>		
16	These improvements help to create error free functions for the contracting Quantity Surveyor	3.76	0.97
17	These improvements increase the sharing and communicating information in functions for the contracting Quantity Surveyor	4.36	0.57
<u>Principle 8</u>	<u>'Control and balance of the process'</u>		
18	When improving the functions, total procedure of the work should be considered well.	4.65	0.63
19	Both conversions and flows should be improved simultaneously	3.68	0.99

The results showed that the Mean values for the eight principles are approximately around 4.00 with Standard Deviation values lesser than 1, which can be considered as a less deviation. Inline with the earlier interpretations of Mean and Standard Deviation, the above results show that all the eight factors gain values over the centre limit of 3.00, even after the deviations are considered. This implies that there is consensus amongst the participants that they 'Agree' to these principles. Therefore, it is reasonable to argue that the experts accept that 'Conversions add value for the process', 'Flow activities, which are non value-adding, should be eliminated' – which are the statements two core principles of Lean Concepts. Among all the statements, Principle 3 statements gained the highest mean value, depicting that most of the members believe in positive side of the statement. It is true that there should be a systematic procedure to adopt any concept successfully, for a particular process and this general truth apply for the Lean Principles as well. Further it can be argued from the results of lowest mean value of the Principle 4 above, 'Reduce Variability'-that the experts believe that there would be a level of accomplishment on it, but only up to a marginal extent. Panel members may have the mentality that the adopting new methods of Continuous Improvement would occur some deviations to their normal procedure of the functions. Although, Lean Principles emphasises that Continuous Improvements will reduce the propensity of varying the work throughout the procedure, above stated mentality of the practitioners may had lead to comparatively low response on it. Therefore it seems that whilst the experts themselves accept the Lean principles, they believe that the other practitioners too would accept the ideology of Lean Concepts. This emphasises the importance of teamwork and coordination between the Quantity Surveyor and other involving professionals, for a successful completion of tasks. So this improvement should not be focused only to Quantity Surveying profession and should relate to involving other professionals in an organisation.

Since reliability and validity of the results must be checked, 'Reliability Analysis' in the SPSS 10.0 software is used to measure the reliability of the data obtained through the research while the Rotated Component Matrix of the Factor Analysis in the SPSS 10.0 software was used to

check the validity. Thus, according to the above discussed results of the Factor Analysis, the twenty (20) statements in the Part 'B' of Delphi Round Two Questionnaire seem to be valid. This implies that the intended idea of testing the acceptability of Lean Concepts in the Sri

Lankan context is conveyed through these twenty statements. According to the Reliability Analysis, since the Cronchbach's Alpha value of the data exceeds 0.70, it is clearly evident that the data obtained for Factors are reliable.

6. Conclusions

'Lean' is a new philosophy for the construction industry which was adapted from the manufacturing industry which depicts the concept that there are two activities in any process- Conversions and Flows. This concept argues that whilst making conversion activities more efficient, improvement of non value-adding activities - i.e. reducing or eliminating them – should primarily be focused [6].

From the obtained results of the first part, it can be clearly identified that all selected activities of Quantity Surveying are considered as conversion activities, when taking them as a whole. But each of them is a combination of sub activities-identified as conversions and flows. In accordance with the data analysis, major portion of the main activities are flow activities which obtained more than eighty five percent (75%) of total sub activities (see Figure 2), means that major share of Quantity Surveying activities consume time and other expenses without adding a worth for the process.

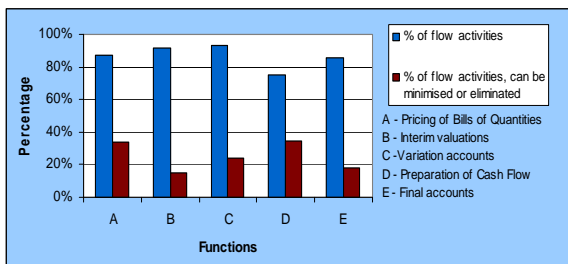


Figure 2: Proportion of Flow Activities of selected functions of a Quantity Surveyor

These results suggest that almost all participants in the panel have a common understanding that there are frequent flow activities throughout the provided functions of a contracting Quantity Surveyor in the Sri Lankan construction industry. This leads to conclude that all Quantity Surveying functions consist both flow and conversion activities.

Also it was disclosed that most of the flow activities can be minimised or eliminated and the awareness amongst the Quantity Surveyors regarding these non value-adding flow activities is considerable. This fact also support that 'Lean' is a suitable concept for the Quantity Surveyors since it becomes easy to adopt it with the awareness of component in it.

This research discovered that Lean Concepts are acceptable for implementing in functions of contracting Quantity Surveyors in Sri Lanka. To accomplish this in Sri Lanka, individual quantity Surveyor and the involving organisation should check its feasibility and suitability for the working procedure within the particular firm. In order to check whether it is feasible to implement the concept of Lean Concepts within the particular organisation, the company should ensure that, there is top management commitment to the implementation; there should be

resources provided to the Quantity Surveyors and also company policies and regulations should facilitate this concept.

Also it is recommended that the Quantity Surveyor as the cost expert in the industry should try to quantify these wastes and should try to cost them. As a result he/she would be able to draw the attention of all the management and other employees of the company to take necessary actions to prevent these flow wastes. A cultural change to Quantity Surveyor and other involving parties is essential to minimise the problematic effects arising through the application of the 'Lean Concepts'.

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