Barriers of Life Cycle Costing on Construction Consultant Practice in Malaysia

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Abstract. Life Cycle Costing (LCC) is deliberately known as a vital tool of construction process to optimise the whole life cost from the cradle to grave. LCC also considered as an important factor for a project to meet the equilibrium point of its strategic objectives. In order to implement the LCC, the procedures must undergo certain framework that enables comparative cost assessments to be calculated over specific duration and take account to relevant economic factors of initial, maintenance, operational, salvage value, discount factors, refurbishment and disposal costs. The aim of this paper is to appraise the benefits and barriers of Life Cycle Costing (LCC) practised in the construction industry of Malaysia among the consultant team. The objectives of this paper to explore the benefits and barriers of LCC faced by consultant team in construction projects. To comply with research objectives, a questionnaire survey and interview conducted among the consultant team in Malaysia. 57 participants responded for the survey conducted in this research. From the results, it appears that the implementation of LCC among the professional design team is still limited. Most of the consultant teams had a good knowledge on the processes of analysing LCC, the parameters to be included but still at minimal phases of implementing overall LCC procedures. The lack of reliable data of LCC founded as the main barriers in the Malaysian construction industry. Most of the respondents agreed that the benefit of LCC is the best way to consider the impact of all costs rather than only initial capital costs.

1. Introduction

Life Cycle Cost (LCC) is one of the tool to assure sustainable development to be practiced. LCC is best defined as model that estimates the initial, capital, financing, construction, operation, maintenance, renovation, refurbishment, demolition, and salvage costs over the life span of a building or facility from cradle to grave [6]. The analysis of LCC can be used to distinguish the available alternatives that can offer best value for money [5].

2. Literature Review

Construction industry is associated with risks; certainty and uncertainty of cost, time and quality. The construction stakeholders demand for value for money of the product whilst prioritising the sustainability features for the next generations [11]. LCC is not only emphasised on initial capital cost but other costs relatively incurred right after the possession of land [7].

LCC is the commonest economic evaluation tool to assess whole life cost of an asset or parts at the same time achieved the performance criteria. LCC able to visualise the future costs and demonstrate the transparency, accountability, proper planning, cost benefits analyses, and contractual requirement purpose [8].

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2.1. Benefits of LCC
The benefits that can be gained from adopting LCC will depend on the objective of the project, LCC exercise and circumstances [10]. The benefits of LCC are:

a. Accountability and transparency of future operational & maintenance costs (including annual sinking fund).

b. Enhanced awareness among the stakeholders of whole life costs.

c. Able to optimise the future cost at early stage (design stages).

d. Delivering value for money in the project.

e. Promoting sustainable development by prioritising performance trade off against cost.

f. Evaluation of best options for whole life of assets or parts.

2.2. Barriers of LCC
The benefits of LCC are obstructed by the list of barriers that exist either externally or internally of the construction projects. The barriers are [12]:

a. Reliability of Capital (CAPEX) and Operational Expenditure (OPEX) data.

b. Lack of guidelines and standard method of LCC.

c. Intangible factors (such as political influence, environment factors and others).

d. The future market conditions – inflation, taxation, interest, future costs.

e. Gaps of knowledge among the owner/investor and consultant team.

f. LCC exercise is 0.2-0.5% expensive.

g. Failure of the design team to visualise the whole life cost.

h. Risk and uncertainty of LCC outcomes.

3. Research Methodology
The method used in obtaining the data are by printed and electronic materials such as journals, books to expedite the literature review. In addition, questionnaire survey distributed to targeted sample of population (consultant team) to aid the empirical study.

3.1. Research Population and Sampling
The professional design practice are the targeted population of this research which includes various background. The population of 200 respondents were identified through companies’ email registered with Board of Quantity Surveyor Malaysia, Malaysia Institute of Architects, Malaysia Institute of Planners, and Board of Engineers Malaysia. The distribution to consultants is based on their participation and duty in preparing LCC. The most significant roles in LCC calculation are Quantity Surveyor, Facilities Manager/Building Surveyor and Real Estate Valuer. The ratio of distribution for mentioned consultant team are higher compare to architects, town planner, and others.

3.2 Questionnaire
The survey designed parallel with the objectives of the paper. The first part evaluates the respondents’ professional practice, size and year of establishment of the organisation. A choice of multiple answers had been pre-determined to assist the respondents. The second part comprise of questions with five likert-scale answer from strongly agree to strongly disagree about the benefits and barriers of implementing LCC in Malaysian construction industry.

3.3. Method of Data Collection
This paper is focusing on the benefits and barriers of LCC among the consultant team in Malaysia. There are two method of distributing the questionnaire which encompass of face to face survey and online survey. Online survey are done by uploading the questionnaire forms via Google forms.
3.4. Data Analysis
The data collected were analysed by using Statistical Package for Social Science (SPSS). The set of data were analysed in statistical approached which deliver a proper data handling.

4. Findings

4.1. Benefits of Life Cycle Costing
In this section, the data obtained indicates the awareness among the consultant team on the benefit of LCC. The aim of this section in line with the objective of this paper. According to the survey, the mean of top three LCC benefits indicated the same mean (4.42 - agree). However, the ranking was determined by the standard deviation. Most of the respondents agreed that the benefit of LCC is it considered all impacts of all costs rather than only initial capital cost. In the nutshell, it indicates that majority of the consultant team have a decent fundamental knowledge of LCC. Subsequently, the respondents agreed that LCC able to assist in the effective management of assets. Thirdly, they agreed that LCC able to assist in producing earlier actions to generate revenue or lowering the overall cost of an asset.

Generally, all of the LCC’s benefits set in the survey achieved standard deviations less than one, which express significant agreement among the respondents. In addition, all of the benefits of LCC obtained the mean more than the scale of four, which represent agree. It proof that most of the respondents in this survey are aware the benefit adopting LCC in their project.

Table 1. Benefits of Life Cycle Costing

| Benefits of LCC                              | Mean | Std. Deviation | Rank |
|---------------------------------------------|------|----------------|------|
| Consider Impact of All Costs                | 4.42 | 0.653          | 1    |
| Effective Management                        | 4.42 | 0.731          | 2    |
| Generate Revenue or Lower Costs             | 4.42 | 0.801          | 3    |
| Investment Options Effectively Evaluated    | 4.37 | 0.723          | 4    |
| Accurate and Realistic Assessment           | 4.35 | 0.744          | 5    |
| Framework for Incremental Costs             | 4.26 | 0.720          | 6    |

4.2. Barriers of Life Cycle Costing Implementation in Malaysian Construction Industry.
Majority of the respondents strongly agree that the utmost barrier is lack of reliable data. Based on the survey conducted, the problem faced by construction player is short of data especially Operational Expenditure (OPEX). However, public and private sectors can obtain the data of Capital Expenditure (CAPEX) from historical database. The data from manufacturer for building components or parts such as Original Equipment Manufacturer (OEM) is the most difficult to obtain. The main barrier of LCC implementation is lack of existing reliable data (mean 4.56), it is strongly supported by research [6]. Next, lack of knowledge on LCC by the client ranked second (mean 4.23), followed by lack of experience by the design consultant team (mean 4.19), lack of interest from the client (mean 4.00) and lack of standard method (mean 3.56). It is contradict with the agreement on lack of standard method, where Public Work Department has published a Guideline of LCC in 2012. It is aim to enhance the awareness among construction player to exercise LCC in their project. The guideline is a good reference to adopt LCC practice. Government also has put initiative by setting a regulation for any public project, which involved with value management approach and worth valued more than RM50 million are mandatory prerequisite to adopt LCC.
Table 2. Barriers of Life Cycle Costing

| Barriers of LCC                                      | Mean | Std. Deviation | Rank |
|-----------------------------------------------------|------|----------------|------|
| Lack of Reliable Data                               | 4.56 | 0.780          | 1    |
| Lack Of Knowledge by the Client                     | 4.23 | 0.802          | 2    |
| Lack of Experience by the Professional Team         | 4.19 | 0.766          | 3    |
| Lack of Interest From Client                        | 4.00 | 0.824          | 4    |
| Lack of Standard Method                             | 3.56 | 0.926          | 5    |
| Intangible Factor                                   | 3.12 | 1.226          | 6    |
| Lack Of Encouragement By Government                 | 3.05 | 1.342          | 7    |
| Risk And Uncertainty of LCC Outcomes                | 2.96 | 1.281          | 8    |
| Unstable Market Condition                           | 2.82 | 1.241          | 9    |

5. Conclusion

It can be presumed that execution of LCC particularly in Malaysia Construction industry as new approach and not widely adopted. Taking into general thought, it is discovered that the practice of LCC among the construction professionals is still limited. The loopholes of implementing LCC are gaps of knowledge among the consultant team [2]. Barriers that exist such as reliability of data, and lack of experience of the consultant team hindered the LCC to be widely adopted in construction project.

6. Recommendations

Government should play the role and put fundamental interest to adopt LCC procedures not only focusing Private Finance Initiative (PFI) but also on others building for government utilisation [1]. It includes for new project or existing building because operational and maintenance no longer play a minor role in life span of a buildings. Therefore, government influential is important to develop LCC assessment. As mentioned in earlier chapter, small improvement or deprivation within the operational phase will give a huge economic impact.

Despite from that, government agencies such Construction Industry Development Board also need to sustenance the effort by setting certain condition, codes, regulation and obligation to the private sectors developers for adopting LCC. Introduction of specific codes for energy usage, which related to LCC should be formulated to encourage the development of LCC in the industry.

Furthermore, government should encourage the parties involved in construction about the awareness of adopting knowledge management in their business activities. It is important for all the stakeholders to access to specific database system that provide reliable data on LCC. The existence data for LCC are not standardised, it is differ from other practice such as quantity surveyor firms in Malaysia able to access the schedule of rates provided by Public Work Department at Rates Online (RATOL) database system.

Private sector clients are categorised as the sponsoring organisation, initiator who has direct intention and responsible to development of a project. Clients have certain factors for embracing long terms economic models into various stages in construction project. Educating the clients on the procedures of LCC is important. Some of the client refused to adopt LCC approach due to incurring cost of managerial aspects. However, the long terms return and savings could be achieved by optimising all associated post-handover cost. Seminar and conferences are some of the recommended mode of educating to encourage the LCC adoption among the investors.

Private sector clients also can assist government towards developing LCC capital and operational expenditures database. The initiatives of developing LCC database in European countries, such as
Sweden are undertake by the non-government organisation. The industry cannot totally rely on the government’s efforts. Professional design team should have a strong fundamental knowledge on LCC procedures (4). Professional design team are responsible to consult the clients and give their professional judgement to optimise the overall cost of the projects. Professional bodies such as Institute of Surveyor Malaysia, Malaysian Institute of Architects, Boards of Engineers Malaysia and other bodies related to construction industry are recommended to encourage their members on the importance of LCC implementation. Besides that, educational efforts should be conducted to enhance the understanding and knowledge on LCC.

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