The Implementation of Construction Cost Index (CCI) in Malaysia

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Abstract: Cost performance is an important criterion in construction industry to determine a project success. In order to enhance the construction cost estimation and cost performance, Construction Cost Index (CCI) is introduced. CCI serves as a business cycle measurement in budget preparation, cost modelling and cost forecasting in construction projects lifecycle. Although CCI has been introduced by Construction Industry Development Board (CIDB) over a decade however the cost performances for construction projects in Malaysia are still remain unsatisfactory. Therefore, this study aims at examining the causal relationship of CCI implementation success factors to address the effectiveness of CCI in Malaysian construction industry. Principal Component Analysis (PCA), ANOVA and T-Test are conducted to examine the factors of implementation of CCI in relation to CCI components. It is found that economic condition and reliability and validity of CCI are the major success criteria in implementing CCI. Also, it is discovered that Malaysian construction industry is ready to adopt CCI to improve the cost estimating performance.

Introduction

Construction cost remains the highest concern throughout project management life cycle in construction industry [1]. It is an important criterion to determine a project success. In order to improve the precision of the construction cost estimation, Construction Cost Index (CCI) has been introduced and widely implemented by the developed countries.

The construction cost overrun in construction project has become a common norm in the industry. This can be seen from the past records that there are less than 50% of public projects and 37% for private projects are completed within the designated budget [1].Therefore, it is essential to ensure that the budget preparation for construction projects is comparable to the real time estimated cost during the projects. Through the introduction of CCI in construction industry, the accuracy of budget preparation can be improved [2].

Through the support and encouragement of Construction Industry Development Board (CIDB) Malaysia, CCI is first run in Malaysia on December 2003. Malaysian government has taken the first move to amend the acts and actions to reimburse the escalated building material cost to the construction parties [3]. By implementing CCI, the budget preparation, cost control and cost management in Malaysia construction industry are expected to improve. With the awareness of construction personnel in the utilization of CCI, the projects' cost performances can be enhanced.

CCI has been introduced in Malaysian construction industry over a decade. However, its effectiveness and implementation are yet to be justified. As such, it is crucial to review the implementation of CCI in Malaysia. Therefore, study on the factors which influence the implementation of CCI in Malaysia ought to be conducted. Seeing that CCI is able to formulate an accurate construction cost forecasting which leading in better bidding, it is essential to maximize the application of CCI at the preliminary to its final stages in Malaysian construction projects. The result of this study is significant to the authority and practitioners in identifying the effectiveness of CCI in Malaysia construction industry. The awareness of local construction industry personnel on the effectiveness and application of CCI can be elevated in order to improve the overall cost performances in construction industry. Hence, solutions can be developed to overcome the barriers through the study of factors influencing the implementation of CCI in local construction industry.

Implementation of Construction Cost Index (CCI)

Moore and Riley [3] emphasis that continuous update of construction technologies across the global trends is needed for future construction activities. As a result, CCI is created and introduced to provide a better construction cost evaluation. CCI serves as an indicator showing the average cost movement trended to contractors in a period of time in construction projects [4].

CCI is implemented in Malaysia to provide a better construction cost evaluation. The components of CCI in Malaysia are building materials and products cost, labour cost, and construction equipment hire cost in Malaysia [5] [6]. However, Eurostat reviews that the contents to calculate CCI are building materials cost, labour cost, machinery cost, transportation, energy and others [7].CIDB has developed a new CCI to be used in Malaysia, this is due to transportation cost is usually ascribed in material cost in Malaysia and he cost of energy is mostly embedded in machineries, materials and overhead costs [8]. Consequently, the Malaysian CCI is consists of building materials cost, labour cost and machinery cost.

As the introduction of CCI is purposely to control and enhance the construction cost estimation, thus the reliability and validity of the CCI data provided is critical [9].The estimation of construction cost is directly influence by the accuracy of the CCI data [10]. Moreover, the economic indicators, macroeconomic and economic conditions in domestic or international have great and direct influences the construction cost [11]. Also, contractors and consultants is assisted in determine the market trends. Additionally, the context of construction projects and project management also influence the construction parties to implement CCI in their contracts as well [12].

The support of local government is a crucial issue for a region to adopt new implementation. In fact, the publication of indices and prices fluctuation on construction materials monthly by CIDB is assisting the contractors and consultants to get the accurate construction cost. In order to examine the effectiveness of the implementation of CCI, the factor influences the implementation should be identified. The factors influence the implementation of CCI in Malaysia is classified into five main issues as shown at Figure 1.

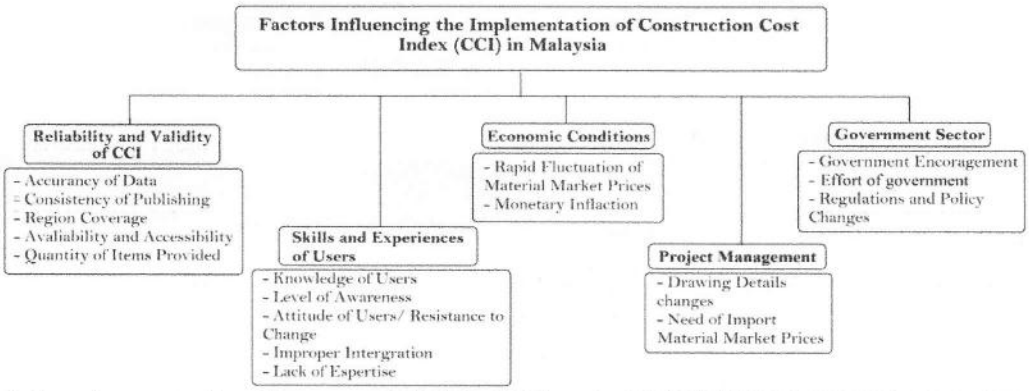

Figure 1: Implementation Factors of CCI in Malaysia [7] [9] [10] [11] [12] [13] [14] [15] [16] [17] [18] [19] [20] [21]

Methodology

Questionnaire survey is selected to collect the data from the registered CIDB G7 contractor. There are 5829 contractors registered under CIDB G7 in Malaysia [2]. The population sampling is based on 95% confidence level, 5% sampling error, resulted in data sampling of 360 sets. 1000 questionnaire is distributed to the contractors, 426 sets are received, and 375sets valid questionnaire encountered representing 37.5% of response rate. The result is validated through a semi structured interview with the authorities and practitioners.

Principal Component Analysis (PCA) is conducted through SPSS to the factors influencing the implementation of CCI in Malaysia. The reliability test of Cronbach's Alpha is recorded as 0.937 meanwhile Kaiser-Meyer-Olkin and Bartlett's Test is recorded as 0.692.

Data Analysis

There are five main factors affecting the implementation of CCI in Malaysia, namely reliability and validity of CCI, skills and experiences of users, economic condition, project management, and government policies and regulations. The key factors that affecting the implementation of CCI is extracted through Principal Component Analysis (PCA) as shown in Table 1.

The highs factor loading is recorded as 0.824 (CCI provides latest market prices), followed by 0.798 (CCI reflects the local economic condition to construction industry), 0.793 (Published CCI is up-to-date), 0.792 (Government policies and regulations enhanced the implementation of CCI) and 0.775 (The CCI provided by CIDB is tally with real time market).

It is found that economic condition and the reliability of the CCI is the main factors that influencing the implementation of CCI in Malaysia. The economic condition is dominating the construction cost (building material, labour and machinery cost) meanwhile the reliability and validity of the CCI is greatly rely on the accuracy and the publication time of the CCI in Malaysia.

Table 1: Principal Component Analysis of items in the five (5) core factors in this study

Rotated Component Matrix[a]			
			Loading
Reliability and Validity of CCI	SA1	The CCI provided by CIDB is tally with real time market.	.775
	SA2	The time interval on publishing CCI is sufficient.	.689
	SA3	Published CCI is up-to-date.	.793
	SA4	CCI provided by CIDB cover all the states in Malaysia.	.657
	SA5	CCI data is easy to be accessed and obtained.	.653
	SA7	CCI provides the prices of unique items.	.654
	SA8	CCI provides needed import materials prices.	.733
Skills and Experiences of Users	SB1	CCI is known by most construction personals.	.683
	SB4	The skill to utilize CCI is known.	.712
	SB6	Construction personals recognise CCI from various sources.	.701
	SB9	Construction personals are willing to learn to use CCI.	.741
Economic Condition	SC2	CCI provides the latest market prices.	.824
	SC3	CCI reflects the local economic condition to construction industry.	.798
	SC5	Data of CCI in CIDB is up-to-data with the actual market prices.	.713
	SC6	Global and local economic affect the use of CCI in Malaysia.	.705
Project Management	SD1	Frequent changes of drawing.	.692
	SD2	Use of CCI enables to save construction cost.	.671
	SD5	CCI contributes time efficiency to the entire construction project.	.707
Government Policies and Regulations	SD6	CCI provides current material, labour and machinery prices.	.678
	SE6	Government policies to cancelled building materials controlled prices cause CCI to be used to obtain latest market fluctuation prices.	.670
	SE7	Government policies and regulations enhanced the implementation of CCI.	.792

After examining the most influencing factors of CCI implementation in Malaysia, the next logical step is to evaluate the effects of nature of business of the respondents towards implementation factors of CCI. There are seven (7) significant factors have vary effects on the implementation factors.

According to Table 2, factor SA1 (The CCI provided by CIDB is tally with real time market) is significant to the respondents. This can be seen from the high positive mean skewed to the strongly agreed. However, contractor and consultant mean weightage is lower compared to others. As for the practitioners of CCI, they are seeking for better accuracy of CCI which can reflect the real time market fluctuation. This is mainly due to the CCI data provided should be reliable to encourage the implementation of CCI as the data reliability is directly influence the accuracy of cost estimation [17].This could be further justified by the CIDB interviewee that the accuracy and reliability of the CCI data is the most important factors which influence the utilisation of CCI by Malaysian practitioner. Similar result encountered for SB4, both parties are seeking an improvement of skill to utilize CCI. On the contrary, contractor and consultant are more agreed for SC3 (CCI reflects the

local economic condition to construction industry) and SC6 (Global and local economic affect the use of CCI in Malaysia).

Table 2: ANOVA Test-Implementation Factors and Respondents' Firm

	SA1				SB4				SC3				SC6				SE4				SE5				SE7			
Firm	Co	D	Cs	A	Co	D	Cs	A	Co	D	Cs	A	Co	D	Cs	A	Co	D	Cs	A	Co	D	Cs	A	Co	D	Cs	A
Mean	3.16	3.66	3.39	4.00	3.30	3.50	2.95	3.83	3.81	3.16	3.34	3.16	3.89	2.66	3.86	3.50	2.14	2.00	3.08	1.83	2.24	2.00	2.95	2.34	3.59	3.66	2.69	4.16
F	9.942				6.18				11.064				14.124				11.256				6.994				13.045			
Sig.	0.000				0.001				0.000				0.000				0.000				0.000				0.000			

*Co = contractor firm, D = development firm, Cs = Consultant firm, A = Authority

There are significant difference mean value in the ANOVA test for SE4 (CCI hard to implement in cost estimation due to the complexity of cost performances in construction projects) There is significant bias in SE4 as the authority results and consultant results are extremely different. From the interview, consultants agreed that CCI is a good initiative to improve the costing performance in construction, however, the difficulties of implementation is rely on the real time publication of CCI. At the current stage, CIDB is unable to collect, analyse and publish the data based on market fluctuation. The factor of CCI implementation is greatly counted on the improvement of CIDB management in this matter. Similar results encountered for SE7 (Government policies and regulations enhanced the implementation of CCI) and SE5 (Government did not enforces CCI or provides policy/regulations to encourage the use of CCI). The outliers in mean values from consultants raise the concern of ineffective government policies and regulations in enforcing the CCI implementation.

After conducting ANOVA, a statistical examination on three (3) CCI components (building material cost, labour cost and machinery cost) is conducted to justify the implementation factors of CCI to the components. The result is shown in Table 3.

Table 3: Independent T-Test of Implementation Factors and CCI Components

Independent Sample T-test							
	Factors	Means					
		Building Materials Cost		Labour Cost		Machinery Cost	
		Low	High	Low	High	Low	High
SB7	CCI not suitable to be use in construction projects.	3.1148	2.8085	2.8070	3.1765		
SB9	Construction personals are willing to learn on using CCI.	3.3443	3.5532	3.6316	3.2157		
SC5	Data of CCI in CIDB is up-to-date with the actual market prices.			3.1579	3.0392		
SC6	Global and local economic condition is the factors affect the use of CCI in Malaysia.	3.6230	3.6170			3.6957	3.4872
SE5	Government did not enforce CCI or provides policy/regulations to encourage the use of CCI.	2.3115	2.2128			2.4348	2.1795
SE4	CCI hard to implement in cost estimation due to the complexity of cost performances in construction projects.			2.2807	2.2549		
SE7	Government policies and regulations will be the important factor causes the implementation of CCI in Malaysia.	3.3770	3.6809	3.5789	3.4314	3.5797	3.3846

*All results in significant level of 0.05
*Low means median and lower, High means above median

Based on the t-test result, there are significant different on factors SB7, SB9, SC5, SC6, SE4, SE5 and SE7. As building materials cost (BMC) occupy more than half portion in CCI components [2], views on implementation factors of CCI by respondents who allocates higher material cost portion are significant to justify. This group believes that CCI is suitable to be utilised in construction projects to control material cost. It is worth noted that SC6 as p value for two groups in BMC differ significantly (with sig (p)= 0.05 or less), yet the actual difference of means is small which is not clinically significant. This problem usually occurs when scores within the groups are similar and the groups have small standard deviations [22]. It can be concluded that the respondents are emphasized on building material costs and economic condition as these factors are highly

influence the CCI fluctuation [15]. In contrast, CCI is less important if it do not provide reliable market data as this may resulted in unreliable cost estimation.

Conclusion

The introduction of Construction Cost Index (CCI) since 2003 in Malaysia has reasonably improved the construction cost estimating in the industry. However, the CCI is not widely implemented by the practitioners due to lack of enforcement by the authority and weaknesses encountered in the real time CCI publication. The benefits and advantages of implementing CCI can be seen from the developed countries in Western Country where construction material prices are monitored by the authority to reduce speculations and minimize construction cost conflicts.

Since CCI has proven its ability to improve cost estimating performance and Malaysian construction industry is ready to adopt, Malaysian government should enforced the implementation of CCI as a stepping stone to moving towards developed country.

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