CONSTRUCTION COST INDICES AND SOURCES (CCIS): A SUMMARY OF SOME INTERNATIONAL SOURCES AS GUIDE IN NIGERIA

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ABSTRACT

Construction cost indices and sources (CCIS) are terms that have been echoed around the world by researchers and practitioners alike. Many governments all over the world have intervened in the construction industry with the aim of improving efficiency and saving public funds. The objective of the paper is to educate the government on construction cost indices and to improve a better understanding of the construction cost sources. This paper define cost index in simple terms; highlight the factors to be considered in constructing an index and uses of cost index/applications. It also articulate cost indices philosophies as input indices, output indices, hybrids, building cost and tender price indices. The development of various construction cost sources was investigated. Some sources provide adjustment factors for locations and others provide adjustments for time. Availability of CCIS may not be a panacea to all the problems in the construction industry but it will surely make it better. It was concluded that project promoters and estimators to carefully assess the situation at hand and prior to selection of an applicable cost index for a preliminary cost estimating exercise. A major recommendation from the research was that, a workable construction cost indices Data Bank that would be well articulated and managed be put in place in the country for accurate and reliable data storage and accessibility at all times.

Keywords: CCIS, Efficiency, Cost Indices, Philosophies, Project Promoters, Estimators.

INTRODUCTION

It has been demonstrated that economic performance places demands upon the management and delivery of construction projects. According to Diekmann (2003), An increasingly global institutional, commercial and industrial (ICI) construction market place has fuelled more intense competition to host new facilities. The result is a cycle driven by competition, which in turn, drives the need to search for more efficient methods for project management and delivery (PMD). Cost estimating is an important aspect of PMD; therefore, any efforts directed at improving PMD must take cost estimating (CE) into consideration. Many project promoters rely upon conceptual methods to provide estimates of construction costs early in the project development phase. By removing some of the requirements for design details and detailed historical cost data, conceptual methods allow estimates to be made in the absence of substantial design data. At this stage, estimation by cost indices is one of the more common approaches for all types of construction. Although each index differs in its intended use and reliability, fundamentally an index is used to transform a known cost at one place or time reference to an estimated cost at the required place or time (Diekmann, 2003). A normalization procedure is used to transfer costs to a baseline value of 100 to allow for a decrease in the value of the data as well as an increase. Variability in indices produced by different sources is owed to differing underlying assumptions. The assumptions and methodology behind indices vary, thus rendering any attempts to transfer values between indices unreliable. Even comparisons of the estimated project cost for a particular location based on one cost index with that based on another may result in inconsistent estimating conclusions about the competitiveness of that location. Therefore, the objective of this paper is to educate the government on construction cost indices and to improve a better understanding of construction cost sources.

COST INDEX

Cost index is a number indicating the current level of prices, wages, etc compared with a previous level. An index number will measure the change in the cost of an item or group of items has occurred from one period to another. It is also said to be a multiplier derived from cost information of past project which is used to fore-cast the building cost of a new or future project. Its objective is to measure the economy's price level or cost of living. Cost index is necessary for the development of any meaningful impression of location competitiveness. Consideration needs to be given to the reliability of the data used to produce the cost sources and the validity of the assumptions with respect to the intended use of

the index. Estimators need to ensure that the data provided by these cost sources are representative of prevailing political and economic conditions of the location in question.

Factors to be Considered in Constructing an Index

i. The Purpose of index: The purpose must be considered carefully since it will affect all decisions relating to the other factors.
ii. The Selection of items: There is difficulty in capturing the spirit of an index by measuring a limited number of items.
iii. The Choice of weights: The balance between the importance of the individual items in the index is achieved through weighting the different values.
iv. The Choice of base year: A typical rather than a freak year should be selected since this is more likely to provide an honest and reliable index.

Uses of Cost Index/Applications

Index numbers are used either for updating historic cost data to current pricing levels or for predicting future trends in costs and prices. The following are some of the more uses and applications:

Cost planning: The process of cost planning requires the efficient use of large quantities of historic cost data. The total cost of a project, the all-in rate or the prices for an individual element can be updated. For instance, PR = OR x CI / OI where PR is the proposed rate, OR is the original rate, CI is the current index and OI is the original index. Also, the percentage difference between the two rates can be calculated as follows: Percentage change = CI – OI / OI x 100.

Forecasting: The pattern of existing indices can be extended to a date at some time in the future.

Variation of price clauses (fluctuations): Indices are used to calculate the increased costs of construction under a fluctuation-type contract.

Comparisons of cost relationships: The costs of different materials and processes do not change at the same rate.

Assessment of market conditions: In addition to the cost of building, market conditions will affect the price charged to the client. The tender price index takes this into account. A relative market condition index can

be calculated by dividing the tender price index by the building cost index.

Pricing: Index numbers can be used for updating prices in the bills of quantities or either published sources, to current or future dates. The process used is identical to that used in cost planning.

COST INDEX PHILOSOPHIES

The applicability of an index is affected by its type. Generally, indices are characterized as input, output, or hybrid (Mohammadian and Seymour, 2004).

Input Indices

Input indices are representative of the construction process inputs such as common materials, equipment, and trade labour hours. Although some effort may be put toward generally proportioning quantities of labour and materials to represent their usage, the primary objective is to reflect the local market prices for these items. The same quantities and units are used for every location. Most importantly, they do not contain any assumptions or adjustments related to labour productivity, skill levels, practices or local building code requirements. As a result, they are the simplest to produce and contain the least error. Input indices may be useful for companies that move their crews around and only need to know the differences in the costs of materials. Alternatively, these indices are useful if labour productivity can be assumed to be similar between the locations, or if a general cost of construction comparison is desired.

Output Indices

Output indices measure the total cost of construction of a completed structure in each location. These indices more accurately represent the real costs of construction and reflect local conditions including labour skill, availability and productivity; however it is extremely difficult to collect the information and it usually requires significant estimating resources. The challenge rests in the effort required to match project parameters across locations. If data from real buildings are used, then adjustments must be made to make the unique buildings comparable. Alternatively, the plans and specifications for a single project could be sent to each location for estimation. In this case, it would be important to ensure each estimating team used the same assumptions and that they found the project requirements relevant in their location. For example, a brick facade may be standard in some locations, but not in others due to cost or building code requirements, say for earthquake resistance.

Theoretically, output indices are ideal because they reflect all local conditions. Practically, the effort required to produce them is onerous.

Hybrids

Hybrids focus on the installation of smaller, more manageable building elements such as foundation walls, insulation or roof membranes to exploit the ease of input index development and the reliability of output indices. Generally, labour, material, and equipment costs and overhead and profit are combined to produce total installed costs. When hybrid costs are transferred to other locations, it was generally found that the location indexes were based on changes in wage and material costs, not on differences in elemental installation costs.

DIFFERENCES BETWEEN BUILDING COST INDEX AND TENDER PRICE INDEX

Building Cost Index

It measures changes in the contractor's cost. It is constructed on a combination of actual wage rates, material costs and plant and overhead charges. The combination of these different items is complex in attempting to measure reality. It is therefore based on the principle of a 'basket of goods' in order to represent typical ratios.

A building cost index can be constructed for:

- The total construction costs of a building or a type of building.
- An element (external walls) or trade (brickwork) within the building process.
- A single material, e.g. cement.

Tender Price Index

It is based on what the client is prepared to pay for the building. It therefore takes into account building costs, but it also makes an allowance for market conditions and profit. It may or may not include fluctuations in price, depending on the terms of the contract. It is usual to provide two separate indices which can either include or exclude fluctuations.

COST SOURCES (The Canadian and American)

Boeckh Commercial, Institutional, Light Industrial Building Cost Guide

Boeckh has been published for 66 years. It provides 940 location indices including 53 Canadian cities. The baseline for costs is Milwaukee WI in 1995. It was chosen because of its historically stable economy and its typical profile of national economic characteristics. Boeckh provides

square foot building costs in Milwaukee, WI for 120 different building models falling into 10 model types.

Dodge Cost Guide

Dodge cost indexes have been published since 1932. All the costs found in the Dodge Unit Cost Guide are U.S. national averages. Local multipliers for over 1000 location indices including 86 Canadian cities are used to adjust the national average to the different locations. Crew compositions are assumed constant over all locations.

Engineering News Record

ENR has published indexes since 1913. It has focused primarily on input costs including labour, cement, lumber and steel. A 20 (USA) city average index is published weekly, but the specific city indexes are published annually in December.

Hanscomb-Means International Construction Cost Index

Hanscomb-Means has been in circulation for about 12 years. It provides a survey of in-place construction cost ranges to a prime contractor for industrial projects, showing approximate changes in costs over time and approximate differences in costs across locations. The baseline is Chicago, IL. Exchange rates are applied at the market rate current at the time of publishing. It covers 20 cities of which only one is Canadian.

Hanscomb's Yardsticks for Costing

Hanscomb provides installed-in-place costs for 8 Canadian cities. These indices are intended to be used as a costing tool by estimators for design working the early stages of a project and not as a bidding tool. Teh publication has four main sections. The Current market prices section contains prices organized according to the CSI Master Format Divisions. Prices in this section include all materials, labour to install, transportation, equipment costs, and site overheads and profit for work done by subcontractors.

Helyar Construction Cost Guide

The Construction Cost Guide has been published for more than 20 years. Helyar publishes an annual range estimate of in-place construction costs, expressed as cost per sq. ft., for 34 building types across 8 Canadian cities. Index trends are published for commercial building costs, institutional costs, industrial, apartment, and housing building costs, and consumer price index. The Guide excludes land costs, financing costs,

legal costs, architectural and engineering costs and permit costs. Site costs are estimated separately.

KPMG International Cost Comparison Analysis

Since 1994, KPMG has provided in-place costs (including land and construction) and operating costs (including labour, electricity, financing costs and taxes) for nine industries (electronics, food processing, medical devices, metal fabrication, pharmaceuticals, plastics, telecommunications equipment, packaged software, and advanced software).

Richardson International Cost Index

Richardson provides indexes that compare the cost changes over 21 international locations (of which 5 are Canadian) with an average, fictional location called Richardson, USA as a base. The factors are based on formulas used to adjust U.S. based estimates for process plant industry construction to each country. They attempt to meet the needs of owners, contractors, and consultants by providing economic, political, and regulatory information about each location as well as costs.

RSMeans Building Construction Cost Data

RSMeans has published cost data for over 60 years. The Means Building Construction Cost Data provides local multipliers that represent relative construction factors for material costs, installation costs as well as the weighted average for total in-place costs for each CSI Master Format Division. These multipliers can be used for comparing costs between 930 cities (of which 62 are Canadian) as well as across time for the same city.

Saylor Current Construction Costs

For 40 years, The Saylor Current Construction Costs has provided costs for union and open shop trades, 23 materials, 21 subcontractor specialties, and a major cities cost relationship index for 125 cities (5 in Canada). The costs are based on San Francisco, CA. The Current Construction Costs publication contains six main sections.

Statistics Canada

Statistics Canada has published the current ICI building index since 1981. These indexes are used only to compare changes in costs across regions and types of construction, not differences in absolute costs. They were developed for price deflators for estimating the real value of construction output for the National Accounts. Statistics Canada publishes three types of construction price indexes. First, their input prices monitor changes in the cost of labour, machinery and building materials. Second, the bid

price for construction outputs estimates the cost for certain types of engineered construction based on 7 unit bid prices. Finally, model prices for construction outputs estimate the cost of various model structures by pricing the in-place contractor's price for various components.

SUMMARY OF THE CHARACTERISTICS OF THE COST SOURCES (THE CANADIAN AND AMERICAN)

Only ENR produces solely input costs while all of the others produce hybrid assembly costs. All sources except StatsCan provide location indexes, but less than half also index over time. Almost all of the output-based sources provide assemblies and structures indices, while the majority of input cost sources provide labour indices. Only a few input sources provide materials and equipment indices. No cost source was however studied in the case of Nigeria.

Challenges in the use of Indices

According to Ashworth (2010), challenges in the use of cost indices can be summarized as follows:

i. The composition of an index is based on typical commodities that should reasonably measure the appropriate change. They may in practice be totally unrepresentative of the things they hope to measure.
ii. Commodities which may be considered to be important may be outside the scope of the index.
iii. In an attempt to measure real comparisons, the same item, same quantity and same source for the commodity must be used.
iv. If the original commodities cease to exist then inaccuracies can occur due to the substitution of alternative items.
v. The correct balance of items that were chosen initially may now proof to be false because of changes in fashion etc, that have occurred over a period of time.
vi. Individual weightings should be applied to reflect the importance of certain items in the index.
vii. Inaccuracies in the data can occur because of errors in computation or because users supplied false returns. They may do this to conceal information they do not wish to disclose.

CONCLUSIONS

The paper has demonstrated that the method of determination of cost indices has an obvious effect on the reported cost and all sources of indices can be proven to be correct, depending on their interpretation. In this light, the only way ahead seems to be for project promoters and

estimators to carefully assess the situation at hand and prior to selection of an applicable cost index for a preliminary cost estimating exercise and ensure that all assumptions are understood. Personal or local biases should not be allowed to affect the reliability of the process. It is always difficult to prejudge the evolution and development of existing systems, particularly in the more subjective construction project management area. Nevertheless, prediction is necessary for progress. Prediction based on analysis of the existing situation and its related historical trends can be used as a mechanism to project into the future. Although it has always been difficult to predict and project into the future of the construction industry, the effects of economic performance on international construction markets have long been observed and these observations have enabled accurate predictions of the effects of changing economies. Indications are that the outlook for competitiveness remains global. Hence, the international construction industry should continue to seek more efficient methods of PMD. The result will probably be a prolonged need to seek improvement in efficiency for countries to remain competitive as hosts for new facilities. Therefore estimators will be charged to make use of their ideal interpretations of the existing situation and related historical trends to formulate comprehensive frameworks for estimating.

RECOMMENDATIONS

The following recommendations have been drawn from the conclusion of this paper:

i. A workable construction cost indices Data Bank that would be well articulated and managed be put in place in the country for accurate and reliable data storage and accessibility at all times.
ii. The government to constitute a task force to investigate the construction industry and report on the prons and cons of the industry.
iii. Private cost sources should also be encouraged by the government (though capital intensive) to come up with cost yardsticks and indices as exemplified by Newpro-Quants Nigeria some years back.

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BIOGRAPHY

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Usman Muhammad Danjuma was born in December, 1978 in Bida, Niger State. He had his primary and post-primary education at Government Model School, Bida and Federal Government College, Minna respectively. He attended FUT, Minna where he obtained his B.Tech degree in Quantity Surveying in 2006 and M.Tech degree also in Quantity Surveying in February, 2017. A lecturer in the Department of Quantity Surveying, Federal Polytechnic, Bida. A fully Registered Quantity Surveyor with the Quantity Surveyors Registration Board of Nigeria; Member of the Nigerian Institute of Quantity Surveyors; Fellow of Strategic Institute for Natural Resources and Human Development and Graduate of the Nigerian Institute of Management (Chartered). He is happily married with children.

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Alamu F. Bosede was born on 22nd August, 1976. She attended Tudun-wada Primary School, Minna between1983 and 1988 for her primary education. She also attended Government Day Secondary School, Tunga, Minna between 1989 and 1994. She then proceeded to the Federal Polytechnic, Bida in 1995 and read National Diploma in Building and Quantity Surveying. She obtained B.Tech in Quantity Surveying at Federal University of Technology, Minna in 2006. In 2017, she also obtained her M.Tech in Quantity Surveying at F.U.T. Minna. She lectures at the Federal Polytechnic, Bida, Department of Quantity Surveying. Presently, a Member of the Nigerian Institute of Quantity Surveyors (NIQS). She is married and blessed with children.

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