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Development of a Cost Benchmark for Hostel Building Projects in Awka, Anambra State, Nigeria

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ABSTRACT

The study sought to first, develop a common cost benchmark for a specific size of hostel buildings in Awka, Anambra State, that can be used as reference cost benchmark for estimating proposed, similar hostel projects and second, to ascertain the most cost significant element of these hostel buildings projects. Awka was purposefully selected because of the presence of the only federal university in the State. Data on project cost, number of rooms, size per room and size of site was obtained from project records, based on some stipulate criteria such as project duration, site conditions, material, plant and labor specifications as well as their costs. Five hostel buildings met these criteria. Results of a simple average analysis showed that hostel buildings of 30 rooms on an average site size of 450m^2 has a project cost benchmark of N41.6m as at the second quarter of 2016 and a benchmark cost/m^2 of N92,444.00. An elemental Analysis also revealed that superstructure (52%), services (20%) and substructure (12%) were the most cost significant, while preliminaries (3%), finishes (8%) and external works (5%) were the least cost significant of these hostel projects. It was thus recommended that Quantity Surveyors/construction cost professionals and intending clients/hostel developers/Builders in Awka should consider adopting this cost benchmark before preparing their estimates or embarking on hostel construction of in order to enhance feasibility studies, sourcing financing/loans, reduce project duration and cases of abandoned hostel projects. The government, via professional bodies such as the Nigerian Institute of Quantity Surveyors (NIQS), should also endeavor to embark on rigorous research to create a data bank for benchmark costs of various types of building projects in different localities, to improve accuracy and reliability of construction cost estimates.

INTRODUCTION

Before launching a building project, the project manager has to assess the cost of the building prior to construction and even prior to framing a detailed estimate. To facilitate quick assessment of cost of the building or its elements (part) in a more realistic manner he can adopt the Elemental Cost Analysis method as developed by the Central Building Research Institute (CBRI) (Bogan, 1994; Guha, 2013) or he can make use of a cost benchmark.

Benchmarking is the process by which the estimated performance (often cost) of a project is compared to other similar projects. This can highlight areas of design that are not offering good value for money. It can also help in the assessment of tenders from suppliers and contractors (Atkins, 2013). Going by its literal definition, Benchmarking can also be considered a point of reference from which measurements can be made; and something that serves as standard by which others may be measured' (www.globalbenchmarking.ipk).

These results can also help support the employer and can also inform the concept design process. In view of this, it should be noted that there tends to be a high level of optimism in project feasibility stages, referred to as 'optimism bias' and in order for projects to be delivered to time and cost the optimism in project, estimates has to be reduced. The process of analyzing cost and benchmarking can help reduce optimism bias and consequently create a more 'predictable' project outcome (Fifer 1989; Atkins 2013). As design development progresses, along with knowledge about the employer's brief and the site itself, some features of a project may change beyond what was initially envisaged, hence, repeating benchmarking exercises throughout the design development process should, therefore, be considered (Rossiter 1996; Atkins 2013).

According to Nanayakkara and Fitzsimmons (1999), cost benchmarking is carried out to find examples of superior project cost performance, to understand the processes and practices driving that performance and to provide performance measurements as targets for best practice. The knowledge of project attributes underlying performance often enables performance targets to be normalized (or tailored) to suit other projects with different requirements. There is usually significant variation in the input costs to the construction process due to quality factors and market forces. Due to the absence of an industry-standard protocol for recording project cost information, these variations are often not captured and recorded in a standard manner (Camp

1989; RICS 2011). Benchmarking may be a one-off event but is often treated as a continuous process in which organizations continually seek to improve their practices (RICS 2011).

There are a number of factors to consider when thinking about the timing of a benchmarking exercise. At the Feasibility Stages, the employer is likely to be concerned with establishing an affordable cost limit for a project and may be considering a number of outline design solutions. This is, therefore, an ideal time for initial benchmarking because the process should reveal achievable targets for the cost limit, building efficiencies and gross internal floors areas, for example, before too much time and cost is spent on the design itself (Brussels 2011; Atkins 2013).

Generally, advice given to an employer at pre-contract stage (in respect of construction cost and duration to construct, among other things) is estimated. Consequently, it is likely that the estimate will carry with it an element of risk (Bernard 2006). A key output of the benchmarking process is that it produces a range of factual outcomes. This range can, therefore, serve as guidance as to the range of accuracy (the risk) of the advice given. Note, that it is worth considering the extremities of the range carefully; the benchmark data, i.e. the 'best in class' may be an aspiration but one which is only achievable given certain parameters which may or may not exist on other projects. However, Boxwell (1994) and Hong (2011) note that there is no single cost benchmarking process that has been universally adopted.

A number of obstacles hinder the development and use of cost benchmarks for building projects not just in Awka, but in Nigeria. These stem largely from the current industry culture for managing its projects. Overall, cost benchmarking practices in Nigeria is very low. In fact, there is hardly any use of formal benchmarking tools used by the government, private clients, organizations and professional bodies. With respect to the building industry, cost benchmarking is rarely adopted by Quantity Surveyors/construction cost experts, builders and developers at the inception/feasibility and design stages of projects to estimate the cost of proposed projects. The implication of this is that these projects may face abandonment when the monies budgeted for them cannot carry them to completion. To worsen issues, there is currently no data bank of cost benchmarks used for planning construction projects. It is against this backdrop that this research sets out not only to establish a reliable cost benchmark for estimating hostel building projects in Awka, Anambra State but highlight the procedures involved in developing it.

AIM AND OBJECTIVES OF THE STUDY

The aim of this research is to develop a typical cost benchmark for a specific size of hostel buildings in Awka, Anambra State that can be used as a reference cost benchmark for estimating proposed, similar hostel projects. The following objectives will help actualize this aim:

I. To obtain cost data for completed hostel building projects and to identify the cost significant elements of these projects.

II. To establish cost benchmark for the hostel building projects.

LITERATURE REVIEW

Definition and Concept of Cost Benchmarking

Project cost benchmarking is the process of measurement and comparison of strategies, policies, practices, and performance against best-in-class organizations. It is an important management tool for assessing building project cost. The concept is aimed at improving the processes performed by the recipient organization; to assess building project cost by applying efficient work processes (work done by people, equipment and information systems). It is a valuable building project cost technique and its application not only identifies innovative work processes but also involves discovering the thinking behind innovation (Bernard 2006; Atkins 2013).

Process of building project cost benchmarking

Building project cost benchmarking involves the following key steps as shown in figure 1.

• Data collection
• Data comparison
• Data analysis
• Action
• Repeat.

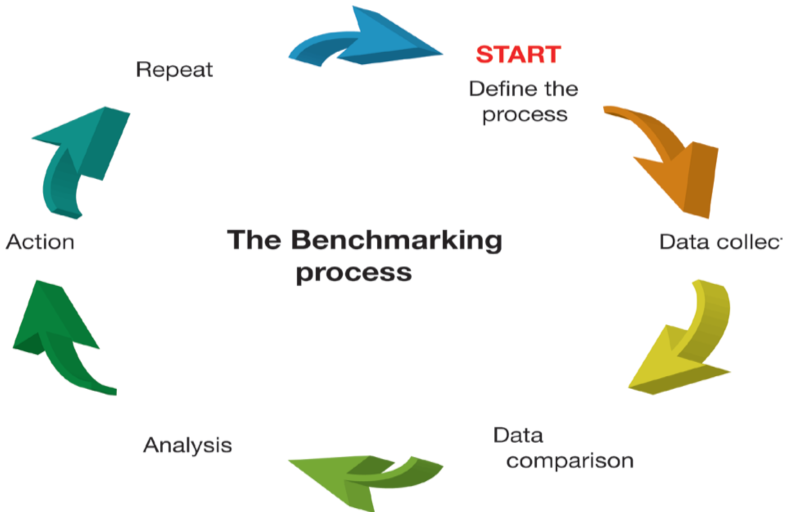


Figure 1: The Benchmarking process (Atkins, 2013).

In terms of data collection; it is considered good practice to establish a baseline with a defined method of measurement and its corresponding cost breakdown and analysis. During data collection, the following are considered: (a) collecting data appropriate to the objectives (b)the approach to collecting the data (c) the cost of obtaining the data, and (d) the time and resources required to collect and analyze the data. The means by which the collected data is displayed is also important since it should be clear and easy to understand. Options include tables, trend charts and graphs, pie charts, scatter diagrams,

After data collection, a comparison can now be made. Figure 2 show a typical comparison of the average benchmark costs on a project carried out by Atkins (2013) between 2003 and 2008.

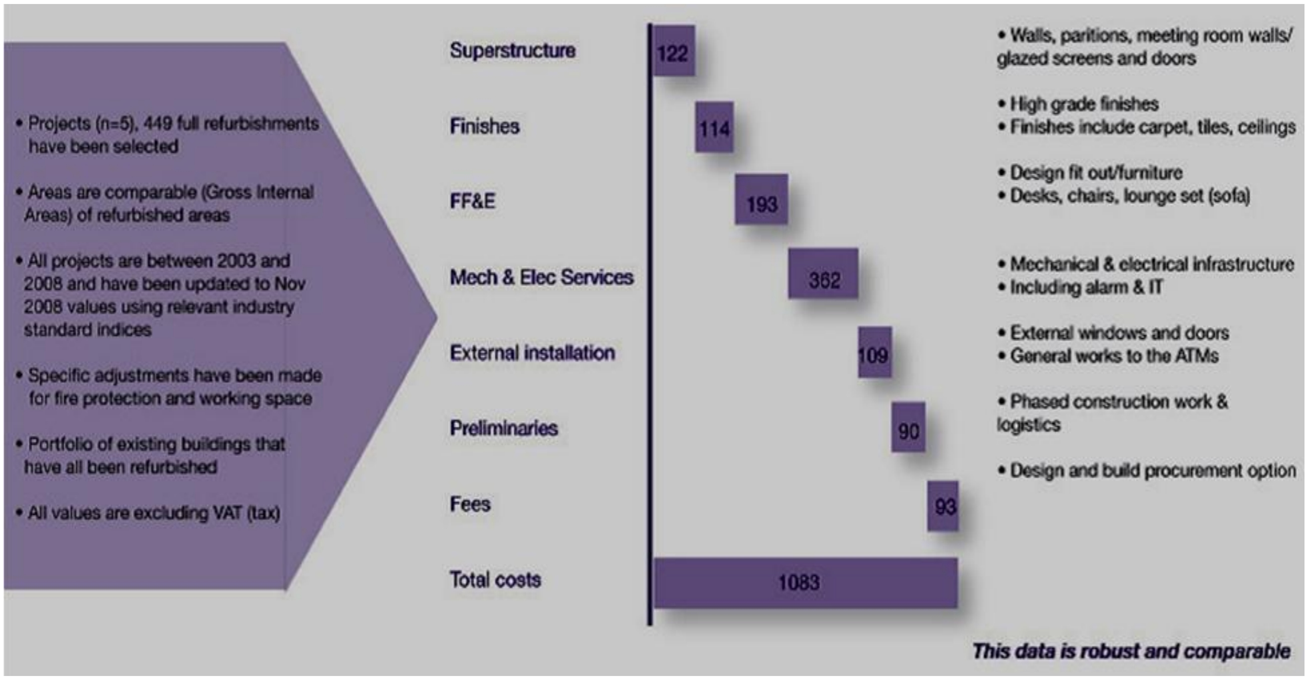


Figure 2: Comparable Benchmark Costs (Atkins, 2013).

The resulting comparison data is only part of the benchmarking process and it has little value unless it is analyzed and reported on. It is this analysis and report which will ultimately identify realistic, achievable targets and may well reveal opportunities for improvement. The process of analysis may also identify project data which has been included in the benchmarking process but is not appropriate. In this case, the benchmarking results may be skewed so it is recommended that this project data should be removed and the benchmarking exercise reviewed and repeated.

While the benchmark is about identifying best performance or best in class it will identify a specific data based on the parameters agreed. This will help communicate the risk range which will inform the employer and project team in the early stages of a project. A skewed range could, therefore, misinform the risk calculation. Hence, the process of benchmarking is not complete until the resulting data is analyzed and necessary action taken. A typical example of a benchmark analysis is described below.

You are considering the cost/m^2 GIA (gross internal floor area) for a planned project. Established through data collection and comparison, the benchmark cost is N843, 200 with a mean average cost/m^2 GIA of N895,900. Until this data is put into context, through analysis, the information has limited use. Analysis might reveal that the benchmark data is based on strip foundations, no lift installations and no air conditioning, while some of the comparison projects might have piled foundations, lifts and air conditioning (leading to the increased average cost). At this stage, it is important to consider reviewing the data used for the benchmarking exercise. In this example, it might be worth removing some of the comparison project data and introducing other, more appropriate project data. If the data set is amended then the process should be repeated until there is confidence in the output results (Atkins, 2013).

Principal items underlying the assessment of building project cost benchmark.

According to (Atkins 2013), these items or elements include; substructure, superstructure, finishes, furniture, fittings and equipment (FF&E), services, preliminaries and external works. Figure 3 shows a breakdown of the average percentage distribution of these elements on case projects carried out by Atkins (2013).

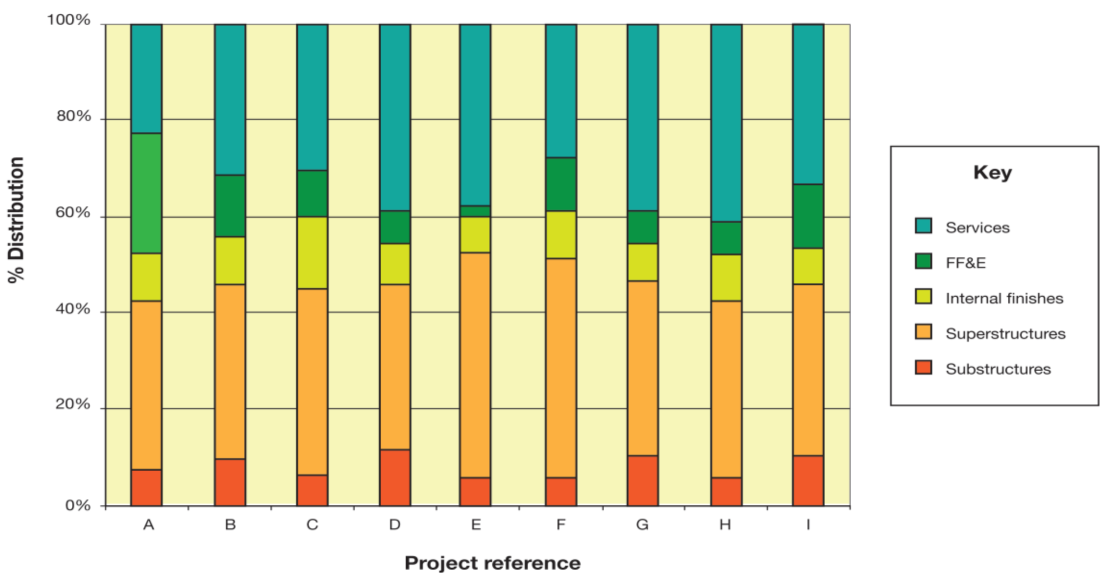


Figure 3: Percentage distribution of elements in the building cost benchmarking process (Atkins, 2013).

From the chart, it is clear that certain items such as overheads and profit are missing. It does not also show how risk and inflation were factored in. This might lead us to review and amend the exercise. The data needs to be put on a consistent basis; i.e. the treatment of inflation, risk and overheads and profit needs to be consistent with allocations made to elements and cost categories to ensure reliability and comprehensiveness. Thus, an overall average cost distribution as illustrated in Figure 4 is produced.

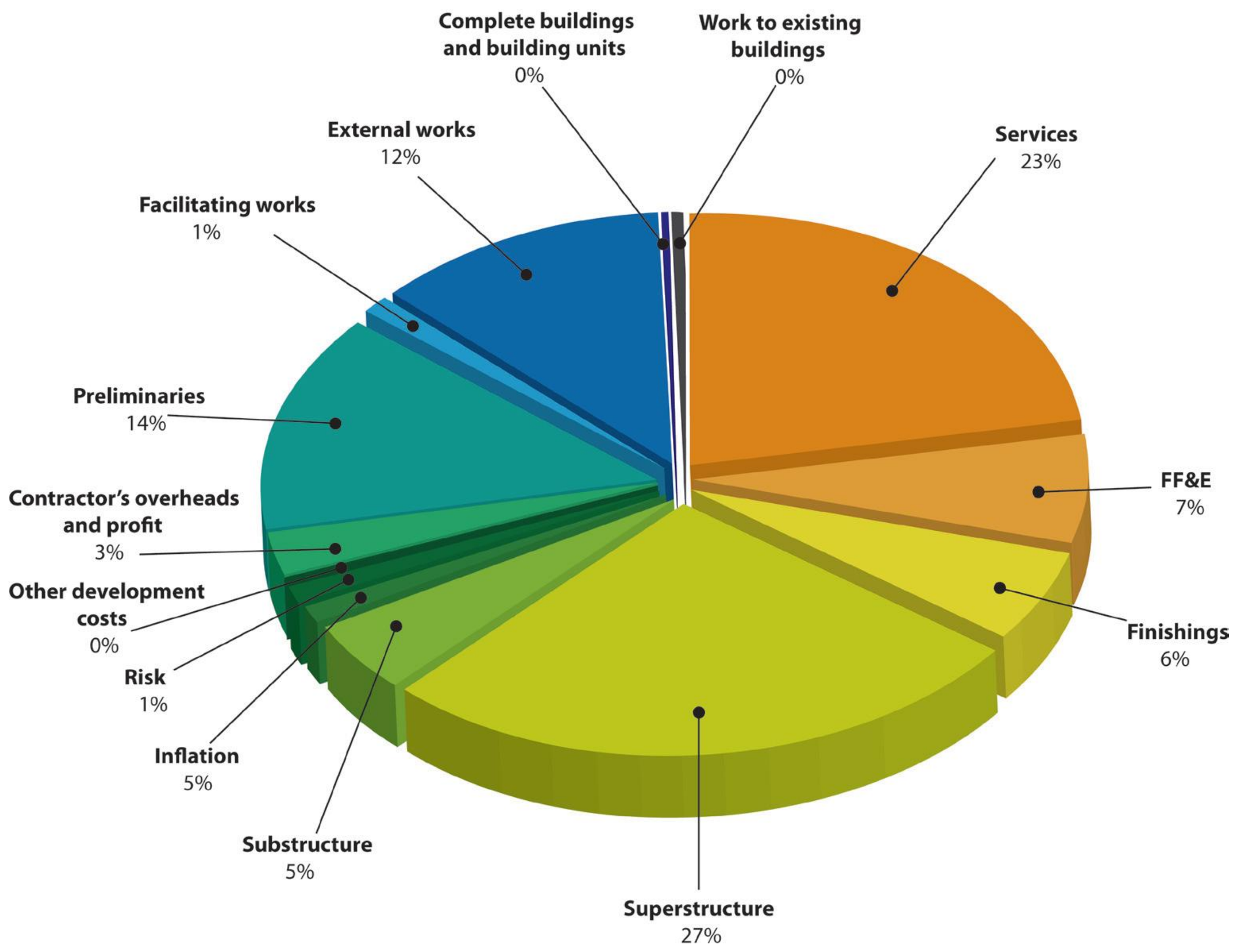


Figure 4: Average percentage distribution of elements in building cost benchmarking (Atkins 2013).

From Figure 3 we can see that the substructures for each project do not vary too much. However, Project A appears to have a higher percentage cost for fixtures, fittings and equipment (FF&E) than the other projects. Projects D, E and H appear to be quite heavily serviced in comparison to the others. Looking at the data table in conjunction with Figure 4 will locate where the specific differences lie. Going back to the cost analyses will also identify the reason behind the difference.

Representing the cost data

It is suggested that cost data in the benchmarking analysis is represented at two levels:

(a) In summary format (i.e. group elements/elements)

(b) In detailed format (group elements, elements, sub-elements, components)

For the summary format, it is worth thinking about how the resulting data will translate into useful information. In the detailed format, the cost data can be represented by group elements, elements, subelements and components in different unit rates and quantities to arrive at a total construction cost. Buildings, in general, tend to have a gross internal floor area (GIA) which can be calculated by following the principles laid out in the RICS *Code of measuring practice* (2007). In addition, many buildings can be represented in terms of number of functional units (the unit of measurement used to represent the prime use of a building or part of a building). The summary format may, therefore, be represented as shown in figure 5 with the total project cost, group element cost and element cost all broken down into cost/m2 GIA and (if appropriate) cost/functional unit (RICS, 2007).

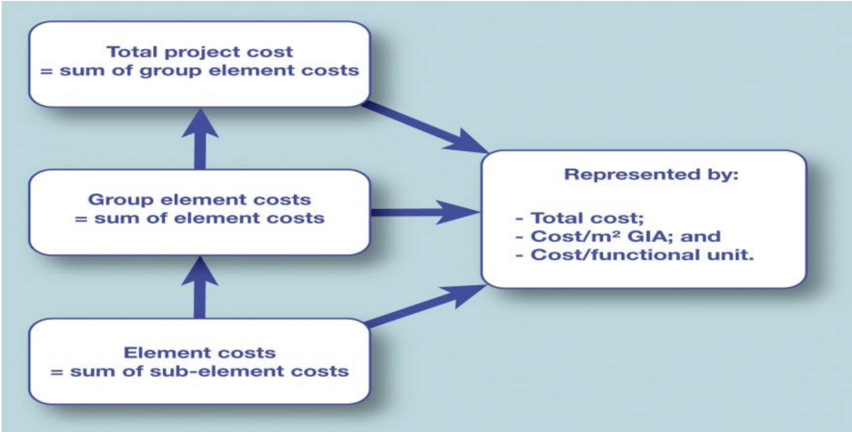
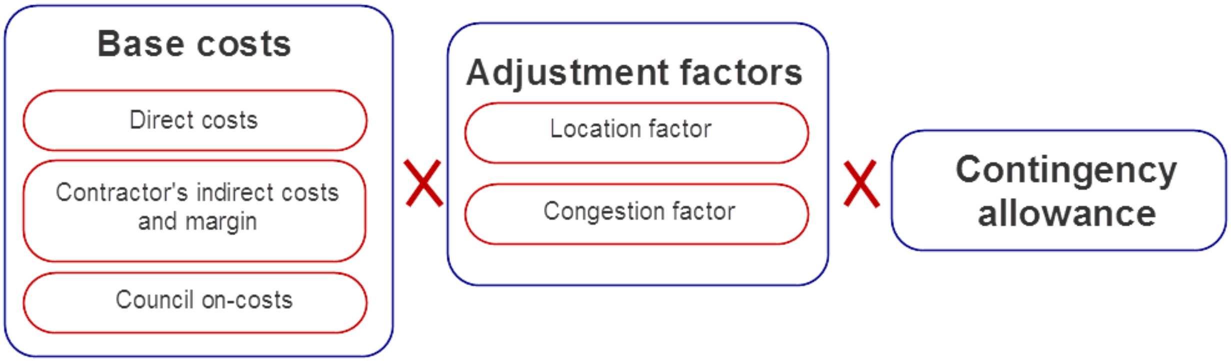


Figure 5: Format for representing cost data in building cost benchmarking (Atkins 2013).

Components of calculating Benchmark Costs

The benchmark cost of a building project item is made up of 3 components (IPART, 2014):

Benchmark cost = Base cost x Adjustment factors x Contingency allowance (1)



Note that this calculation assumes that the Adjustment factor and Contingency allowance are indices, not percentages. If the adjustments are expressed as a percentage, add 1 before multiplying (e.g., for contingency allowance of 20% add 1 and use 1.2).

(A) Base cost reflects the typical efficient cost of providing the item with a defined scope. This cost covers the direct costs, contractor indirect costs and margin, and council on-costs. It is expressed for e.g as N per relevant unit (eg, meter, m^2 or item).

(i) The direct cost component

The direct costs are the costs incurred to supply and construct the item. These can be expressed as a specific metric, such as ₦ /m2 or ₦ /m or ₦ each. The main drivers of these costs are the performance outcome and scope of the item and the market conditions for supplies and labor (usually by subcontractors). Direct costs have been developed to specify a performance outcome and scope for each of the infrastructure items that is appropriate for the purpose of collecting infrastructure contributions.

(ii) The contractor's indirect costs and margin component

Indirect costs are the costs incurred by the contractor to deliver an infrastructure project, such as site office accommodation, management personnel and project insurances. Margin is the contractor's overheads (non-project specific costs) and profit. These costs are usually proportional to the size of the project, and so are estimated as a percentage of the total direct costs. We assume that the item would be delivered through the most commercially efficient delivery process (e.g. competitive tender, public/private partnership, e.t.c). There is no allowance for additional costs associated with inefficient processes.

Contractor's indirect costs can be calculated by preparing an indirect cost estimate for 1 benchmark item from each category (being an item that best represents the proportion of indirect costs against direct costs generally across the relevant category). This contractor's indirect cost estimate includes time-based resources, required over a number of weeks (e.g., project management personnel or site facilities) and non time- based resources, such as one-off costs (eg, transport of plant to and from site). The indirect cost estimate can then be divided by the direct cost for the relevant benchmark item and expressed as a percentage. Contractor's margins selected or used should take into consideration; an understanding of contractors' cost structures, including the level of corporate overheads and how the long run market conditions work under construction due to the higher labor and plant proportions for pricing of infrastructure in competitive tenders.

(iii) Council on-costs component

By 'council on-costs' we mean costs incurred by the council to deliver the benchmark item, which may include: internal staff costs (for project oversight, project planning and definition, contract preparation, tendering and contract administration), professional fees (such as legal advice, specialist investigations and any outsourced project management), regulatory compliance costs (such as gaining environmental approval), levies and other government charges, insurance costs taken out on behalf of the project owner and design costs. On-costs are usually proportional to the size of the project, and so are estimated as a percentage of the total cost to the contractor (i.e., direct costs + indirect costs and margin).

(B) Adjustment factors reflect variations in the cost of building project depending on factors such as different geographical settings, regional prices, access to materials and congestion settings.

(C) Contingency allowance accounts for the uncertainty involved in the planning, design and delivery of infrastructure projects.

Establishing the Cost Benchmark

The methodology used in arriving at the benchmark cost for building project includes the following;

a) Data collection of different projects,

b) Data comparison of similar projects,

c) Data analysis to arrive at an average cost which will serve as benchmark cost for proposed similar project.

d) Implementing analyzed data into similar project to get the proposed project cost

Some other factors to consider when developing a building cost benchmark include the following; value analysis, functional analysis, project analysis indexation (Location factor), project cost or cost/m^2, project duration, productivity in terms of cost or volume of construction per unit of time, production or build rate in terms of m^2/day;, spend rate in terms of €/day or month, ratio of hourly labour cost to total cost/m^2 of construction. Others include; construction material cost, labor wage rate, construction site condition, inflation factor, project schedule, quality of plant and specification, reputation of engineer, regulatory requirements, insurance requirements, size and type of construction project, engineering review and contingency. A typical illustration is described below.

Project A is a two-storey office building with a gross internal area of 1, 980m^2. It has a base date of December 2016 and is located in town A. the contract value is N114, 806,000. Project B is a two-storey office building similar to project A and is at RIBA design stage C. Tender returns are planned for January 2017. The project is to be located in town B and its gross internal floor area is 2,075m^2.

In this example the pricing data for project A is to be used as the basis of an 'order of cost' estimate for project B, so what is the forecast cost of project B?

Project data	**Project A**	**Project B**
All in TPI	225 (2Q2010)	232 (forecast 3Q 2012)
Location factor	105(Town A)	96(Town B)
Gross internal area	1,980m^2	2,075M^2
Total cost	N114,806,000	?
Cost/m^2 GIA	N57,983	?

Cost/m^2 GIA project B = N57, 983 x project B TPI x project B location factor

Project A TPI x project A location factor

Cost/m^2 GIA project B = N54, 662

Forecast cost project B= N54, 662 x 2,075m^2 = N113, 423, 650

Sources of information for Building Cost Benchmarking

In general, market information, such as schedules of rates or tender prices, is the most accurate source of information, and it to be used if available. Other 'next best' information sources include cost estimating software and publications (particularly if using the bottom up costing method) and historical cost data (Bogan, 1994).

Importance of benchmarking to building projects

The simple answer is that the process identifies what has been achieved in reality. Understanding factual outputs of executed projects and the means by which these outputs were achieved creates realistic targets for similar, planned building projects (Atkins, 2013). Such targets should be an improvement on what 'has gone before'. While building cost is often a main consideration when benchmarking, it is also worth considering other factors relating to a building project such as: construction cost/m^2 Gross Internal Area, cost per functional unit, distribution of construction cost, building efficiency (wall to floor ratio), building shape, form and size (particularly in relation to high rise buildings), architectural ratios (facade and glazing ratios), floor plates including columns and structural grid sizes, mechanical and electrical services metrics (KVA/m^2, smoke and fire protection, refrigeration levels, number of lifts), sustainability ratings, construction duration, import duties and local taxes, procurement routes and contract type.

Expected results/benefits and pitfalls

Cost benchmarking offers the following benefits to companies and organizations (Boxwell 1994):

- Highlights areas of practice and performance requiring attention and improvement,
- Identifies strengths and weaknesses to other respondents,
- Establishes company's true position versus the rest, thus, making it easier for the company to raise the organizational energy for change and develop plans for action,
- Helps measures current company performance,
- Prevents reinventing the wheel (Why invest the time and costs when someone else may have done it already -and often better, cheaper, and faster?),
- Accelerates change and restructuring by using tested and proven practices, convincing sceptics who can see that it works, and overcoming inertia and complacency and creating a sense of urgency when gaps are revealed,
- Leads to "outside the box" ideas by looking for ways to improve outside of the industry,
- Forces organizations to examine present processes, which often leads to improvement in and of itself and
- Makes implementation more likely because of involvement of process owners.

By benchmarking cost of different building projects, companies get the information they need to optimally adjust their performance goals and find ways to achieve them. Ideas are everywhere; the challenge is to habitually seek and adapt them. Experience proves that many ideas originate not just outside one's own company but also outside one's industry. Among the pitfalls of benchmarking, we may distinguish between analytical and political pitfalls (Boxwell 1994; Scott 2005).

- **Analytical**: Validity of supplied data, soundness of methodology, support of conclusions by data.

- **Political**: Confidentiality of the data must be ensured, executive management must support and reassure benchmark participants support should be ensured for improvement initiative

Building project cost benchmarking can also have a positive influence on Nigeria's building industry by improving building process and promoting the emergence and evolution of a "learning culture" throughout the project - a key to continuous improvement, total quality, and competitiveness over the long term.

Challenges of Cost Benchmarking

A number of challenges face the development and use of cost benchmarking, not only in developing countries but developed nations. There is absence of an industry-standard protocol for recording project cost information currently, these variations are not captured and recorded in a standard manner. A protocol for recording project cost information was produced and published. This protocol may be used by a central body such as BSRIA, CIBSE (Chartered Institution of Building Services Engineers) or BCIS (Building Cost Information Service) to obtain industry feedback on costs and to develop a central cost database for building projects (Atkins, 2013).

Atkins (2013) further stresses that the unique nature of building projects also restricts the number of samples suitable for comparison. This makes project attributes contributing to costs wide-ranging. Reluctance by the industry - clients and contractors and construction organizations to part with cost information is another major setback. In addition to this, cost data available in the industry does not generally identify cost significant project features from which the costs have been derived Available statistical cost data available from published sources often contains averages from good and bad projects, therefore cannot be used to represent best practice.

Furthermore, contextual factors which drive cost for benchmarking are high. Cost of maintaining imported equipments, cost of diesel, substandard products, accessibility, presence of unskilled artisans and security threats. There is also very low use of quality benchmarks. When benchmarking is used, it is mostly for budgets, selection of vendors and rarely used for strategic policies (Atkins, 2013).

METHODOLOGY

The study was carried out in Awka, the capital of Anambra State in South Eastern Nigeria. This city was purposefully selected because of the presence of the Nnamdi Azikiwe University, the only federal university in the State; which makes it the construction hub of hostels buildings in the State.

Cost data, such as number of rooms, size per room, project cost, was obtained from project records for 30 rooms hostel building projects in Awka, and after this exercise, five hostel buildings were selected based on the following criteria:

In developing the benchmark cost of the hostel project cost, a number of factors were considered. They include similarities in:

- Project duration (start – finish)
- Project location
- Site and building size
- Specifications- type of design, plant, construction materials and method
- Cost of construction materials
- Labor wage rate
- Site condition
- Inflation

DATA PRESENTATION, ANALYSIS AND RESULTS

The data on five selected two storey hostel buildings accommodation on a plot of land (450sq m) 2016 in Awka, Anambra state are as shown in table 2.

Table 2. Data on sampled hostel building projects.

S/N/ Project No	Number of rooms	Size per room (all en-suite)	Project Cost(₦)
A	30	3.2m x 2.8m	50,000,000
B	30	3.00m x 2.80m	43,000,000
C	30	3.00m x 3.00m	35,000.000
D	30	2.80m x 2.70m	38,000,000
E	30	3.40m x 2.60m	42,000,000

Source: Authors' field survey (2016).

Average cost of project = $\frac{A + B + C + D + E}{5}$ / 5

= $\frac{N50M + N43M + N35M + N38M + N42M}{5}$ = N41.6M

Benchmark cost for the project = N41.6M

Cost/m^2 = N41.6M / 450m^2 = N92,444

Furthermore, these projects comprises of the following elements with their average percentages of the total project cost, as shown in table 3.

Table 3. Average percentage of building elements to project cost

Sr. No.	Element	Average percentage of total project cost
1	Substructure	12%
2	Superstructure	52%
3	Finishes	8%
4	Services	20%
5	Preliminaries	3%
6	External works	5%

Source: Authors' field survey (2016).

SUMMARY OF THE FINDINGS AND CONCLUSION

Results of the analysis on the sampled hostel building projects shave shown that hostel buildings of 30 rooms on an average site size of 450m^2 has a project cost benchmark of N41.6m as at the second quarter of 2016 and a benchmark cost/m^2 of ₦92,444.00, while findings from an elemental Analysis also revealed that superstructure (52%), services (20%) and substructure (12%) were the most cost significant, while preliminaries (3%), finishes (8%) and external works (5%) were the least cost significant of these hostel projects. However, there may be limitations in their use as true benchmarks, due to the limitations of obtaining comprehensive cost data), data such as design fees, cost of documentation, commissioning costs, contractor's profit margin and overheads, statutory/regulatory costs, insurance costs and contingency costs to mention but a few. This information, however, provides a useful starting point for preliminary/feasibility estimating and cost comparisons. This data is also useful during the design process and in future benchmarking exercises as they identify areas where costs are significant and where efforts should be focused to ensure better construction cost management.

RECOMMENDATIONS

Based on the findings, this research hereby recommends the following

- Quantity Surveyors/construction cost professionals and intending clients/hostel developers/Builders in Awka should consider adopting this cost benchmark before preparing their estimates or embarking on hostel construction of in order to enhance feasibility studies, sourcing financing/loans, reduce project duration and cases of abandoned hostel projects.

- There is need for the Federal Government, via the Nigerian Institute of Quantity Surveyors (NIQS) should endeavor to embark on rigorous research to create a data bank for benchmark costs of various types of building projects in different localities of the country to improve accuracy and reliability of construction cost estimates. Published cost data can also be relied on. In view of this, cost benchmarking efforts, for a start, could focus on specific and more narrowly defined and crucial factors in construction that affect cost, since no two projects are exactly the same and several factors influence project cost.

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