Practical Application of Cost-Data for Construction Cost Estimating & Control

Presented at the Nigerian Institute of Quantity Surveyors Zonal Workshop (Southwest Zone) at Ibadan Oyo State

8-9 May 2024

QS Stanley Orji (MNIQS, RQS)
Senior Cost Manager, Turner & Townsend and
QS Adedoyin Ajetomobi (MNIQS, RQS)
Cost Manager, Turner & Townsend

making the **difference**

Turner & Townsend

NIGERIAN INSTITUTE OF QUANTITY SURVEYORS
The professional construction cost managers

Agenda

1. Who we are
2. What is cost database
3. Benefits of cost data
4. Steps to develop a database
5. Key applications of database
6. Practical application of cost database
7. Digital Cost Management
8. Construction estimating
9. Cost control
10. Budget preparation
11. Indicative estimates
12. Elemental estimates
13. Detailed estimates
14. RIBA 5 – Construction phase

Brief profile

10 years + experience in the industry

Senior Cost Manager, Turner & Townsend

Chairman, Young Quantity Surveyors Forum (YQSF)

Handled over $500 million dollars worth projects ranging from data centers, healthcare, commercial, housing, infrastructures, etc.

Specialist in Cost Management of Mechanical & Electrical Installations

Stanley Orji

Senior Cost Manager

Brief profile

10 years + experience in the industry

Cost Manager, Turner & Townsend

Member, Nigerian Institute of Quantity Surveyors (NIQS)

Handled over $150 million dollars worth projects ranging from data centers, healthcare, commercial, housing, infrastructures, etc.

Specialist in construction Cost Estimating and cost management.

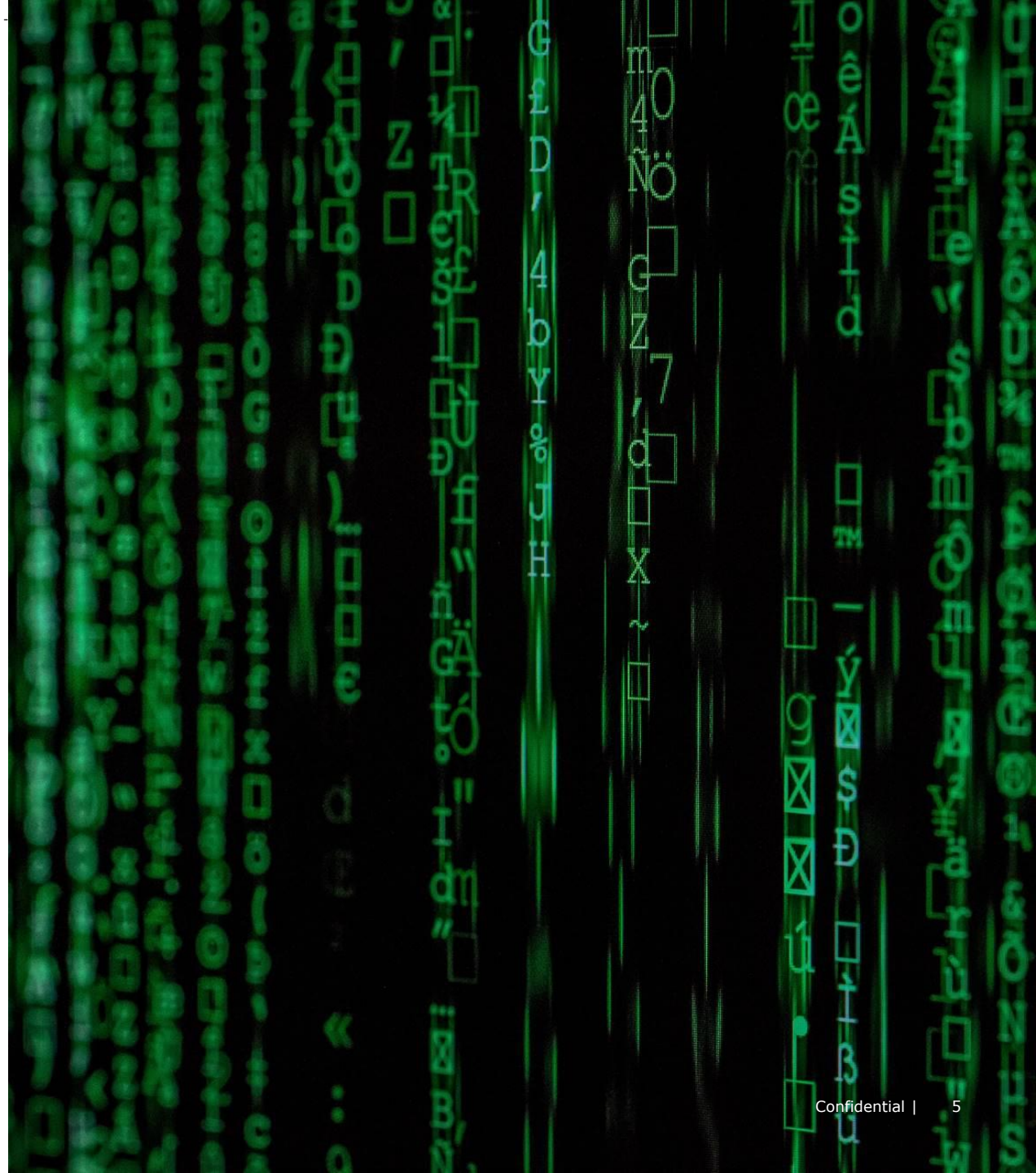
Adedoyin Ajetomobi

Cost Manager

What is a cost database?

The cost database is a centralized computerized repository of historical cost information or current costs of construction which will aid users in the production of benchmark estimates, derivation of building rates, and the analysis and benchmarking of construction costs.

The cost database is expected to be structured around a progressive breakdown structure like the Uniformat or International Construction Measurement Standards (ICMS) numbering systems.



Benefits of cost data / historical data

- Identify cost drivers.
- Make decisions about project and investments.
- Compare costs.
- It provides insights for decision making.
- Risk assessment.
- Timeframe projection.
- Avoid repetition of mistakes.
- It helps to quickly determine project cost in early conceptual stage.

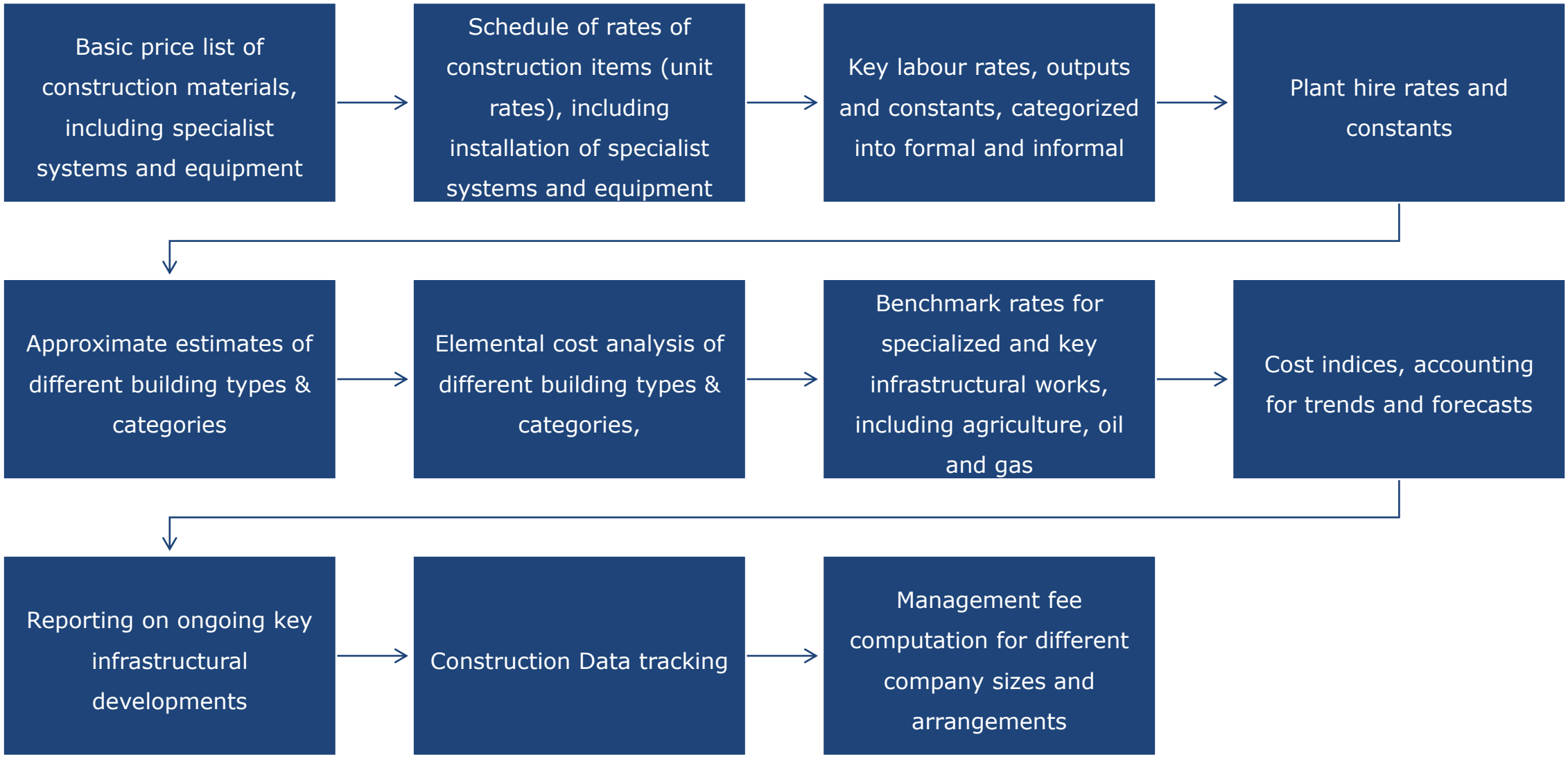
Steps to develop a database

1. Collection of data.
2. Data cleaning and quality check.
3. Data categorization.
4. Analysis to establish patterns, etc.
5. Documentation.

In improving cost estimation accuracy, we must

- Use historical data from similar projects.
- Use benchmarks as guide.
- Adjust estimate based on data analysis.

Key applications of the database

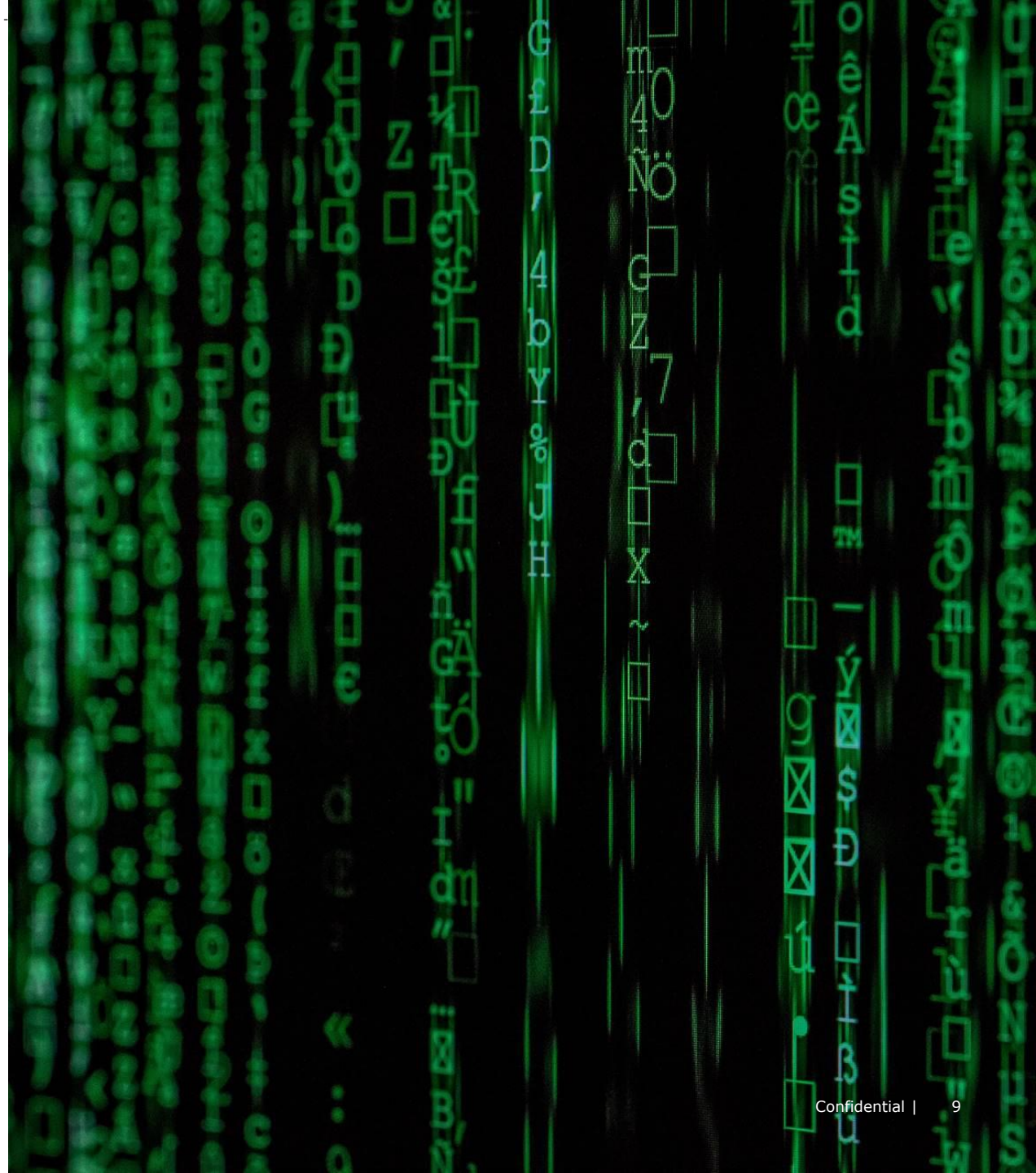


Practical Application of cost database in an organization

Turner & Townsend model

- **International Construction Market Survey (ICMS) -** https://publications.turnerandtownsend.com/international-construction-market-survey-2023/

- **Data Centre Cost Index (DCCI) -** https://www.turnerandtownsend.com/en/perspectives/data-centre-cost-index-2023/



Digital Cost Management

Cost consulting – a digital solution

We recognized a shortcoming for our requirements in widely available construction software, so we built our own – we call it **The Hive**.

To truly evolve our digital service offering, we chose to invest in custom software development, both because of a lack of quality software in the industry, and as an opportunity to differentiate. We use the latest secure cloud technologies to make our digital platform accessible from any device. The platform is continuously updated by our software engineers to deliver updates for us and our clients simultaneously.

Our apps embody our cost TIC methodology and improves our productivity and value by automating transactional and consistently applied processes to focus efforts on providing insight.

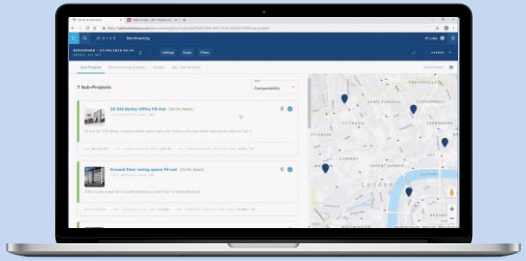
Allow clients to utilize their own instance of the Hive

If requested, we can develop your own instance of our internal platform and cost management apps. These apps can then be populated with your data using internally available technologies, enabling your employees to focus on insight or continuous improvements.

Our digital services

We believe that our digital products outlined below **differentiate us from our competition**. The HIVE provides us with the innovative tools to enable our clients to develop a one source of truth, use data to effectively make informed decisions, and drive greater cost certainty. This digital service is typically charged to Clients on a monthly subscription basis.

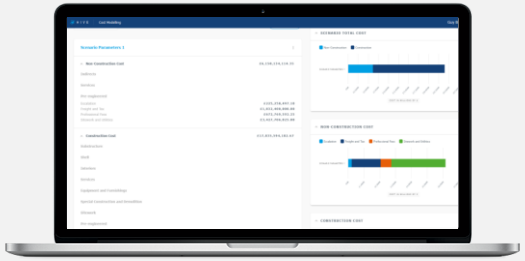
HIVE



Benchmarking

Provides a single location and **consistent methodology** for benchmarking historical projects and producing a benchmarking report, for both cost specialists and wider non-technical teams.

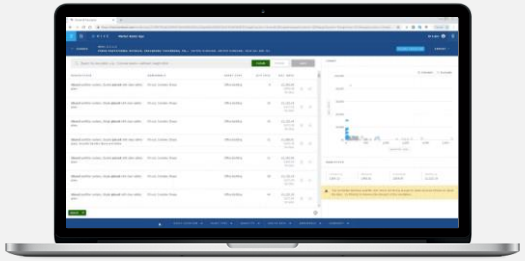
This reduces wasted effort in finding, maintaining and analyzing historical cost data, while increasing **analytical consistency**.



Parametric Modelling

Enables your team to generate detailed costs comparison scenarios for canonical designs in seconds instead of weeks, enabling much **quicker decision making**.

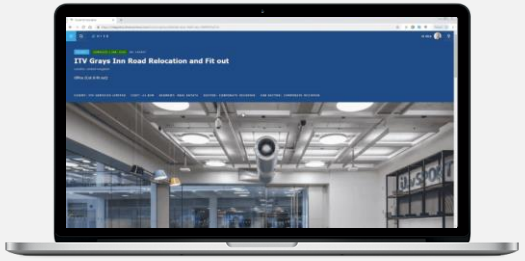
By producing a detailed estimate, the app enables **improved cost certainty** pre-contract, faster and more accurate GC negotiation, and accurate historical data to be captured for use in future estimating.



Market Rates

Provides a single, centralized location for detailed cost data, which is displayed alongside a statistical analysis for each dataset to give **greater cost certainty** when building estimates or challenging GCs.

Valuations can then be built from 'benchmarked' historical data, without cost specialists having to hunt for cost data or maintain their own cost libraries.



Hive platform

Provides teams with **a single location for historical project data** – including costs, schedule and individuals/ organizations involved in the project.

The Hive is intended to ensure all parties work to the **same version of the truth**, while providing the raw data to allow users to carry out their own analyses above what is provided as functionality within the apps.

TURNER & TOWNSEND – HIVE

Link: Benchmarking (turntown.com)

Thank you

Q&A

DAY 2

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Construction Estimating and Control

- Construction Estimating is a process of forecasting the time, cost, resources required to complete a project.

- Narrow down to QS, this is a process of calculating the forecasted direct (Material, Labour, and Plant) cost and indirect cost (Overhead, profit) for finalizing a project.

Cost control

Cost control

- This is the process of managing cost. It manages the budget and actual variances.
- This starts with budgeting.
- This is monitored and readjusted per project objectives and outcomes.
- This can be done with cost report (it should be futuristic) as part of cost management.
- Close monitoring of budget and variations.

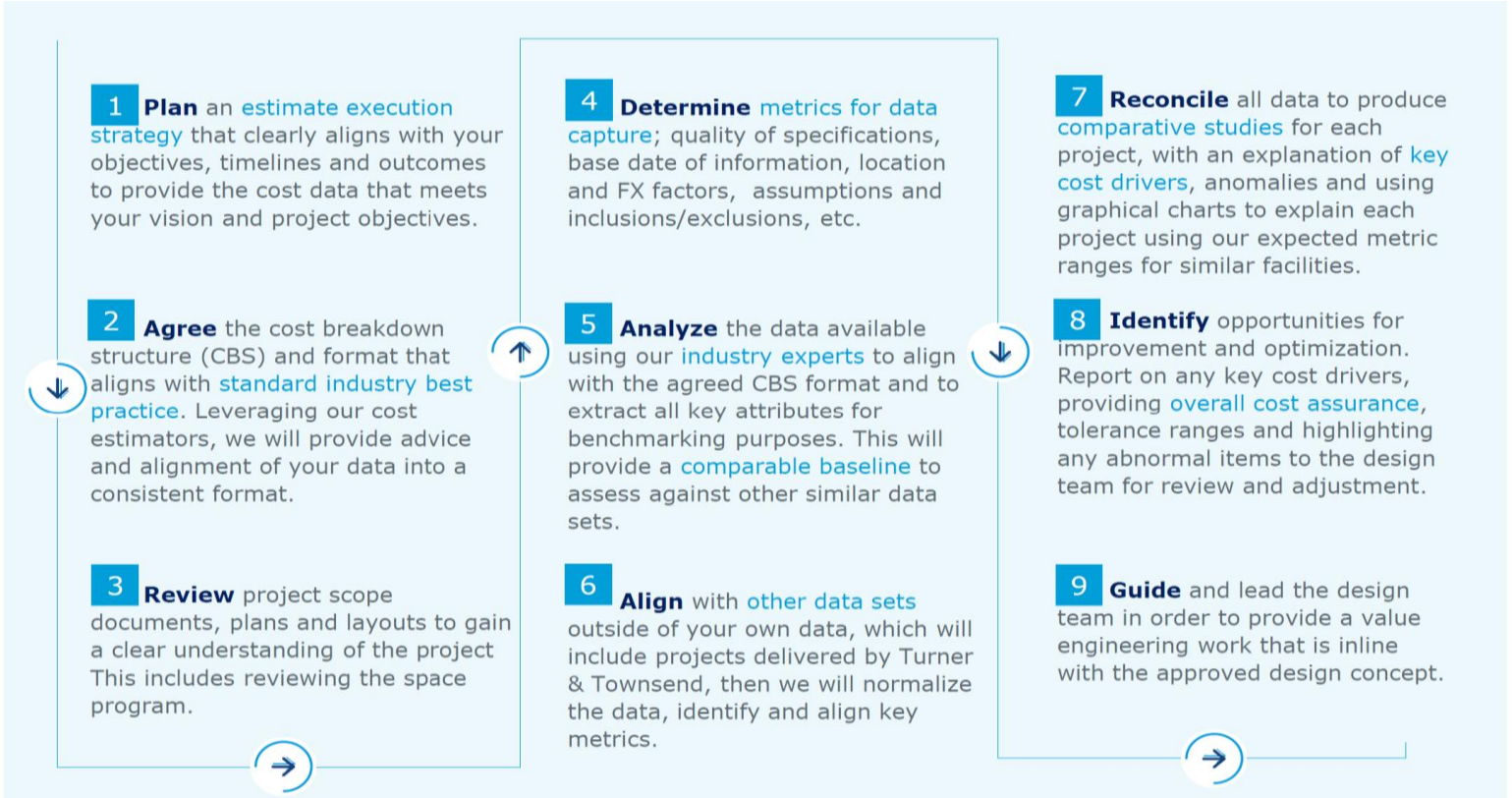
Control the estimating process

As the design matures, will the budget still be enough to accommodate the approved design?

Our **'right the first-time'** estimating process directly aligns with your objectives and goals, and will facilitate the design-to-budget process.

Our proven methodology and templates will help our estimating team to drive the estimating process through the various design stages and assure the project teams that the project budgets are aligned to the scope of the project.

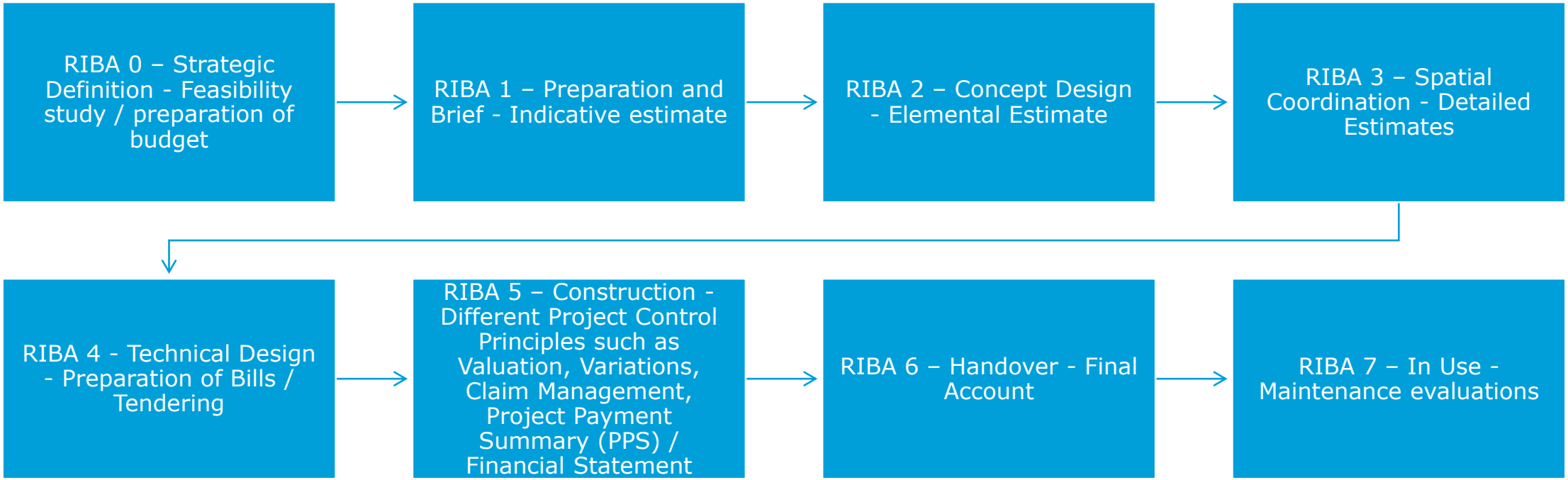
The estimating process is an **iterative process** that requires a framework including industry norms and validated **benchmarking metrics**.



Key Deliverables

- Project baseline cost estimate
- Benchmark report
- Project concept, schematic design, design development and tender phase cost plans
- Basis of estimate report
- Value Engineering register
- Cost risk register

RIBA Stages and Estimates/Controls to be delivered by Quantity Surveyors



RIBA STAGE 1 – FEASIBILITY STUDY / BUDGET PREPARATION

This is usually the first step on the project which most at times Quantity Surveyors who should be playing key roles in advising the client on the best investment options available and aiding the client in preparation are not usually involved but left option to other financial professionals to develop and passed on to Quantity Surveyor to fit into his estimates and project controls.

Things to consider when preparing feasibility studies/budget:

1. The Market Indices
2. Cost Analysis
3. Consideration of Escalations / Inflations
4. Contract Arrangements
5. Evident Commercial Risk
6. Sources of Finance and Financial Cost

RIBA STAGE 2 – INDICATIVE ESTIMATES

This is usually the first estimate prepared based on the high-level details obtained from the design.

We are usually expected to show some comparison with other projects, indicates the list of exclusions and inclusions and even prepare a costing for the risk elements

TURNER & TOWNSEND – HIVE

Link: Benchmarking (turntown.com)

CASE STUDY 1

One Apapa are looking at expanding their business ventures in Nigeria and engaged Turner & Townsend to prepare feasibility study and a high-level budget for an office fit out development of approx. 1025 sq.m.

The following are some of the assumptions;

1. Construction cost is $1610 per sq. m

Set the target cost

How does this project cost when compared to other similar projects and does it fit within the approved budget?

To determine a **feasible baseline budget**, you will need robust benchmarking metrics and data in a consistent structure. A suitable estimate template is critical to delivering this and we can help ONE develop a cost breakdown structure.

We understand this requirement from our experience on other projects.

We have developed a globally consistent benchmarking tool which draws on two key areas of experience:

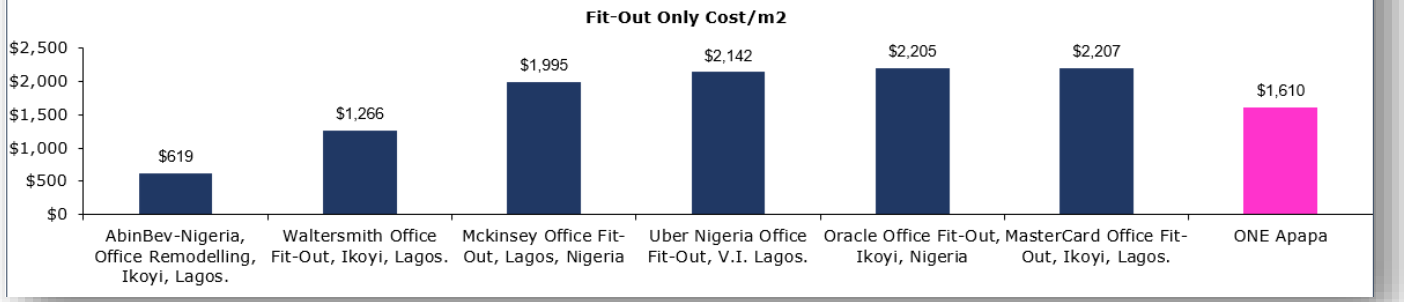
- We have **a lot of data** locally and globally, which we rely on to produce fast, accurate Rough Order Estimates.
- Our own Digital Transformation has seen a huge push on data collection internally at Turner & Townsend, and so we understand collecting data consistently at scale.

This would enable us to provide your estimate template immediately and to compare your data with industry-wide benchmarks.

Based on our understanding of your project requirements and workplace design standards guidelines, we anticipate the fit-out project capex budget (excluding contingency and VAT) to be approximately **USD 1350 – USD 1850 per m2** ** +/- 10%.

Benchmarking analysis - Fit-Out

Project Title	Cost (US$)	Area (m²)	Cost/m²	Contractor	Grade
AbinBev-Nigeria, Office Remodelling, Ikoyi, Lagos.	$649,843	1,050	$619	Haussmann	Recycled materials
Waltersmith Office Fit-Out, Ikoyi, Lagos.	$1,025,591	810	$1,266	I-Space	Medium spec
ONE Apapa	**$1,650,000**	**1,025**	**$1,610**	**tbc**	**Medium spec**
Mckinsey Office Fit-Out, Lagos, Nigeria	$1,302,735	653	$1,995	I-Space	High spec
Uber Nigeria Office Fit-Out, V.I. Lagos.	$565,578	264	$2,142	Haussmann	High spec
Oracle Office Fit-Out, Ikoyi, Nigeria	$3,969,000	1,800	$2,205	I-Space	High spec
MasterCard Office Fit-Out, Ikoyi, Lagos.	$1,015,445	460	$2,207	I-Space	High spec
Average	$1,454,028	866	$1,721		



*** These ROM do not constitute as professional advice. They are for reference only and are still to be validated after reviewing the client requirements client brief and are not to be used for any business case development.*

Improve the cost budget accuracy

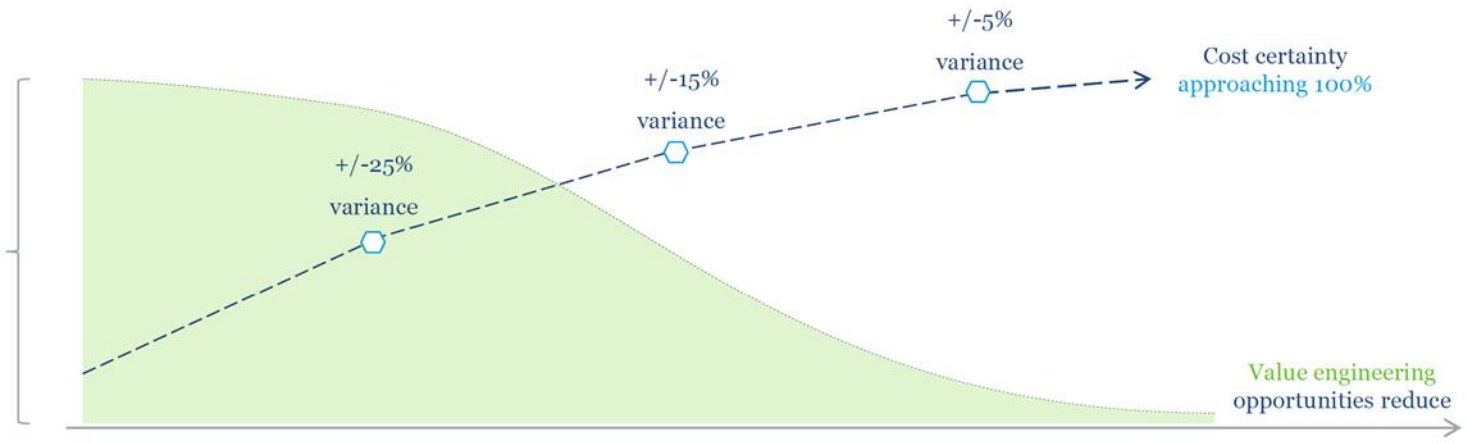
Is the design to budget estimate accurate?

We will facilitate that common templates, processes and are embedded throughout your project lifecycle to drive improvements.

As projects progress we use a variety of methods to **increase cost certainty** and drive **savings**.

We will maximise opportunities for **value engineering** early on and then control the cost throughout the project.

This process allows for a robust and accountable estimate and provides **change control** throughout.



Concept Design

Benchmarking the project against others executed projects allows you to validate your concept and make investment decisions more quickly.

This stage also holds the most opportunity for value engineering, we will identify the priority areas for savings.

Schematic Design

Increased design certainty fixes the scope for value engineering, with the level of opportunity still high.

Using structured costs/m2 data we will challenge costs in priority areas (i.e. design, procurement) to increase cost certainty.

Detailed Design

As the detail of the design information increases, cost estimate accuracy increases, giving you more confidence in your budget before approaching the market.

We will utilize a mix of vendor quotations to reduce cost risks.

RIBA STAGE 3 – ELEMENTAL ESTIMATES

At this stage we are expected to break the estimates into each element in the building projects

A Critical review of BCIS Elemental Cost Plan Breakdown

Link: …….

C:\Users\orjista\Downloads\Project A__Cost Plan.xlsx

RIBA STAGE 4 – DETAILED ESTIMATES

At this stage, some high quantities take-off is carried out for the scope of work and all-in rates are applied to the items measured.

A REVIEW OF DETAILED ESTIMATE

Link: …….

C:\Users\orjista\Downloads\Project A _ Cost Plan.xlsx

RIBA STAGE 5 – CONSTRUCTION WORKS

At this stage, construction work begins, and cost monitoring and reporting are important.

KEY POINTS

- Approved change order process indicating cause of change, parties responsible for the change, does the change have a schedule and cost impact, funding of the proposed change etc.
- Change order management – Changes are monitored and readjusted per project objectives and outcomes.
- This can be done with cost report (it should be futuristic) as part of cost management.
- Contractor should not proceed with any change with cost implication without obtaining necessary approval.
- Compare tender drawings (RIBA 4) and construction drawings (RIBA 5).

Link: .....

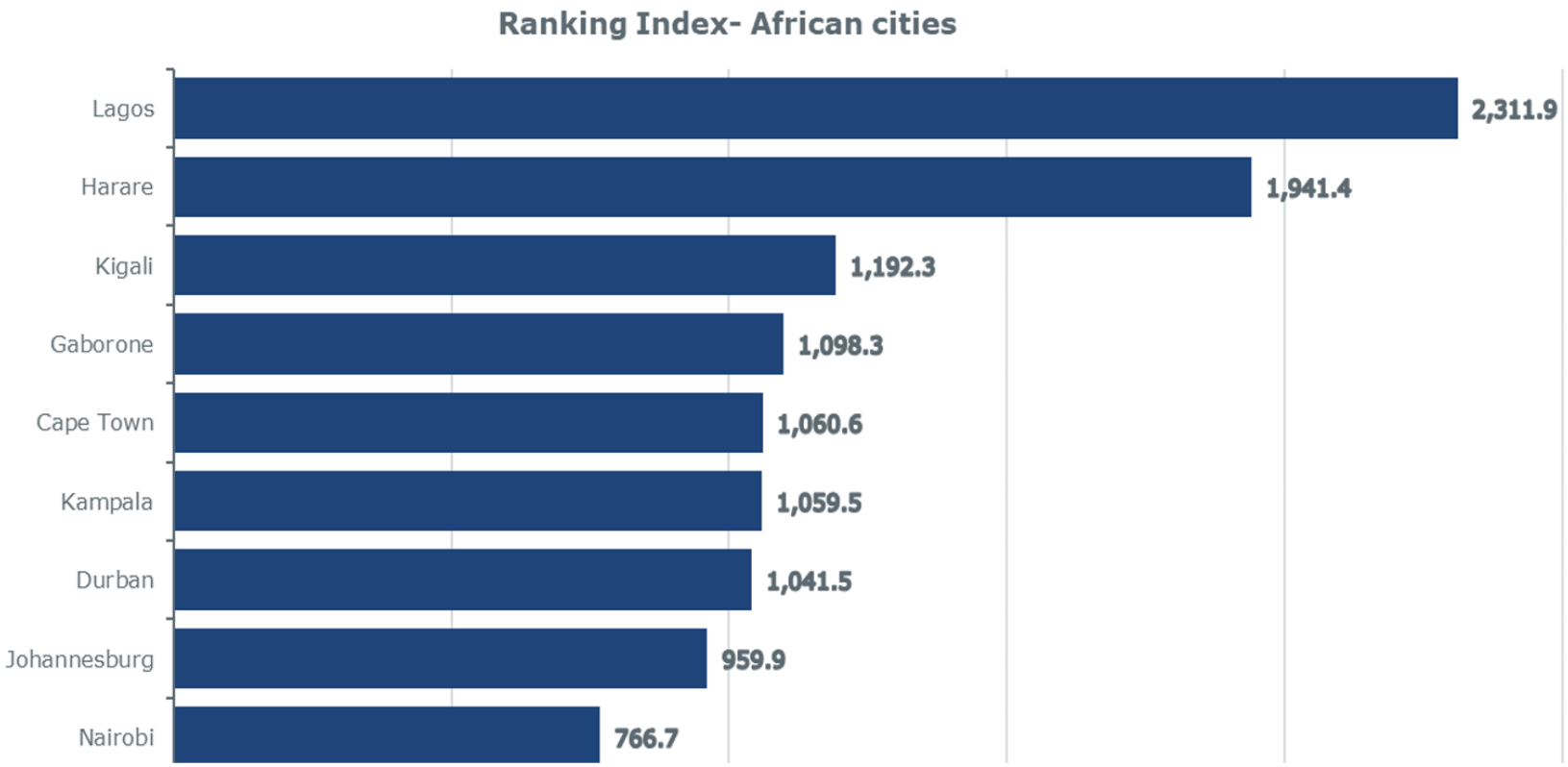
CASE STUDY 2

The acoustic requirements of the client for the office spaces require the change of rockwool in partitions from 20 kg/m2 density to 100 kg/m2. The contractor has presented the estimate for this change for approval.

Thank you

Q&A

Cost Ranking Index- African cities



From the countries that we surveyed; **Lagos remains the most expensive place to build** in Africa at $2,311 per m2. This compares to Kampala for less than half of this per square meter.

Nairobi remains the cheapest location to build among the African cities surveyed.

International construction market survey 2023

Regional Construction Cost by Asset Type

International building costs per sqm of internal area in 2023	Nairobi USD	Kampala USD	Kigali USD	Gaborone USD	Harare USD	JHB USD	Cape Town USD	Lagos USD
Commercial								
CBD Offices - high rise prestige	958	1,418	1,403	1,282	2,600	1,130	1,265	3,207
CBD Offices - up to 20 floors medium (A-Grac	684	1,095	1,052	1,216	2,000	905	1,001	2,175
Education								
Primary and secondary	380	669	549	704	1,150	573	615	815
General Hospital (e.g. city teaching hospital)	1,034	1,818	1,440	1,662	3,000	1,659	1,771	2,392
Hotels								
3 Star travellers	1,027	1,236	1,404	1,139	2,400	1,051	1,108	1,924
5 Star luxury	1,255	1,827	1,755	1,802	2,900	1,524	1,602	2,990
Resort style	1,141	1,905	2,171	2,119	2,900	1,479	1,490	3,479
Industrial								
Advanced manufacturing facility	837	1,252	994	689	1,200	737	759	
Large warehouse distribution centre	532	597	686	461	1,100	382	520	1,218
Retail								
Large shopping centre including mall	586	1,030	1,414	1,142	1,700	995	1,040	3,262
Neighbourhood incl supermarket	510	669	915	679	1,550	737	970	2,446
Prestige car showroom	608	618	706	730	1,365	821	964	1,359
Residential								
Apartments high rise	586	796	903	894	1,580	916	984	2,283
Townhouses medium standard	548	436	707	619	1,260	618	722	1,087

Regional Construction Cost by Component

Material, labour and plant cost	Nairobi USD	Kampala USD	Kigali USD	Gaborone USD	Harare USD	JHB USD	Cape Town USD	Lagos USD
Labour								
Group 1 Tradesman e.g. plumber/electrician	2	5	3	2	6	6	7	1
Group 2 Tradesman e.g. carpenter bricklayer	2	5	3	2	6	5	7	1
Group 3 Tradesman e.g. carpet layer, tiler, plasterer	2	6	4	2	4	5	7	1
Group 4 Green collar installation operative e.g. insulation/solar/heat	2	5	5	2	4	6	7	1
General labourer	1	2	2	1	3	3	3	1
Net Zero design consultant	53	42	229	104	21	62	101	
Site foreman	3	9	5	7	10	14	14	1
Material								
13 mm plasterboard (m2)	4	18	11	6	4	5	6	33
Air/Ground Source Heat pump – 200 kW output	35,742	79,293	30,739	28,280	62,974	27,550	26,763	76,109
Battery storage – 300kWH battery	117,873	148,288	126,800	127,436	122,400	120,883	109,638	141,345
Concrete 30 MPa (m3) (1500m3 job)	84	170	211	120	220	100	124	163
Concrete block – 400 x 200 x 100 tk solid blocks – cost per 1,000 blocks (for schemes with > 10,000 blocks)	403	506	1,098	710	1,000	365	410	3,044
Copper cable (metre) (3C + E, 2.5mm PVC) (100,000m+ job)	3	5	3	2	3	3	3	3
Copper pipe 15 mm (metre) (1000+ metre job)	12	20	10	7	6	7	7	10
Emulsion paint (litre)	7	5	4	8	8	3	3	8
Glass pane 10mm tempered (m2)	65	72	42	155	65	144	110	120
Ready-mix concrete, C25/30, 70% GGBS Cement replacement (m3) (1500m3 job)	95	186	194	106	130	100	110	152
Solar PV Panel – 50m2, excluding framing of support structure (inc. wiring, inverters, sub-mains connections and metering)	8,365	27,328	179	14,171	15,229	12,369	14,056	26,095
Reinforcement bar 16mm (tonne) (120 tonne job)	913	1,168	1,260	1,124	1,200	1,183	703	1,413
Reinforcement bar 16mm - 100% recycled - (tonne) (120 tonne job)	913		1,153	1,124	800		703	1,348
Softwood timber for framing 100mm X 50mm (m)	10	2	1	6	3	5	7	1
Standard brick per 1000	95	96	384	134	140	132	131	1,087
Structural steel beams (tonne) (100 tonne +job)	989	1,439	2,233	1,528	1,440	1,656	1,743	4,349
Structural steel profiles, 100% recycled content (tonne) (100 tonne +job)	989	-	1,930	1,528	1,250		1,743	3,914
Plant								
Hire 50t mobile crane + operator (day)	760	1,622	1,464	866	1,200	708	843	1,087