

Construction Cost Database

Processes of Development, Essential Contents, Quality Criteria for Acceptance, and
Protocols for Establishing a National Construction Cost Database (NCCD)

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Executive Summary

The construction industry remains one of the largest consumers of both private and public capital and one of the least standardised in cost intelligence management across developing economies. In Nigeria, despite decades of professional quantity surveying practice, construction cost information remains largely decentralised, manually curated, and institutionally siloed, if it exists. This has resulted in persistent challenges including inconsistent cost estimates, weak inter-project benchmarking, inflated contingencies, and systemic “budget padding” that undermines fiscal discipline and erodes public confidence.

Historically, cost management relied on professional judgement supported by isolated schedules of rates and market surveys. While effective at project level, this approach is no longer sufficient for a national infrastructure ecosystem characterised by multi-billion-naira programmes, Public–Private Partnerships (PPPs), donor-funded projects, and performance-based budgeting. Globally, construction economies that have transitioned to **data-driven cost management frameworks**—supported by national or sector-wide cost databases—to demonstrate measurable improvements in fiscal discipline, predictability of project outcomes, and infrastructure delivery efficiency. Modern infrastructure governance increasingly demands **data-driven financial management**, traceability of assumptions, and empirical benchmarking across sectors and regions.

Furthermore, international financiers and infrastructure investors increasingly view cost opacity as a material risk. Development finance institutions, sovereign wealth funds, and PPP sponsors require reliable national cost benchmarks to validate feasibility studies and financial models. A nationally governed, professionally curated cost database reduces perceived country risk, limits arbitrary pricing, and strengthens Nigeria’s credibility as an infrastructure investment destination.

A **National Construction Cost Database (NCCD)** represents a structural shift from intuition-led estimating to evidence-based cost governance. Properly designed, it functions as a national reference system that supports feasibility analysis, medium-term expenditure frameworks, procurement benchmarking, life-cycle costing, and post-project audits. International experience demonstrates that jurisdictions with institutionalised construction cost databases experience lower variance between approved budgets and final accounts, improved procurement competitiveness, and enhanced investor confidence (World Bank, 2020; OECD, 2019).

Within the Nigerian context, the absence of a formally recognised institutional construction cost database has contributed to fragmented pricing benchmarks across Ministries, Departments and Agencies (MDAs), conflicting cost assumptions during budget defence, and limited ability of the Bureau of Public Procurement (BPP) to enforce uniform cost reasonableness. This directly weakens the objectives of the **Public Procurement Act (PPA) 2007**, which mandates economy, efficiency, transparency, and value for money in public procurement.

This paper provides a structured framework for understanding the **anatomy of a construction cost database**, defines the **process and quality standards required for professional and governmental acceptance**, and outlines **protocols for establishing and sustaining a NCCD** within Nigeria’s legal, institutional, and economic environment. The paper ultimately positions the Quantity Surveyor as the profession uniquely equipped to act as the **national “Construction Data Custodian”**, safeguarding the integrity of construction cost intelligence in support of sustainable national development.

1. Introduction

A Construction Cost Database (CCD) is a centralized, computerized repository of detailed financial and technical information related to construction costs. It is a critical organisational and national asset that underpins reliable budgeting, cost planning, procurement strategy, value engineering, benchmarking, and policy formulation. Accurate cost information is fundamental to effective construction project delivery. In many developing and developed markets alike, unreliable or fragmented cost data contributes to cost overruns, poor budgeting, inflated contingencies, and disputes. A robust construction cost database provides a systematic mechanism for capturing, validating, analysing, and disseminating cost information derived from real projects and market prices.

Construction cost databases may exist at **Organisational level** (consultants, contractors, developers), **Institutional level** (Professional bodies), **National/ Sectoral level** (public works, housing, infrastructure, policy, benchmarking, macroeconomic planning). The nuances between construction cost databases are not merely technical—they are **strategic, commercial, and regulatory**. For example, a **consulting firm’s database** is about precision and competitive edge, a **professional institution’s database** is about standardisation and knowledge while a **government database** is about control, transparency, and national planning

This paper focuses more on both institutional and national-scale databases, with emphasis on scalability and governance. For a modern Quantity Surveyor or Construction Data Architect, the real expertise lies in, knowing **which database to rely on, when, and for what purpose**.

2.0 The Anatomy of a Construction Cost Database

A construction cost database is best understood not as a price book, schedule of rates, or market bulletin, but as a **strategic cost-intelligence system** that underpins how infrastructure investment decisions are conceived, justified, procured, and evaluated. In mature construction economies, cost databases function as institutional memory—capturing the financial consequences of past decisions and translating them into guidance for future projects. In contrast, where such systems are absent or poorly structured, cost management remains reactive, negotiative, and vulnerable to distortion.

In the Nigerian construction industry, cost information has traditionally been generated and consumed at **project level**, with limited continuity between projects, sectors, or institutions. While this approach reflects the historical evolution of professional Quantity Surveying practice, it is increasingly misaligned with the scale and governance demands of modern infrastructure delivery. National infrastructure programmes, PPP pipelines, and donor-funded portfolios require **consistent, comparable, and empirically grounded cost intelligence** across time and geography.

The anatomy of a construction cost database therefore refers to the **internal structure, logical organisation, and functional relationships** that enable raw cost data to be transformed into trusted national benchmarks. Without a clearly defined anatomy, databases tend to evolve organically, accumulating large volumes of data without commensurate analytical value. Peer-reviewed research in construction economics demonstrates that such unstructured repositories often exacerbate cost uncertainty rather than reduce it (Ashworth & Perera, 2018; Love et al., 2019).

From a governance perspective, the anatomy of a cost database also determines **who trusts it, how it is used, and for what purposes**. Government institutions require cost data that supports budget preparation, procurement approvals, and audit defensibility. Professionals require granularity and traceability for estimating and benchmarking. Investors require predictability and comparability to assess financial risk. A well-designed database anatomy must therefore reconcile these overlapping, and sometimes competing, requirements.

In Nigeria, the absence of a nationally agreed cost database structure has resulted in multiple parallel pricing regimes. Different MDAs apply different assumptions for similar asset types; consultants rely on proprietary databases that cannot be independently verified; and contractors price risk defensively in the absence of transparent benchmarks. This fragmentation undermines the objectives of the **Public Procurement Act (PPA) 2007**, particularly with respect to economy, efficiency, and value for money.

The anatomy of a construction cost database must also reflect the **entire cost lifecycle** of infrastructure assets. Contemporary infrastructure governance extends beyond initial capital expenditure to include operation, maintenance, replacement, and disposal costs. As a result, a modern database cannot be limited to tender-stage pricing alone. It must capture historical performance, cost drivers, and lifecycle implications in a form that supports long-term planning and sustainability objectives.

Furthermore, the anatomy must be sufficiently robust to accommodate **macroeconomic volatility**. In Nigeria, construction costs are strongly influenced by inflation, foreign exchange movements, fuel pricing, and security conditions. Without structural mechanisms for indexing, normalisation, and contextual tagging, cost data rapidly becomes obsolete or misleading. The anatomy of the database is therefore inseparable from its analytical capability.

At a professional level, defining the anatomy of a construction cost database reinforces the evolving role of the Quantity Surveyor. Rather than acting solely as a project-based cost measurer, the Quantity Surveyor becomes a **curator of national cost intelligence**, responsible for ensuring that data is methodologically sound, contextually interpreted, and ethically governed. This shift aligns with international trends in cost management and infrastructure economics, where data stewardship is increasingly recognised as a core professional function.

Consequently, the anatomy of a construction cost database is not incidental; it is foundational. The way cost data is structured determines whether it can support transparency, accountability, and evidence-based decision-making at national scale. A clear anatomical framework provides the basis upon which subsequent layers—resource data, elemental analysis, historical performance, indexing, and digital integration—can operate coherently and credibly. Without such a foundation, attempts to establish a National Construction Cost Database risk becoming technical exercises with limited policy impact.

2.1 Core Structural Layers of a Construction Cost Database

A construction cost database is frequently misunderstood as a static repository of market rates. In reality, it is a **multi-layered socio-technical system** designed to capture, organise, normalise, and translate project-level cost data into actionable national intelligence. Peer-

reviewed research in construction economics consistently demonstrates that cost information systems that lack structural layering fail to support strategic decision-making and tend to reinforce inefficiency rather than correct it (Ashworth & Perera, 2018; Love et al., 2019).

In the Nigerian construction context—characterised by diverse project typologies, volatile macroeconomic conditions, and uneven institutional capacity—the definition and integration of core structural layers is a prerequisite for database credibility and long-term sustainability.

A robust database should be structured into the following interrelated layers:

- **Resource Layer** – raw inputs (materials, labour, plant)
- **Elemental Layer** – building and infrastructure elements
- **Project Layer** – historical project outcomes
- **Indexing Layer** – time, location, and inflation adjustments
- **Digital Integration Layer** – BIM and analytics compatibility

These layers collectively determine how raw data is transformed into reliable benchmarks capable of informing budgeting, procurement, and life-cycle asset management.

2.1.1 The Resource Layer: Capturing Primary Cost Inputs

The foundation of any construction cost database is the **resource layer**, which captures the primary inputs of construction production: materials, labour, and plant. From a construction economics perspective, these inputs represent the true cost drivers of infrastructure delivery (Ashworth & Perera, 2018). Without accurate resource-level data, higher-order cost analysis becomes speculative.

In Nigeria, resource cost data must reflect both **formal market transactions** and the realities of informal supply chains that dominate segments of the industry. Material prices, for example, are influenced by local manufacturing capacity, import dependence, exchange rate volatility, and logistics infrastructure. Similarly, labour costs vary significantly by region due to differences in skill availability, productivity, and security conditions. Peer-reviewed studies emphasise that disaggregated resource data is essential for identifying the root causes of cost escalation and for designing targeted policy interventions (Flyvbjerg, 2014; Love et al., 2019).

2.1.2 The Elemental Layer: Translating Resources into Built Form

Above the resource layer sits the **elemental layer**, which aggregates individual inputs into functional building and infrastructure components. This layer reflects how resources combine to produce tangible outputs such as substructures, superstructures, finishes, and engineering systems. Elemental classification frameworks—such as the New Rules of Measurement (NRM) and CESMM—are widely recognised in the literature as critical tools for standardising cost analysis across projects and regions (RICS, 2021).

For a national database, the elemental layer performs a crucial comparative function. It enables cost planners and policy analysts to compare, for example, the cost of structural

frames across different housing or transport projects while controlling for scope and specification. In the Nigerian environment, where project briefs often vary significantly between MDAs, the elemental layer provides a neutral analytical lens through which cost efficiency and value for money can be assessed objectively.

2.1.3 The Project Layer: Embedding Historical Performance Intelligence

The **project layer** represents the point at which cost data acquires strategic meaning. By capturing complete project histories—including approved budgets, tender sums, variations, final accounts, and delivery timelines—the database moves beyond price reporting into performance intelligence. Research in infrastructure governance demonstrates that historical project data is indispensable for understanding systemic cost overruns and delivery risks (Flyvbjerg, 2021).

In Nigeria, this layer addresses a persistent institutional weakness: the lack of structured post-project learning. Final accounts are often archived without systematic analysis, resulting in repeated estimation errors across successive projects. Embedding project-level outcomes within the database creates a feedback loop that supports continuous improvement in cost planning and procurement practices.

2.1.4 The Indexing Layer: Accounting for Time and Space

Construction costs are inherently dynamic, shaped by inflation, exchange rates, and regional market conditions. The **indexing layer** provides the analytical mechanisms required to adjust cost data for temporal and spatial comparability. Peer-reviewed literature identifies cost indices as essential tools for ensuring that historical data remains relevant for contemporary decision-making (OECD, 2019).

For Nigeria, where inflation and currency fluctuations can be pronounced, the absence of robust indexing can render cost data obsolete within short timeframes. Regional indexing is equally critical, given the significant cost differentials between urban centres, hinterland locations, and security-challenged regions. By explicitly incorporating time and location indices, the database supports more realistic budgeting and fairer procurement outcomes.

2.1.5 The Digital Integration Layer: Enabling Advanced Cost Intelligence

The uppermost structural layer is the **digital integration layer**, which ensures interoperability with modern digital construction and asset management systems. International standards such as ISO 19650 emphasise the integration of cost data with Building Information Modelling (BIM) to support 5D cost management and whole-life costing (ISO, 2018).

For a national construction cost database, digital integration enables advanced analytics, scenario modelling, and evidence-based policy formulation. In the Nigerian context, this layer provides a pathway for aligning traditional Quantity Surveying practice with emerging digital governance initiatives, ensuring that the NCCD remains relevant in an increasingly data-driven infrastructure ecosystem.

2.1.6 Inter-Layer Synergy and System Integrity

Critically, the value of a construction cost database does not lie in any single layer, but in the **synergy between layers**. Peer-reviewed research consistently shows that fragmented or poorly integrated systems undermine data reliability and stakeholder trust (Love et al., 2019). A national database must therefore be designed as an integrated architecture, with clear data flows and validation protocols linking each layer.

For Nigeria, the disciplined implementation of these core structural layers provides the foundation upon which transparency, efficiency, and investor confidence can be rebuilt. By structuring cost intelligence in this manner, the NCCD evolves from a technical repository into a **strategic instrument of national infrastructure governance**.

2.2 Essential Contents of a Construction Cost Database

At the heart of any credible Construction Cost Database (CCD) lies the integrity, depth, and contextual relevance of its data contents. A construction cost database is not merely a schedule of rates; it is a structured representation of how construction inputs interact with market forces, technology, geography, procurement strategies, and time. For the database to support reliable estimating, cost planning, benchmarking, and policy formulation, its core contents must be comprehensive, standardised, and analytically robust.

The essential contents of a CCD can be categorised into five interrelated data domains: materials, labour, plant and equipment, overheads and preliminaries, and historical project data. Each domain must be developed with sufficient contextual metadata to allow costs to be interpreted, adjusted, and applied appropriately across different project scenarios.

2.2.1 Material Prices

Material costs typically constitute the largest proportion of construction expenditure, particularly in capital-intensive infrastructure and building projects. A robust CCD must therefore go beyond headline unit prices and capture the underlying attributes that influence material cost behaviour.

Material price data should include:

- **Base unit rates** linked to clear specifications (grade, strength class, dimensions, standards compliance).
- **Source and supply-chain information**, distinguishing between locally sourced, imported, or hybrid supply arrangements.
- **Delivery and logistics components**, including transportation distances, handling, storage, and wastage allowances.
- **Market volatility indicators**, reflecting seasonal fluctuations, currency exposure, import duties, and regulatory constraints.

Critically, material prices should be indexed geographically to reflect regional market conditions. Urban centres, remote locations, and infrastructure corridors often experience markedly different pricing regimes. Without regional indexing, material cost data becomes misleading and undermines the credibility of cost advice. For institutional databases, material pricing should also be time-stamped, enabling inflationary adjustments and historical trend analysis to support feasibility studies and long-term infrastructure planning.

2.2.2 Labour Rates and Productivity Data

Labour cost data within a CCD must recognise that labour pricing is not determined solely by wage rates, but by productivity, skill availability, regulatory frameworks, and socio-economic conditions. A sophisticated database therefore integrates both **rates and outputs**, allowing cost estimators to model labour costs realistically.

Key labour data components include:

- **Trade-specific wage rates**, differentiated by skill level (skilled, semi-skilled, unskilled).
- **Productivity norms**, expressed as output per hour or per day under defined working conditions.
- **Statutory and contractual allowances**, including pensions, insurance, overtime, and union-negotiated benefits.
- **Regional labour market adjustments**, reflecting differences in supply, demand, and living costs.

Incorporating productivity data is particularly important for digital cost modelling and BIM-enabled 5D estimating, where time and cost dimensions are interlinked. Without productivity benchmarks, labour cost estimates become overly simplistic and disconnected from construction realities. For government and institutional users, reliable labour data also supports workforce planning and policy decisions related to skills development.

2.2.3 Plant and Equipment Costs

Plant and equipment costs are often underestimated or oversimplified, yet they are critical cost drivers in infrastructure and heavy construction projects. A well-structured CCD treats plant costs as dynamic assets whose economic behaviour varies depending on utilisation, ownership model, and project duration.

Plant and equipment data should capture:

- **Hire and ownership rates**, including daily, weekly, and monthly benchmarks.
- **Utilisation factors**, recognising idle time, standby costs, and productivity constraints.
- **Operating costs**, such as fuel, maintenance, operator costs, and consumables.
- **Mobilisation and demobilisation costs**, particularly relevant for geographically dispersed projects.

By embedding plant cost data within a CCD, Quantity Surveyors can model alternative construction strategies, compare mechanised versus labour-intensive approaches, and assess the cost implications of accelerated programmes. At institutional level, such data enhances transparency in contractor pricing and discourages the arbitrary loading of plant-related costs.

2.2.4 Overheads and Preliminaries

Overheads and preliminaries represent the organisational and project-specific costs required to enable construction but are not directly attributable to permanent works. These costs are highly sensitive to project duration, complexity, and procurement approach, making them one of the most misunderstood components of construction pricing.

A credible CCD should therefore include:

- **Typical site overhead benchmarks**, such as supervision, temporary facilities, utilities, and site security.
- **Head office overhead recovery norms**, expressed as percentages or time-based allocations.
- **Duration-sensitive cost relationships**, linking preliminaries to programme length and phasing.
- **Risk and contingency allowances**, clearly distinguished from profit margins.

For both organisational and institutional databases, the transparent treatment of overheads is essential to achieving value for money. It enables clients and investors to differentiate between legitimate project costs and inefficiencies, while supporting more informed negotiations during procurement and contract administration.

2.2.5 Historical Project Cost Data

Historical project data is the backbone of any construction cost database, providing empirical evidence against which future projects can be benchmarked. However, historical data only becomes valuable when it is contextualised and normalised.

Key historical data elements include:

- **Initial estimates versus final account outcomes**, highlighting cost growth or savings.
- **Procurement routes and contract forms**, allowing comparisons across delivery models.
- **Project location, scale, and functional characteristics**, enabling like-for-like benchmarking.
- **Time performance data**, linking cost outcomes to programme compliance or delays.

To maximise its usefulness, historical project data must be adjusted for inflation, scope changes, and exceptional events before being integrated into the CCD. When properly curated, this data supports life-cycle costing, post-project evaluation, and evidence-based policy formulation. For investors, it provides confidence that future cost forecasts are grounded in demonstrable performance rather than speculative assumptions.

2.2.6 Integrative Value of Comprehensive Cost Data

The true strength of a Construction Cost Database lies not in the individual data categories, but in their integration. When material, labour, plant, overhead, and historical data are harmonised within a single digital framework, the database becomes a powerful analytical

tool. It enables normalisation across projects, supports BIM-based cost modelling, and provides a defensible basis for strategic investment decisions.

In this context, the Quantity Surveyor's role extends beyond data entry to data interpretation, validation, and governance ensuring that the essential contents of the CCD remain accurate, relevant, and aligned with industry and policy objectives.

3.0 The Processes for Developing a Construction Data Database

In an era where infrastructure delivery is increasingly shaped by data maturity, the construction sector is undergoing a structural shift from fragmented record-keeping to integrated intelligence systems. For senior decision-makers, the development of a construction data database is not merely a technical exercise; it is a strategic intervention that directly influences cost certainty, schedule reliability, and risk governance across portfolios.

From a Quantity Surveying and cost management standpoint, the fundamental challenge lies not only in the scarcity of data, but in its inconsistency, fragmentation, and lack of standardisation. The real value emerges when data is curated, structured, and governed in a manner that supports benchmarking, predictive analytics, and commercial assurance. The following present a structured analysis of the end-to-end processes required to develop such a database, framed for policy relevance and executive application.

3.1. Data Requirement Analysis

The starting point in developing a construction data database is a rigorous interrogation of its intended purpose. Databases that are not anchored in decision-making requirements tend to devolve into passive repositories with limited strategic utility. Therefore, the first principle is alignment: the database must be explicitly designed to serve defined organisational and project-level objectives.

At a strategic level, organisations must determine whether the database is intended to support cost benchmarking across programmes, enhance procurement intelligence, improve risk visibility, or enable portfolio-wide performance analytics. Each of these objectives imposes different requirements on data structure, depth, and frequency. For instance, a database designed for claims avoidance will require far greater temporal resolution and event tracking than one focused solely on high-level benchmarking.

Equally critical is the identification of core data domains across the project lifecycle. Construction is inherently multidisciplinary, and meaningful insights can only be derived when cost, programme, safety, and resource data are integrated. Cost data must extend beyond simple unit rates to include the full commercial lifecycle—bills of quantities, variations, and final accounts. Programme data must capture not only planned and actual durations but also causal mechanisms of delay, particularly along the critical path. Safety and resource data, often treated as peripheral, become central when organisations seek to correlate productivity, risk exposure, and cost performance.

A further layer of sophistication arises in defining data granularity and update frequency. Highly aggregated data may support executive dashboards but is insufficient for dispute

resolution or forensic analysis. Conversely, excessively granular data, captured without a clear use case, imposes unnecessary administrative burden. The calibration of this balance—between usability and precision—is a defining feature of mature data systems.

3.2. Schema Design and Standardisation

Once data requirements are established, the next phase involves translating them into a coherent structural framework. Schema design is not simply a technical activity; it is a governance mechanism that determines whether data can be reliably compared, aggregated, and interpreted across projects and time.

A recurring failure point in construction data systems is the absence of consistent classification. Without a common coding structure, even high-quality data becomes analytically unusable. The adoption of recognised classification systems such as Uniclass or OmniClass provides a shared taxonomy that aligns design elements, cost data, and procurement packages. This alignment is particularly critical in BIM-enabled environments, where quantities extracted from models must map directly to cost codes to enable 5D integration.

From a technical perspective, organisations must also determine the appropriate database architecture. Relational databases remain the backbone of structured construction data, particularly where relationships—such as those between projects, trades, and cost items—must be explicitly defined and enforced. Their strength lies in ensuring data integrity and traceability, both of which are essential in contractual and audit contexts. However, the increasing prevalence of unstructured data—ranging from site reports to sensor outputs—necessitates the complementary use of non-relational systems capable of handling scale and variability.

A well-structured schema typically integrates several core components: project metadata, cost records, programme schedules, resource allocations, and event logs capturing variations and delays. The critical success factor is relational integrity. Data must not exist in isolation; each cost entry, for example, should be traceable to a specific activity, contract provision, and project context. This interconnectedness is what enables meaningful analysis rather than superficial reporting.

3.3. Data Acquisition and Integration

The acquisition of construction data is inherently complex due to the multiplicity of systems and stakeholders involved. Unlike more centralised industries, construction operates through a network of loosely coupled platforms—each optimised for a specific function but rarely designed for interoperability.

Data typically originates from several primary sources: geometric and specification data, enterprise systems capturing procurement and financial transactions, site reporting tools documenting progress, and increasingly, the challenge is not access to these data streams, but their integration into a unified and coherent environment.

Achieving this requires a deliberate integration architecture. Application Programming Interfaces (APIs) play a central role in enabling systems to communicate, while middleware

and data pipelines automate the transfer and transformation of data between platforms. The objective is to establish a “single source of truth,” where all stakeholders operate from a consistent and validated dataset.

In practical terms, this integration can be conceptualised as a continuous data flow, the database serves as the central consolidation layer, harmonising these inputs into a format suitable for analysis. Within this ecosystem, the Quantity Surveyor assumes a critical assurance role, validating the consistency and commercial accuracy of data at each interface.

3.4. Data Cleaning and Normalisation

No construction database can deliver reliable insights without addressing the pervasive issue of data quality. Raw construction data is often inconsistent, incomplete, and misaligned—a reflection of the fragmented processes through which it is generated. As such, data cleaning is not a peripheral activity but a foundational requirement.

Common issues include duplication of records, inconsistencies in measurement units, misaligned coding structures, and missing data fields. Left unaddressed, these issues undermine analytical outputs and erode stakeholder confidence in the system. The cleaning process therefore involves a combination of standardisation, validation, and deduplication.

Standardisation ensures that all data conforms to a consistent framework, whether in terms of units of measurement or classification codes. Validation introduces rules and controls, such as cross-referencing entries against contractual documents or enforcing logical constraints on quantities and values. Deduplication, often overlooked, is essential in financial datasets where repeated entries can significantly distort cost analyses.

Beyond cleaning, normalisation restructures the database to eliminate redundancy and preserve relationships between datasets. This involves decomposing data into logically distinct tables—such as separating supplier information from cost records—while maintaining the links that enable integrated analysis. The result is a database that is both efficient and analytically robust.

3.5. Security and Governance

As construction data becomes a strategic asset, its governance assumes critical importance. Issues of ownership, access, and compliance are no longer administrative concerns; they are central to risk management and organisational accountability.

A fundamental requirement is the clear definition of data ownership. In complex projects involving multiple stakeholders, ambiguity in ownership can lead to disputes, particularly in relation to commercially sensitive information. This must be complemented by role-based access controls, ensuring that individuals can only interact with data in ways that align with their responsibilities. For example, cost data may be editable by Quantity Surveyors but only viewable by project managers, while financial approvals remain within the remit of finance teams.

Compliance with established standards further strengthens governance frameworks. The adoption of ISO 19650, for instance, introduces structured processes for information management within BIM-enabled projects, including naming conventions, data exchange

protocols, and audit trails. Such standards are increasingly becoming prerequisites for participation in major infrastructure programmes.

Cybersecurity is an equally critical dimension. Construction databases often contain sensitive financial and contractual information, making them attractive targets for cyber threats. Robust measures—including encryption, secure cloud environments, and disaster recovery protocols—are therefore essential to safeguard data integrity and continuity.

3.6. The Future: AI-Driven Construction Analytics

The evolution of construction data databases is ultimately defined by their transition from descriptive to predictive systems. While traditional databases focus on recording what has occurred, the next generation leverages artificial intelligence to anticipate future outcomes and inform proactive decision-making.

Predictive cost modelling, for example, enables the forecasting of final account values based on early-stage project data, allowing for timely interventions. Anomaly detection algorithms can identify deviations in cost or productivity patterns, flagging potential issues before they escalate into claims or disputes. Automated benchmarking extends this capability across portfolios, enabling real-time comparisons between projects, regions, and asset types.

Perhaps the most transformative development is the integration of databases with digital twin technologies, where live data feeds create dynamic representations of physical assets. This enables continuous performance monitoring and optimisation throughout the asset lifecycle.

For the Quantity Surveying profession, this represents a paradigm shift. The traditional role of retrospectively measuring and valuing work is giving way to a forward-looking function centred on prediction, advisory, and strategic control. In this context, the construction data database is not merely an operational tool—it is the foundation of a new model of commercial intelligence in the built environment.

4.0 Quality Standards for Acceptance of a National Construction Cost Database

The effectiveness of a National Construction Cost Database (NCCD) is determined not by the volume of data it contains, but by the **quality, credibility, and institutional trust** it commands. In the absence of clearly articulated quality standards, a national database risks becoming a mere aggregation of inconsistent market prices—incapable of supporting procurement decisions, budget approvals, or investment appraisals. For Nigeria, where public infrastructure expenditure is closely scrutinised under the **Public Procurement Act (PPA) 2007**, the acceptance of any national cost database must be anchored on verifiable quality criteria that align with statutory obligations, professional ethics, and international best practice.

Quality standards for acceptance therefore serve a dual purpose. First, they provide **technical assurance** to Quantity Surveyors and cost professionals that the data is reliable for estimating, cost planning, and benchmarking. Second, they provide **institutional**

assurance to government decision-makers, auditors, and investors that cost information used in budgeting and procurement is defensible, transparent, and free from arbitrary manipulation.

4.1 Data Integrity and Institutional Credibility

Data integrity is the foundational quality requirement of any construction cost database. In practical terms, data integrity refers to the **accuracy, authenticity, and reliability of cost information throughout its lifecycle**—from data capture to analysis and dissemination. In the Nigerian construction environment, where cost data is often sourced from disparate project teams, consultants, and contractors, the risk of distorted or non-verifiable data is significant.

To achieve institutional credibility, an NCCD must rely on **validated data sources**. These should primarily include certified Bills of Quantities, tender returns, and audited final accounts prepared or verified by registered Quantity Surveyors. Data submissions must be accompanied by metadata clearly identifying the project type, location, procurement route, contract conditions, and date of pricing. Without such contextual information, cost data loses its analytical value and becomes misleading.

Equally important is the establishment of a **clear audit trail**. Every data point within the database should be traceable to its source, with documented approval and validation stages. This is particularly critical for public sector projects governed by the BPP, where cost benchmarks may be challenged during due process reviews, budget defence sessions, or post-project audits by the Office of the Auditor-General. A database that cannot demonstrate data provenance cannot command acceptance within Nigeria’s public finance control environment.

4.2 Granularity and Analytical Usefulness

Beyond accuracy, a construction cost database must offer sufficient **granularity** to support different levels of decision-making. Aggregated or composite rates may be convenient, but they are inadequate for serious cost governance. For a national database to be accepted as authoritative, it must allow users to interrogate cost build-ups down to elemental and resource levels.

Granularity enables Quantity Surveyors to understand not only *what* a project costs, but *why* it costs that amount. For instance, separating material, labour, plant, preliminaries, and overhead components allows analysts to identify whether cost escalation is driven by market inflation, productivity challenges, logistics constraints, or contractual risk allocation. This level of insight is essential for value engineering, policy formulation, and life-cycle cost optimisation.

For government stakeholders, granular data supports **evidence-based budgeting**. When MDAs present capital project proposals, cost assumptions can be benchmarked against national norms rather than negotiated subjectively. This directly strengthens compliance with the PPA 2007 requirement for economy and efficiency in public procurement.

4.3 Currency, Update Frequency, and Market Responsiveness

A cost database that is not current is inherently unreliable. The Nigerian construction market is particularly sensitive to macroeconomic variables such as inflation, foreign exchange volatility, fuel pricing, and import tariffs. Consequently, acceptance of a national cost database depends heavily on its ability to reflect **prevailing market conditions**.

Quality standards must therefore prescribe **defined update cycles**. Volatile inputs—such as cement, reinforcement steel, fuel, and imported mechanical and electrical components—should be reviewed and updated on a quarterly basis. Less volatile data, such as historical project outcomes, may be consolidated annually. Importantly, update methodologies should be transparent, with clear explanations of how inflation indices, exchange rates, and location factors are applied.

From a governance perspective, this responsiveness enhances confidence among policy makers and investors. A database that visibly tracks market movements reduces the temptation for excessive contingencies and “padding” during cost planning. It also provides early warning signals to government regarding emerging cost pressures that may affect national infrastructure programmes.

4.4 Regional Indexing and Spatial Cost Intelligence

Nigeria’s construction cost environment is far from homogeneous. Significant cost differentials exist between regions due to variations in security conditions, logistics infrastructure, material availability, labour supply, and climatic factors. A national cost database that applies uniform rates across the country would therefore be technically flawed and institutionally unacceptable.

Acceptance requires the incorporation of **regional indexing**, whereby baseline costs are adjusted using transparent location factors. These factors should reflect empirically observed cost variations across geo-economic zones—North East, North West, North Central, South West, South East, and South South. For example, security-related costs and logistics premiums may significantly affect project pricing in certain regions, while access to ports and manufacturing hubs may reduce costs in others.

Regional indexing transforms the database from a static price reference into a tool for **spatial cost intelligence**, enabling more realistic budgeting, fairer tender comparisons, and improved infrastructure planning at both federal and state levels.

4.5 Data Normalisation as critical for universal Acceptance

Perhaps the most critical—and most misunderstood—quality standard for acceptance is **data normalisation**. Raw construction cost data is inherently distorted by project-specific conditions such as abnormal ground risks, emergency procurement, political timelines, or extreme inflationary events. If such data is incorporated into a national database without adjustment, the result is a systematic amplification of anomalies rather than a reflection of typical market conditions.

Data normalisation involves adjusting project cost data to remove or neutralise abnormal influences, thereby producing **comparable, standardised cost benchmarks**. This process requires professional judgement, statistical analysis, and transparent assumptions—competencies that fall squarely within the Quantity Surveying profession.

For Nigerian infrastructure governance, data normalisation is not optional. It is essential for ensuring that the NCCD supports rational decision-making rather than legitimising inefficiency. A database that lacks normalisation cannot credibly inform budget ceilings, PPP viability assessments, or national infrastructure investment plans.

4.6 Acceptance by Stakeholders

Ultimately, acceptance of a National Construction Cost Database is determined by its ability to satisfy three critical stakeholder groups:

- **Professionals**, who require methodological rigour and analytical depth;
- **Government institutions**, which require transparency, auditability, and statutory alignment; and
- **Investors and development partners**, who require predictability, comparability, and risk reduction.

Meeting these expectations demands that quality standards be formally defined, documented, and enforced through governance protocols. Only then can the NCCD transition from a technical initiative to a **trusted national economic instrument**.

5.0 National Protocols for Establishing a National Construction Cost Database (NCCD)

Establishing a **National Construction Cost Database (NCCD)** is a strategic national infrastructure initiative—not merely a data repository. It requires institutional coordination, technical rigour, and regulatory backing to ensure credibility, adoption, and long-term sustainability. From a Quantity Surveying and cost management standpoint, the objective is to create a **trusted, standardised, and continuously updated cost intelligence system** that supports public procurement, private investment decisions, and macroeconomic planning.

The establishment of a National Construction Cost Database (NCCD) is not a purely technical exercise; it is fundamentally an act of **institutional reform**. International experience demonstrates that construction cost databases succeed only when embedded within formal governance frameworks that define authority, accountability, data ownership, and enforcement mechanisms (OECD, 2019; Flyvbjerg, 2021). In developing economies such as Nigeria, where construction expenditure constitutes a significant proportion of public capital investment, the absence of nationally agreed protocols has historically enabled fragmented pricing practices, cost opacity, and weak inter-project learning.

National protocols provide the **legal, procedural, and professional scaffolding** that transforms cost data from an informal market artefact into a recognised instrument of public finance and infrastructure governance. For Nigeria, such protocols must be carefully calibrated to the country's institutional maturity, regulatory architecture, and market realities, particularly within the framework of the **Public Procurement Act (PPA) 2007**, the **Bureau of Public Procurement (BPP)**, and existing public financial management systems.

5.1 Institutional Architecture and Legal Anchoring

A defining characteristic of successful national construction cost databases is **clear institutional ownership combined with professional custodianship**. Empirical studies in

public infrastructure governance show that databases located outside formal regulatory structures lack authority, while those controlled solely by political institutions often suffer from credibility deficits among professionals (World Bank, 2020).

In Nigeria, the NCCD must be institutionally anchored within the federal infrastructure and procurement ecosystem. Policy oversight should reside with a central government authority responsible for national infrastructure planning—such as the Federal Ministry of Works or National Planning bodies—while regulatory alignment must be ensured through the Bureau of Public Procurement. This alignment is essential to ensure that the NCCD directly supports statutory objectives of economy, efficiency, transparency, and competition as enshrined in the PPA 2007.

However, technical custodianship should rest with the Quantity Surveying profession, acting through a formally recognised professional body. The rationale is both epistemic and ethical. Quantity Surveyors are uniquely trained in cost measurement, normalisation, and benchmarking, and are bound by professional standards of independence and verifiability. International literature consistently identifies professional stewardship as a critical success factor in cost data governance (Ashworth & Perera, 2018; RICS, 2021).

Legal anchoring does not necessarily require a new Act of Parliament at inception. Rather, the NCCD can be operationalised through:

- BPP regulations and circulars recognising the database as an official benchmarking reference,
- Mandatory cost data submission clauses embedded within public works contracts, and
- Progressive integration into national budgeting and medium-term expenditure frameworks.

The NCCD should be embedded within Nigeria’s existing governance structures:

- **Policy Authority:** Federal Ministry of Works / National Planning
- **Regulatory Alignment:** QSRBN/ Bureau of Public Procurement (BPP)
- **Professional Custodianship:** Nigerian Institute of Quantity Surveyors (NIQS)
- **Legal Anchoring:** Alignment with PPA 2007 principles

Such an incremental approach reflects best practice in institutional reform, reducing resistance while building legitimacy over time.

5.2 Data Harvesting Protocols: Public and Private Sector Integration

At the core of any NCCD lies the challenge of **systematic data harvesting**. Construction cost data is generated continuously across public and private projects, yet without formal protocols it remains dispersed, inconsistent, and largely inaccessible for national learning.

For the public sector, data harvesting should be mandatory and standardised. All federally funded construction projects above a defined financial threshold should be required to submit structured cost data at key project stages—tender, award, and final account. This requirement aligns with international norms, where post-project reporting is recognised as essential for improving future cost performance (Love et al., 2019).

In Nigeria, integration with existing BPP procurement workflows is critical. Bills of Quantities, tender returns, and final accounts already pass through due process mechanisms; the NCCD protocol should therefore leverage these existing touchpoints rather than creating parallel reporting systems. This minimises administrative burden while enhancing data completeness.

Private sector participation presents a different challenge. Private developers and contractors are often reluctant to share cost data due to commercial sensitivity. International studies suggest that voluntary participation increases when data is anonymised and when contributors receive tangible benefits, such as access to national benchmarks and improved market intelligence (OECD, 2019). For Nigeria, PPP and concession contracts offer a particularly effective entry point, as data-sharing obligations can be embedded contractually without distorting market competition.

5.3 Data Processing, Classification, and Normalisation

Raw construction cost data is inherently heterogeneous. Projects differ in scope, procurement route, risk allocation, location, and timing. Without systematic processing, such data cannot support meaningful comparison or policy analysis. National protocols must therefore define **standardised classification and normalisation processes**.

Classification systems should be aligned with internationally recognised frameworks such as the New Rules of Measurement (NRM) or Civil Engineering Standard Method of Measurement (CESMM), adapted where necessary to reflect Nigerian construction typologies. Consistent classification ensures that cost data is comparable across projects and sectors, enabling aggregation without loss of meaning.

Data normalisation is the most technically demanding aspect of the protocol. Research in megaproject governance demonstrates that failure to normalise cost data leads to systematic bias, reinforcing inefficient practices rather than correcting them (Flyvbjerg, 2014). Normalisation involves adjusting project costs to remove abnormal influences such as emergency procurement, extreme inflation spikes, or exceptional ground conditions. The objective is not to erase risk, but to distinguish between typical market conditions and project-specific anomalies.

Public Sector

- Mandatory submission of:
 - Bills of Quantities
 - Tender returns
 - Final accounts
- Threshold-based inclusion (e.g. projects above ₦500 million)
- Integration with BPP procurement portals

Private Sector

- Anonymised data submission
- Incentives for participation:
 - Access to benchmark data
 - PPP compliance requirements
- Contractual data-sharing clauses for concessions

In the Nigerian context, where macroeconomic volatility and security-related risks can significantly distort project costs, transparent normalisation methodologies are essential for credibility. These methodologies must be documented, peer-reviewed, and applied consistently to maintain trust among stakeholders.

5.4 Data Security, Ethics, and Access Governance

Construction cost data constitutes a **strategic national information asset**. As such, national protocols must address data security, ethical use, and controlled access. International experience highlights that weak governance in this area undermines both professional confidence and investor trust (World Bank, 2020).

Access to the NCCD should be tiered. Policy makers may require aggregated cost indices for budgeting and planning, while registered professionals require granular data for estimating and benchmarking. Investors and researchers may access anonymised, high-level datasets to support feasibility studies and policy analysis. Such differentiation protects sensitive information while maximising public value.

Ethical governance is equally critical. Clear rules must prohibit the misuse of data for cartelisation, price fixing, or anti-competitive practices. Independent audits and periodic public reporting enhance transparency and reinforce the legitimacy of the system.

5.5 Integration with National Infrastructure Planning and Public Finance

For the NCCD to achieve its intended impact, it must be integrated into Nigeria's broader infrastructure planning and public finance systems. International research consistently shows that cost databases deliver the greatest value when linked to medium- and long-term investment planning, rather than used solely at project level (OECD, 2019).

In practical terms, this means that NCCD outputs should inform:

- Budget ceilings for capital projects,
- Cost assumptions in feasibility studies and PPP business cases,
- Post-project evaluation and lessons learned frameworks.

Such integration transforms the NCCD from a technical reference into a **policy instrument**, supporting evidence-based decision-making across the infrastructure lifecycle.

5.6 Institutional Sustainability and Capacity Development

Finally, national protocols must address sustainability. Construction cost databases are not one-off initiatives; they require continuous updating, professional oversight, and institutional learning. Capacity development within MDAs, professional firms, and regulatory bodies is therefore essential.

Empirical studies emphasise that sustained training, professional accreditation, and stakeholder engagement are critical to preventing database degradation over time (Love et al., 2019). In Nigeria, embedding NCCD competencies within Quantity Surveying education and continuous professional development frameworks would ensure long-term resilience and relevance.

6.0 Conclusion: The Quantity Surveyor as National “Construction Data Custodian”

In a digital infrastructure economy, cost data is both an **organisational/institutional** and **strategic national asset**. The Quantity Surveyor, by training and ethical mandate, is uniquely positioned to curate, validate, normalise, and interpret this data. The profession’s evolution from cost measurer to **cost intelligence custodian** is not optional—it is central to Nigeria’s infrastructure reform agenda.

The Quantity Surveyor’s role evolves beyond cost measurement to **cost governance, data stewardship, and financial intelligence leadership**. The success of a National Construction Cost Database depends not merely on technology, but on professional ethics, methodological rigour, and institutional trust.

By assuming the role of **Data Custodian**, the Quantity Surveying profession positions itself at the centre of Nigeria’s infrastructure reform agenda—ensuring that public funds are protected, private capital is attracted, and national development is delivered on the foundations of verified, transparent, and normalised cost data.

A National Construction Cost Database, governed by robust protocols and professional stewardship, will enhance fiscal discipline, restore investor confidence, and ensure that infrastructure development is anchored on verified, transparent, and defensible cost intelligence.

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