

How's your bottom line?...embracing Life Cycle Cost analysis

Stephen Ballesty¹

In-Touch Advisory, Australia

Built Environment projects in our dynamic world are increasingly complex and challenging to compare and contrast, but one metric remains constant for most and is often used to express or explain performance: 'COST', in all its forms (capital, renewal, operational, maintenance, recycle etc.) within a whole life approach. Cost, in combination with other indicators, is a major consideration for most throughout the asset life cycle. Hence, access to quality data and an understanding of cost management approaches is a critical part of the decision-making process and demonstration of value.

Life Cycle Cost (LCC) analysis provides a valuable comparative and management tool that can influence the design, specification, construction, operations, and sustainability performance with implications for asset management practices.

The paper combines and provides an overview of experiences gained in the development of the International Cost Management Standard, 3rd edition (2021); the RICS' Professional Statement in Cost Prediction, Global, 1st edition (2020); and the AIQS' Information Paper: Life Cycle Cost Analysis, 1st edition (2022). These resources, and the UN's Sustainable Development Goals (SDGs), a framework for many of the challenges confronting asset management practices including confidence in our process and outcomes.

Keywords

Asset / Facility, Asset Management (AM) / Facility Management (FM), AIQS, Built Environment, ESG, ICMS, ISO, Life Cycle Cost (LCC), RICS, Service Life, and Sustainable Development Goals (SDGs).

1 Introduction

Accurate, reliable and timely information is necessary for effective decision-making in almost every aspect of life, whether these decisions are undertaken by individuals, communities, businesses or government organisations. Notwithstanding the range of key performance indicators (KPI's) available, cost performance remains an essential component of any effort to persuade others to make different decisions from the ones which they might otherwise make. The same can be said for the design, delivery and management decision making for the Built Environment in support of our quality of life.

The absence of accurate, reliable and timely information, can lead to ill-informed or bad decisions; and/or the inability to persuade or support others to make better decisions; and be fully accountability for the outcomes of various project decisions. In short, information management is at the core of asset management's ability to influence outcomes.

To truly achieve a sustainable Built Environment the challenges include budgeting for long-term sustainability, resilience and adaptability planning. This requires decision-makers to have access to comparable and consistent data; improved Cost Prediction; and enhanced life cycle cost (LCC) analysis to support cost-performance across a range of metrics.

In recent years progress has been made, with at least three (3) separate global cost management initiatives from the [ICMS Coalition](#), [RICS](#) and [AIQS](#) that all AM practitioners should be aware of, and could adapt as appropriate to their situation.

¹ S.Ballesty, In-Touch Advisory, Australia
Stephen.Ballesty@in-touchadvisory.com

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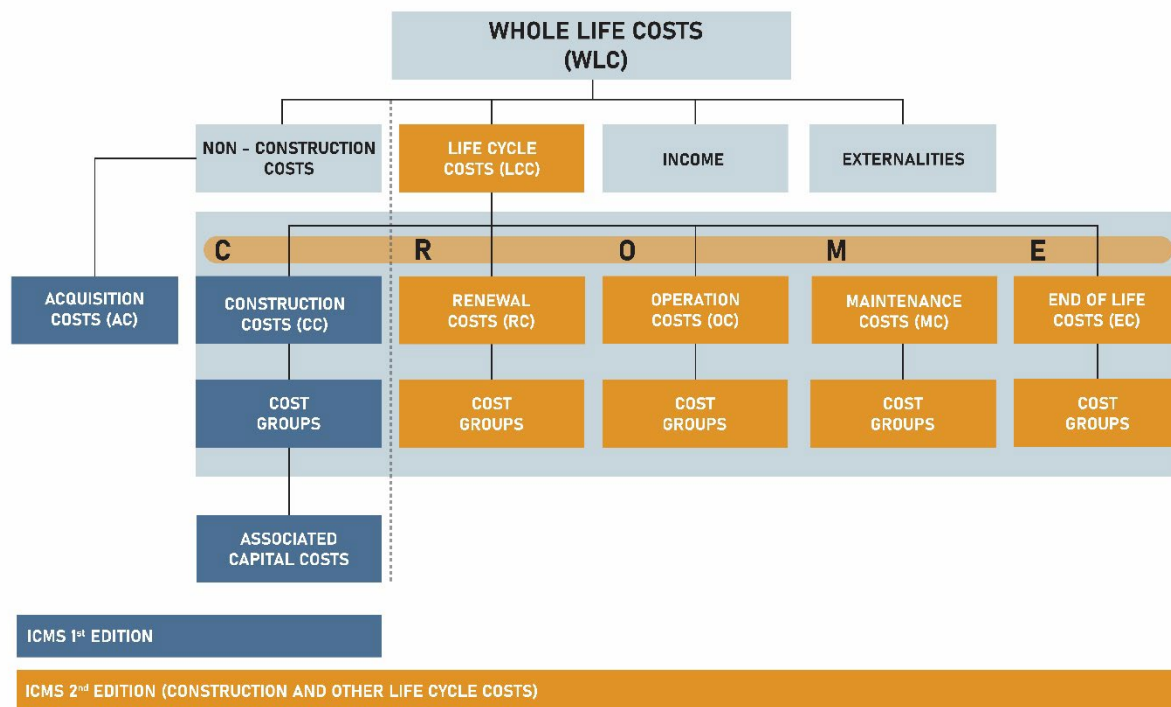
2 International Cost Management Standard, 3rd edition (ICMS, 2021)

The ICMS Coalition, founded in 2015, currently comprises 47 non-governmental, not-for-profit professional bodies internationally focused on achieving consistency in construction project cost reporting and benchmarking. ICMS provides a high-level structure and format for classifying, defining, measuring, recording, analysing and presenting capital and life cycle costs, intended to complement existing local/national standard method of measurement.

This enhanced consistency and transparency across international boundaries is intended to lead to more confidence in global investment projects and reporting.

The first edition of ICMS (2017) focused on creating a standard approach for capital cost classification and reporting. The second edition, ICMS (2019), built upon this by extending global cost classifications based on a new acronym CROME (groupings for Construction, Renewal, Operation, Maintenance and End-of-life costs) – all components which have a direct impact on LCC outcomes. ICMS 2019 better connects AM / FM to the project planning, investment decisions and construction phases via cost management of the asset / facility life cycle.

Figure 1: Relationship between WLC and LCC depicted within the ICMS framework per ICMS (2019) and AIQS-LCC (2022).



The third edition, ICMS (2021) recognizes the criticality of reporting carbon emissions consistently if the impacts of global climate change are to be averted. A common global reporting framework for capital costs, life cycle costs and carbon emissions, will allow for their interrelationship to be more readily explored. Consistency in data management across the asset / facility life cycle should provide decision-makers with improved transparency on the cost and carbon relationship, contributing to achieving a sustainable Built Environment.

In combination with other measures, the ICMS 2021 provides the potential for enhanced understanding and benchmarking of the metrics which AM / FM can utilize to add value not only for their organisations and stakeholders but for society as a whole.

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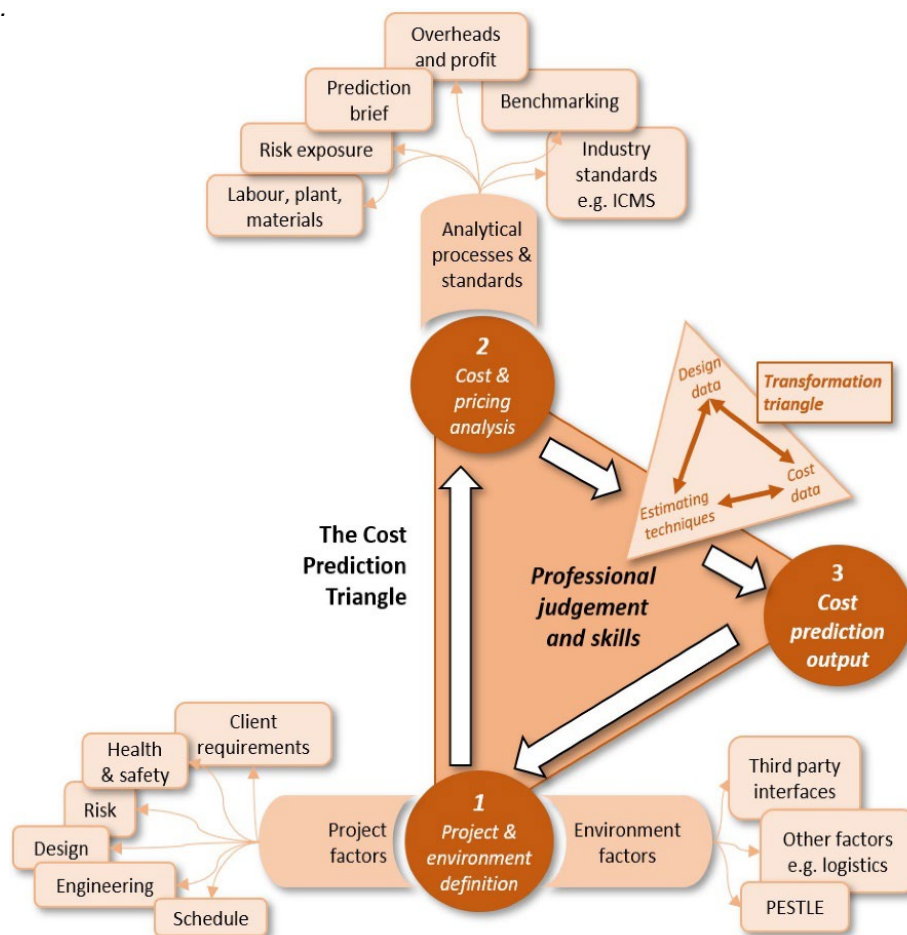
3 RICS Professional Statement: Cost Prediction, 1st edition (2020)

Cost Prediction is dynamic, increasingly digital and relies on context, assumptions, data maturity, information completeness and risk management approach to achieve accurate, reliable and timely forecasts.

Across various markets, by location and sector, Cost Prediction can be approached in different ways with the same goal, providing certainty. This RICS professional statement not only elicits the key principles from these various approaches but sets out minimum mandatory requirements for RICS professionals and RICS-regulated firms to follow when producing cost predictions.

This document provides an overview of global practices and the implementation of ICMS (2019), and a reporting framework for construction and life cycle costs as a part of a whole life cost (WLC) approach. There is a recognition of the cyclical nature of the Cost Prediction process, and the importance of decisions on capital and longer-term costs that ultimately affect asset performance and facility functionality with reference to longevity, maintainability, sustainability and resilience – all these issues have a direct impact on AM / FM outcomes.

Figure 2: Cyclical nature of the cost prediction process per the RICS' Professional Statement Cost Prediction (2020).



There is a dual focus on project out-turn and life cycle costs with regard to life safety and sustainability. This requires the management of expectations involving several integrated processes: definition of the project scope; the setting of realistic / agreed goals; a detailed plan with specified timelines; budget agreement and adherence; identification of common setbacks; and regular communication.

Throughout the paper there is a consideration of data, its origin, completeness, validity, consistency, timeliness and accuracy, across the data structure, metrics, acquisition, sources, re-basing and digitization. Also, consistent outputs reporting is considered essential to fully understanding risks and minimizing bias at the different levels and stages of the Cost Prediction process, each reflecting the maturity of the data inputs.

Access to good quality data improves decision-making ability and prediction accuracy.

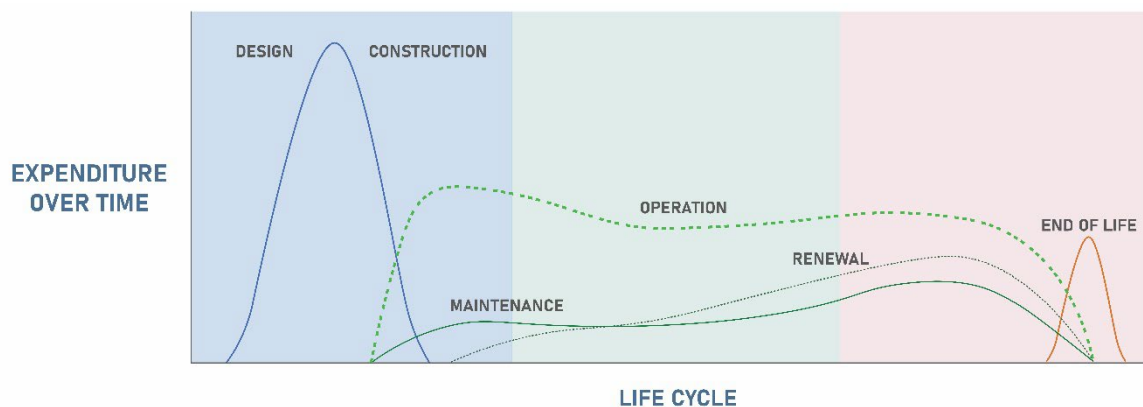
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4 AIQS Information Paper: Life Cycle Cost Analysis, 1st ed. (2022)

As early as *Management Aspect of Terotechnology* (1976), Life Cycle Costs (LCC) were simply defined as being concerned with the 'cost of ownership'. Even then this was not considered a new or radical concept. Today, with the world confronting global challenges, this AIQS Information Paper provides essential guidance for the context and practice of LCC analysis across all the asset / facility life cycle or project phases.

LCC analysis provides a valuable comparative and management tool that can influence the design, specification, construction, operations, and sustainability performance. Increasingly stakeholders are seeking to apply responsible management principles, taking account of ESG criteria, the acronym for Environmental, Social, and Governance (economic and corporate issues), for three (3) broad areas of interest. These are stakeholders who consider it important to reflect their corporate values and broader concerns in their project objectives instead of merely the potential profitability and/or risk presented by an investment opportunity.

Figure 3: Expenditure profiles throughout the Life Cycle at each project phase per AIQS-LCC (2022).



This LCC paper integrates elements of leading publications and relevant guidelines, specifically taking account of the latest in LCC thinking as a part of a whole life cost (WLC) approach and drawn from the:

- ISO 15686-5:2017 Buildings & constructed assets, Service Life Planning, Part 5: Life-cycle costing.
- RICS' Cost Prediction, global professional statement, 1st edition (2020).
- International Construction Management Standard, Global Consistency in Presenting Construction Life Cycle Costs and Carbon Emissions, 3rd edition (ICMS 2021).
- ISO 41000 series of Facility Management standards and ISO 55000 series of Asset Management standards.

Moreover, the LCC paper takes account of the broad and integrated influences of a range of Built Environment professionals and decision-makers throughout the asset / facility life cycle.

Additionally, multiple criteria and metrics are considered, and notes practitioners should be aware of project and asset / facility risks, the circular economy concept, various types of obsolescence and the UN's 17 SDGs (sustainable development goals) - <https://sdgs.un.org/goals>.

The AIQS-LCC paper provides concise background and context, with specific advice on the relationship between whole life costs (WLC) and life cycle costs (LCC), the use of the ICMS' CROME (construction, renewal, operation, maintenance, and end-of-life costs) acronym. It also sets out the components and process of LCC analysis, details getting started including calculation methodologies, along with an overview of current technology and tools.

However, the risks and assumptions involved with undertaking LCC analysis can directly contribute to unrealistic expectations and/or failure to achieve desired outcomes. While the digitization of the delivery (design and construction) and management of the Built Environment holds great promise, the application of professional judgement does remain a determining factor in successful LCC analysis.

The AIQS-LCC paper provides a practical consensus on the key LCC issues, one attempt to demystify LCC analysis has been the preferencing of the term 'Service Life' of a constructed asset or facility. This has generally been considered as having the same meaning as economic, design, useful or effective 'life'.

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A significant contribution of the AIQS-LCC paper is its Cost Management Life Cycle examination, for the first time combining the AIQS' Australian Cost Management Manual and the ICMS' CROME acronym (2019).

Figure 4: Cost Management Life Cycle table per AIQS-LCC (2022) grouped into the three (3) principal life-cycle phases of Design, Construction and Asset / Facilities Management. These three (3) phases are then further broken down into a ten (10) project life stage framework.

FACILITY LIFE PHASES ★	PROJECT STAGES PER ACMM & ICMS COMBINED	BASIS & DOCUMENTS REQUIRED	COST MANAGEMENT ACTIVITIES	LCC INTERFACE & DELIVERABLES
DESIGN	1. Brief ★	Study Brief, sketches or relevant information.	Brief Stage Cost/Indicative Cost.	Business Case or Feasibility Study inputs based on facility policy and functional objectives.
	2. Outline Proposals ★	Scope of works (size, type, location, plan, building shape, etc.) and functional areas.	Outline Proposal Cost/ Preliminary Estimate.	Life Cost Budgets related to project planning horizons and life expectancy targets.
	3. Sketch Design ★	Dimensioned sketch plans, elevations and sections, structural sketches and specifications.	Sketch Design(Limit of Cost Estimate) Cost Plan.	Life Cost Planning with comparative analysis and option selection.
	4. Documentation ★	Final working drawings and specifications prior to tender.	Tender Cost Plan (Tender Estimate).	Life Cost Plan per design.
Project planning: reflective of current policies, standards, strategic objectives and understanding of risks and target LCC requirements.				
CONSTRUCTION	5. Tender ★	Priced Bill or Schedule of Prices.	Tender Report/contract administration and analysis.	Life Cost Plan per tender.
	6. Construction ★★	For construction documents.	Final Account/contract administration and evaluation.	Project Monitoring management review and option refinement.
ASSET / FACILITIES MANAGEMENT	Performance Evaluation: reflective of facility plans, standards, monitoring, benchmarking and meeting target LCC requirements.			
	7. Renewal ★	Costs of replacing a Facility, Constructed Asset and/ or major components once they reach the end of their life, and which the client decides are to be included in the capital rather than the revenue budget.		CAPEX budget to support the service delivery plan.
	8. Operation ★	Costs of running and managing a Facility, Constructed Asset, including administrative support services, rent, insurances, energy and other environmental/regulatory inspection costs, taxes and charges.		OPEX budget to support the service delivery plan.
	9. Maintenance ★	Costs of corrective, responsive and preventative maintenance on a Facility, Constructed Asset or its parts and all associated management, cleaning, services, repainting, repairing or replacing of parts.		Maintenance Plan to support the service delivery plan.
	10. End of Life ★	Net costs or fees for disposing of an asset at the end of its service life after deducting the salvage value and other income due to disposal, including costs resulting from disposal inspection, decommissioning and decontamination, demolition and reclamation, reinstatement, asset transfer obligations, recycling, recovery, disposal of components and materials, and transport and regulatory costs.		Business Case or Feasibility Study inputs based on facility policy, functional objectives, performance status and applicable regulatory and statutory requirements.
<p>★ Facility Life Cycle Phases shown here are nominal, the groupings are not exclusive or confined. By definition design, construction and asset/ facilities management should co-exist, overlap & integrate.</p> <p>★ AIQS' Australian Cost Management Manual: Volume 1, 4th edition (2021)</p> <p>★ International Construction Measurement Standards (ICMS), 2nd edition (2019)</p>				

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The LCC process requires a level of due diligence from all interested parties and involves assessing costs incurred and evaluating alternatives that have impacts on the total costs of the constructed asset or facility throughout its' life-cycle.

However, experience has shown life-cycle data to be notoriously scant and that the matter of LCC analysis can be more complex than appears at first glance. Successful LCC analysis requires knowledge and understanding of the:

- Interested parties and stakeholders' ownership objectives.
- End-users operational objectives.
- Design intent, functional requirements, and variables.
- Project scope, status, and available relevant data / documentation.
- Life expectancy concept and the related impacts which affect asset / facility performance.
- LCC analysis techniques, databases, the necessary inputs, and risk assessments.
- LCC analysis formulation, presentation, and interpretation.
- Consistent application of established terminology, standards and calculation methodology.

5 Accepting the challenge

Cost management provides a vital AM / FM tool to communicate value and integrate responsible decision-making across the asset / facility life cycle across the stakeholders to deliver a more sustainable, productive, and liveable Built Environment for all.

To truly achieve solutions for a Sustainable Built Environment, no longer can we afford for consistency of processes and terminology, rigorous Cost Prediction, WLC approach and LCC analysis to be seen as an 'add-on', or optional activities.

Further with the three (3) industry guides covered in this paper currently being provided as [FREE downloads](#) courtesy of the ICMS Coalition, RICS and AIQS, there can be little excuse for not pursuing the proper application of cost management approaches as set out to empowers AM / FM to create additional value for their organisations, stakeholders and society as a whole.

6 References

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Websites:

- [Australian Institute of Quantity Surveyors \(AIQS\)](#)
- [International Cost Management Standard \(ICMS\) Coalition](#)
- [Royal Institution of Chartered Surveyors \(RICS\)](#)
- [In-Touch Advisory](#)