Asset Management – Quality for a lifetime

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1. What asset management is

Definitions vary but basically asset management is choosing, using, maintaining and disposing of an asset in a manner that optimises benefits for the owner and stakeholders. It concerns the decisions made before the asset is acquired and those decisions that continue throughout the life of the asset. In essence it is about maximising benefits over the entire life of the asset, be that ten, twenty or 100 years or more. *Is such a 'life cycle' approach relevant for the designer whose involvement in the project is a pretty short one?*

'Asset management' is an umbrella term that is used to cover the *integration* of all the steps in the life of a building asset from concept, through design, construction, maintenance, use and its eventual disposal. It looks at the links between these hitherto largely separate functions, for the purpose of producing the lowest life cycle cost for the desired function. The technical fields dealing with this include 'life cycle analysis' and 'post-occupancy evaluation'. *Surely the responsibility of the designer cannot extend to maintenance, use and disposal?*

But asset management is concerned with maximising the cost effectiveness and quality delivery of *the total asset portfolio* of the business rather than with maximising the output or quality of any one individual building or element. In other words, each asset, each building is evaluated not as a 'stand-alone' but rather in terms of what value it will add to the owner's total asset portfolio. The technical fields dealing with this include 'corporate asset management' and 'portfolio management'. *What does this wider management function have to do with the designer?*

2. Why asset management is important for the designer

Actually, all of the above apply to the designer – and thus to excellence in design documentation. While the actual construction is the responsibility of the builder, and the maintenance and use of the building is the responsibility of the facilities and maintenance managers, the *integration* of these elements has its basis in the way the asset is designed.

Incorporating the explicit, or implicit, asset management requirements of the brief is not an 'extra' requirement; it is part of effective communication with the client, of meeting and exceeding the client's expectations and also of meeting international standards for quality. It is fundamental to quality in design and delivering on the quality promise. The purpose of this section is to introduce the designer to the asset management concept and briefly explain why and how it is fundamental to design and the implications, therefore, for design documentation.

3. Delivering on the quality promise

The introduction to ***Managing Quality in Architecture*** defines QM as "all that is done to deliver on the quality promise", a good description of QM, but what is this promise and to whom is it made? Quality is not just quality now or the way the building looks and functions on delivery, but rather 'quality for a lifetime'; this is where the asset management requirements of the brief become important.

Building owners, especially in the public sector, are now developing specific asset management requirements. For many, the asset management requirements of the brief may be implicit rather than explicit. But this does not diminish the responsibility of the designer; it just makes it more of a challenge!

Quality promises are implicitly made to the client, the wider community and the profession.

The client:

Within the QM process, architects are responsible only for the design concept and the clarity and quality of the documentation of that concept. They are not *directly responsible* for such things as function or for sound, leak-proof buildings or for maintenance and quality in use.

These things are the responsibility of the construction contractor and the facility manager. And they are not responsible for achieving best value for the portfolio as a whole or the lowest life cycle cost - these are tasks of the asset manager.

However, the design concept is tested not only by the way the building looks but by the way it behaves through time; whether it leaks or does not, whether it suits the needs of the occupants now and into the future, whether it is easy to maintain and adds value to the owner's total building portfolio.

The client is not interested in design *as such*; The client wants a good end result and unless the brief is for a monument, that result includes functionality. Clients *trust* the designer that the design will be one that the builders can actually build, that it can be maintained and will meet the functional (and emotional) needs of the users.

So it is incumbent on the QM process to demonstrate that, whatever the final faults of the building may be, they could in no way be attributed to poor concept, faulty design, or lack of clarity in the documentation.

The client expects no less; this is your quality promise to them.

The Wider Community:

The quality promise to the wider community is that the building will add value to the total urban landscape – or, at the very least, that it will not diminish it! Building designs that do not consider the management of the asset through time can quickly become urban eyesores rather than highlights.

The Profession:

The promise to colleagues is that this design is one that will support, even enhance, the reputation and credibility of the profession.

Keeping the quality promise today requires collaboration:

Keeping all of these implicit promises reflects on the reputation of you as an individual and on the reputation of your company. To do so in today's world requires more extensive collaboration with other disciplines.

Until now, design, construction, maintenance and facilities management have developed as separate disciplines, paying little heed to each other. Each profession has been jealous of its boundaries and fearful of encroachment by others. This has been true not only of building design and construction; it has been true of almost every other area of human endeavour. However, in all fields from science to the arts, to politics and to business, great new ideas and developments are today being wrought by collaboration.

Asset management is an expression of collaboration. It is a multi-disciplinary field that brings together the building owner, the user, the designer, the constructor, facility manager and maintainer and many others. The designer needs to draw on, amongst others, the knowledge of the quantity surveyor for information on the life spans and qualities of new materials and on the environmental specialist for information on sustainable methods of building.

4. Planning for asset management is part of the QM process

Effective communication with the client:

It is a sad fact that after the building has been designed and built, the client will frequently say, "If only I had thought of…" [1] Effective communication is about anticipating, and thereby avoiding, these after-the-event 'regrets'.

[1] Strategic Asset Management, Issue #

Post occupancy evaluation provides important information for designers[2]. To ensure quality designers need to continually review their work from the perspective of the occupiers and maintainers of the buildings designed.

Design practices that included a requirement for all designers to review, within 2-5 years of building completion, what worked and what didn't, taking into account the views of both user and maintainer, would go a long way to re-assuring clients that their design would be one that would 'work in the longer term', and that it would really take into account the asset management requirements.

Meeting and exceeding the client's expectations:

Clients' expectations extend beyond their intended period of use of the building to the resale value of the building. They expect that when the time comes to sell the building that its condition and functionality will commend the building to future buyers.

Meeting international standards for quality:

Trying to pin down the notion of quality is not so elusive. It is clear that, internationally, there is now a strong movement to design buildings that are aesthetic, functional, *and* that care for the environment. For example, in the United States energy usage in federal facilities is to be reduced (on a Btu/SF basis) by 35% by the year 2010 relative to 1985 levels, and in industrial and laboratory facilities by 20% relative to 1990 levels. All energy conservation measures have to be life cycle cost effective,

5. Incorporating Asset Management within design to ensure life time quality

The above discussion has looked at the 'why', it is time we turned to the 'how' of asset management for the designer. This is an exciting and expanding field and only a few elements are addressed here but further information can be found on the asset management resource website, www.amqi.com.

Access by design:

The ease of access to services greatly impacts on the cost of maintenance and certain design trends increase these costs. For example flat flush ceilings provide no indication of the exact location, nor provision to access the air conditioning equipment installed behind the ceiling. Tall ceilings and eaves greatly increase the logistical difficulties of reaching light fittings and replacing globes. Landscaping up to the edge of a building can affect the ease with which external and roof services can be reached. This includes such simple things as making sure that the ground is level around the perimeter of a building permitting the use of ladders.

Longevity by design:

Each element within a building has its own natural life cycle, determined by both functional obsolescence and normal 'wear and tear'. Good design enables those elements that have naturally shorter lives to be easily removed and replaced. The use of non-standard sizes and fittings can double or treble the cost of renewing these shorter life components.

Examples:

Combining elements with different life cycles for purely aesthetic effect may result in the aesthetic benefits intended being lost within a relatively short time because of the difficulties and costs of renewal. For example, the design for the façade of a technical college specialising in wood technologies utilised many of the timbers of the region. It interspersed each separate timber with a white painted section that showed off the timbers to advantage – when it was new. Within only a few years, the paintwork degraded and needed to be re-done. But the college could not afford the costs of the handwork involved in 'cutting in' that the design required. So the intended effect was lost and the building looked decidedly decrepit not long into its life cycle.

[2] Building Research & Information, Special Issue "Post-occupancy Evaluation" Vol 29, No 2 March-April 2001

Alternating light and dark woods and omitting the painted sections could have achieved a very similar effect of showing off the timbers – and have had a more lasting effect. Taking into account the asset management requirements does not necessarily mean a higher first up cost, just a bit of thought.

In another instance, an award winning design was highly rated on its use of maintenance free materials. But it included a small, ornamental balcony of painted wood. Not only did the paintwork predictably need attention within a few years but the designer had made no provision for the balcony to be reached. It could not be accessed from inside the building as its function was purely ornamental. It could not be accessed from outside the building because the landscaping did not permit access of ladders or scaffolding. The solution was a costly one – a section of the roof had to be removed to enable access to the balcony! Again, forethought and the use of maintenance free materials on this decorative balcony would have eliminated these costs and maintained the attractiveness of the building.

Efficiency by design:

Buildings vaunting 'latest technology' or trend-setting design features may be at risk[3] if the technology or features chosen are such that

- the operating performance is unknown;
- maintenance requirements are not fully understood;
- spare parts are difficult/expensive to find (e.g. only available overseas); and
- no local supplier or organisation is available to maintain or work on it.

6. Life Cycle Cost Analysis

Traditionally, life-cycle cost analysis has been used as an economic evaluation tool for choosing among alternative building investments and operating strategies by comparing all of the significant costs of ownership over a given time period in equivalent economic terms.

Environmental issues are now forcing use of life cycle analysis. Potential for 'designing in' lower life cycle costs will be increasingly exploited as owners are required to focus on ongoing costs, rather than capital costs, to reduce energy usage under stringent new environmental standards, and as they become more aware of the ability to use design to reduce ongoing costs in total.

Ongoing costs typically exceed initial capital costs by a factor of two or three:

Ongoing costs can exceed the initial capital cost by a factor of three or more. Furthermore, fully two thirds of these costs are determined before the building even gets to the construction stage – see diagram 1. This is not to say that the costs *are incurred* by this stage, but rather that the pattern of these costs is laid down at the project brief, planning and design stage.

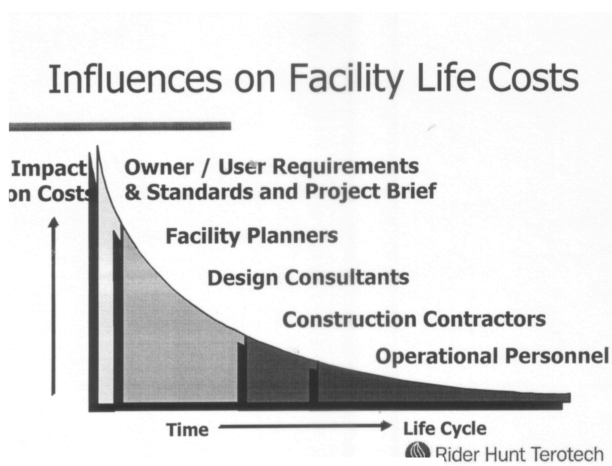

Diagram 1

Cost reduction is greatest at the concept/design stage:

It follows that the opportunities to reduce life cycle costs rest predominantly at this stage – see diagram 2. As the building passes through the concept to the project development and design stage the cost reduction potential decreases and the costs required to make any changes increases.

[3] Further examples of the relationship of design to life cycle costs and aesthetic appeal over the life of the asset may be found in "Strategic Asset Management" Issues 81 (Feb 8 2002) and 82 (Feb 22 2002) on "Maintainability".

Once the design stage has passed, most of the opportunities have gone and change costs rapidly escalate. *This is why the designer is so critical to asset management goal of minimizing life cycle costs.*

Managing the elemental life cycles

Within each building or facility the life cycles vary with each component. The structure may be long living but there are much shorter elements such as scene/finish that may have to be renewed every five or so years. The relative longevity of different elements is illustrated in diagram 3. Diagram 3

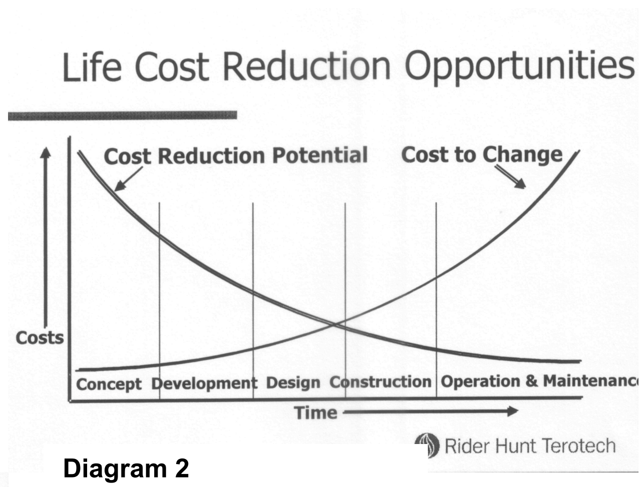

Diagram 2

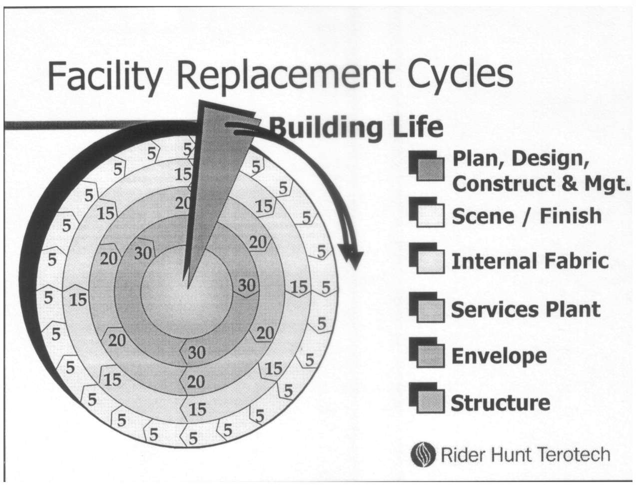

Diagram 3

The implications of varying life cycles is that the proportion that an element contributes to the first up capital cost may be very different from its contribution to life cycle cost. For illustration, consider the elemental costs of a two storey office building drawn from Rawlinson's Construction Guide as given in column 1 of table 1 below.

Using the life spans in diagram 3 and applying them to these elemental costs, the cost of renewing all of the shorter lived components over 100 years during which the structure may be largely untouched, would result in a life cycle cost 4.26 times the first up capital costs.

Over this longer time span the costs of the shorter living elements become more significant.

Comparing column 2 with column 1 can makes this clear. The importance for the designer is that a design change or material selection that reduces the costs of, say, 'scene/finishes' by 10% affects the first up capital cost by a mere 1% but has a 5% cost reduction impact on the much larger life cycle cost.

Table 1 – Elemental Costs of a two storey building (from Rawlinson's)	Percentage of total first up capital costs	Percentage of Life Cycle Costs
Services Plant	35	23
Envelope	30	19
Scene/ Finishes	12	47
Planning and Design	10	2
Structure	7	1
Internal Fabric	6	8

This analysis is highly simplified because the choice of the materials and construction techniques that determine the physical life of components is also dependent on the impact of operational, maintenance and energy costs and on the applicable interest rates.

Choice of desired life cycle:

Other factors such as flexibility to meet changing conditions and the expected demand for the building will also affect the choice.

If expected life cycle is very short, then whole-of-life issues will be about fairly rapid adaptability with a relatively short life-cycle for the building. (Probably low environmental outcomes to optimise early capital return!)

If it's long-term, then alignment with the client's overall portfolio will be as important as the functionality of the building. The architect will need to understand (within the uncertainties of future thinking) how the client expects operations are likely to change and therefore how the role of the building may change. This provides greater opportunity to optimise future revenue and cost streams (as opposed to quick capital return).

It may be that cost models for a range of life-times might be needed for a client to determine the ideal life-cycle objectives for the building.

Some materials and building systems are particularly reliable or durable and repay their higher initial costs with savings in future operation and maintenance efforts. Other materials or systems may be selected because their lower initial costs meet the limits of available construction budgets and, with proper use, are likely to deliver entirely satisfactory service. Sometimes safety, security, or aesthetic concerns warrant both higher initial and future costs. Designers and owners of buildings recognize that there are many such choices and trade-offs among initial construction costs, recurring operations and maintenance (O&M) costs, and building performance. Decisions about a building's design, construction, operation, and maintenance can in principle, be made such that the building performs well over its entire life cycle and the total costs incurred over this life cycle are minimized.

In practice, defining and controlling the life-cycle costs are difficult. The future behavior of materials and mechanical and electrical systems is uncertain, as are the future uses of the building, the environmental conditions to which it may be exposed, and the financial and economic conditions that influence relationships between present and future costs. Unexpected use of the building, unusual events such as storms or earthquakes, poor construction practices, changes of ownership, budgetary constraints, or financial conditions may alter the strategy for minimizing life cycle cost. Finding the best course of action and assuring that it is followed are challenges that continue as long as a building is in use, challenges that life cycle cost analysis can help decision makers to meet.

7 The Future Client

Within the public sector, clients are now increasingly required to take life cycle costs into account in assessing designs. Expect more of this. In particular, expect to see:

- Client briefs that include an explicit assessment of design alternatives that influence life-cycle cost as an element of the scope of work and fees of agency designers.
- Clients that require that value engineering programs and construction contract incentives and other procurement mechanisms to demonstrate savings in expected life cycle cost rather than construction cost only.
- Clients that direct their designers to document clearly their design decisions made to control life cycle cost and the subsequently expected operating consequences for each facility.
- And, in general, more knowledgeable clients. With a reduction in new buildings and an increase in their size, agencies will have both the ability and incentive to allocate the resources for client control.

Within the private sector there is a trend to design, build and maintain contracts. Some of these contracts extend to design, build, maintain *and* operate (with the contractor providing ongoing catering, cleaning, security, etc services). As competition for these contracts increases, the need for minimizing the life cycle costs for a given level of service will become the driving force behind design.

8. Documentation and the key to success

A concept is only as good as its documentation!

Communication with the client:

Clients need to be educated in how to read the ISO documentation. This is the job of the designer.

ISO 9001:2000, the quality management standard, concerns the quality of the design documentation and processes. Ongoing quality, however, concerns the quality of the design itself. Demonstrating that quality in the ISO 9001 process means being able to show how the design:

- has incorporated the needs of the buiding contractor ("buildability")
- has allowed for ongoing requirements ("maintainability")
- has been sensitive to the needs of users to control their own environment
- has minimised energy wastage
- has recognised that the building is not a 'stand alone' but is part of a wider community or portfolio of assets, and
- has optimised both design and material choice to achieve the lowest life cycle cost that meet user and community needs

Communicating with the builders:

The builder is expected to price and construct the building based on the drawings provided, with detailed instructions on how certain things need to be constructed, but often with little briefing on the original concept and ideas behind the design itself.

It is therefore difficult for them to appreciate the design intent and they are not able to share the vision of the design and thus act to preserve it when inevitable changes need to be made on the ground. Worse, builders are reduced to constructing the building based on *their interpretation of the design concept,* which may be very different from the users' original request or the design concept agreed with them. Any concept of operationability and maintainability that may have been originally discussed between the users and the designers is often lost.

Under 'alliance' partnering, all partners are encouraged to seek ways to enable the original design to be constructed in a way that lowers future costs. This requires clearly communicating the original concept. However many of the benefits of alliancing can be had simply by greater clarity in communicating the concept.

Communication with the industry:

The designer's vision needs to be combined with the field knowledge of engineering services engineers, the property management people, the quantity surveyors and valuers (and high specialists like Ove Arup's "external walling systems" consultants). Asset Management is very much a multi-disciplinary field.

All professional fields are rapidly evolving and asset management is no exception. To keep up to date in this field without investing an inordinate amount of time, visit and bookmark AMQ International's "Emerging World of Asset Management" at www.amqi.com and make a practice of regularly catching up with the latest in the section "For designers and urban planners". This section is managed by architects and design professionals for their profession.