SECTION II.5

MANAGING COSTS OF OWNERSHIP

1. THE "BUILDING DOWN BARRIERS" COST MANAGEMENT STRATEGY

The implementation of the objectives of the BDB approach requires the adoption of a coherent cost management approach informed by the principles of "Target Costing". "Target costing" is an approach for the development of new products aimed at reducing their life-cycle costs while ensuring quality, reliability, and other consumer requirements, by examining all possible ideas for cost reduction at the product planning, research and development, and prototyping phases.

Developed over the last thirty years by a number of Japanese firms it became widely known in the West as one of the competition enhancing strategies applied by Japanese motor assembly firms, in particular by Toyota and Nissan. This approach is also now being adopted by a number of companies on a world-wide basis and is no longer confined to the motor industry. Its successful adoption by the North Sea Off Shore Oil industry suggest that, as a general operational principle, it is suitable for the UK construction industry.

Target costing is based on the adoption of a market-driven attitude combined with a disciplined effort to involve the whole supply chain in developing products which offer the best achievable balance between through life cost and functionality. The gist of the target costing approach is not to develop, first, a new model of a car or a new oil ring, determine what it will cost and then place it on the market at a cost-plus price or pass this price to the client. Rather the manufacturers or constructors start with a market analysis. Bearing in mind both trends in the market and rival company capabilities, future market requirements for the products are predicted. The functional attributes of these new products that each market niche requires are clearly identified and an estimate made of the likely cost of producing that "bundle of attributes" using current manufacturing practice. Normally the first estimate of attainable cost plus a reasonable profit margin is above the price which it is thought the market will bear in several years time when the product will become available for sale and so then "target costing firms" go through a process of re-assessing the model until it can produce the new model with attributes required by the market at a price the market will pay. In other words, market price for the new product, whether a car, a camera, or an oil ring, is not determined by adding a profit margin to cost (i.e. a cost-plus approach); instead, an allowable cost is determined by a target price less an appropriate profit margin.

Target Costing is supported by the rigorous implementation of Value Management disciplines (VM). In the BDB approach VM is used as a means of systematically reducing the risk-free through life cost of the project. The VM process is discussed in Section II.3 of the handbook and in tool B.1 and C.2 in Part III.

In its essence, target costing is a simple idea: the supplier works backwards from the client's functional requirements and the maximum market price for the item. The

supplier sets out to design a product that both matches the required level of quality and functionality and provides a viable level of profit at that target price. Costs are to be managed before they are incurred. Suppliers identify the impact of any design option on both the level of functionality and the cost. Design options are generated and evaluated until a combination of options is found that meets the functionality and cost requirements. This involves looking very broadly at the ramifications and possibilities of a design option, including how cost savings can be achieved by simplifying it or the way that it is manufactured and installed. This amounts to what is known in manufacturing as "concurrent engineering" of product and processes so that problems can be solved earlier and costs "designed out". This of course requires early involvement of the supply chain.

While the logic of target costing is simple, it has formidable implications in practice, especially for the construction industry where a version of the contrasting “Cost Plus” approach prevails. The “Cost Plus” approach starts by estimating the costs of production, adds a profit margin and then derives a market price. If the client is unwilling to pay the price then "cost cutting" activities are put in place. The variant used in the construction industry, which we might call “Target Pricing”, usually follows the same pattern as the "cost plus" approach, save for starting to cut costs before the bid is submitted. This is usually achieved by lowering specifications, reducing quality, and trimming profit. This undercuts any motivation on the part of suppliers to lower the total cost. They experience cost reduction activity as “squeezing the subbies”, with “open book costing” perceived as a crude attempt by main contractors to lift the veil masking the way that price quotes have been built up.

Target Costing, on the contrary, is based on the involvement all major players in the supply chain which require the establishment of long standing supply relationships. Innovation in the supply of materials and subsystems is often just as important in achieving the cost reduction goal as the redesign of the final product structure or assembly processes. A collaborative approach to innovation throughout the supply chain is usually facilitated by an open book policy whereby each main party has access to the actual cost and functional data so that they can get involved in sensible debates about possible changes and their costs. Without open books, all that assemblers can do is “beat the table” for cost reductions without knowing how feasible they are which in turn may create tension between parties, possible lack of “honesty” over the question of whether quality has been cut to meet price and, consequently, a need for more checks and associated costs by the assembler.

2. THE IMPLEMENTATION OF THE BDB THROUGH-LIFE COST MANAGEMENT STRATEGY

The application of "Target costing" supported by VM and other cost management techniques (e.g., Risk management, continuous improvement) means that the management of project costs is in fact an ongoing process. Cost management efforts need to be undertaken at all the major decision making junctures in the VM process and beyond. The experience of the BDB Pilot Project indicates that a range of different techniques are most effective at different stages in the project process. Accordingly, the implementation of the "Building Down Barriers" Trough Life Cost (TLC) Management Strategy can be segmented to include the following steps:

1. *Developing an option study and a business case*
2. *Establishing the TLC strategy*
3. *Understanding customer requirements and defining product features*
4. *Costing the project at early stages: producing initial cost estimates*
5. *Collecting and proving TLC data*
6. *Establishing the cost gap at project and cluster level*
7. *Finalising price negotiation with suppliers*
8. *Starting Continuous Improvement - based cost reduction activities*

2.1. Developing an option study and a business case

Before engaging the Prime contractor and its supply chain, the client team sets out to define the main characteristics of the business case at hand. The results are summarised in the Strategic Brief which conveys the essential functional and business requirements of the project, as well as any budgetary constraint. The Strategic Brief is described in Tool A.1 in Part III.

2.2. Establishing the TLC strategy

While developing the business case, the client team needs to establish a clear Through-Life Cost (TLC) strategy for the project.

The strategy sets out the desired duration of the product and balance between the capital and the operational and maintenance elements of the cost. This decision needs to be taken by the client team in view of its strategic needs and financial considerations. The decision identifies a desired balance between the initial capital cost and the through-life cost along a continuum defined by two extreme situations: a high capital investment to achieve the minimum possible expenditure during the life cycle of the product; or a minimum initial capital investment, leading to more substantial costs for operation and maintenance. This profile is necessary for the supply team to effectively guide the value management process, select options, and choose among products during the design process.

When it is not possible to express the TLC strategy in quantitative and financial terms, clear qualitative statements, such as "the building should obtain the maximum TLC efficiency at the minimum capital cost" should be used. However, statements of this sort are more useful when complemented by budgetary constraints established by the client, which will provide the design team with some clear and unequivocal terms of reference.

2.3. Understanding customer requirements and defining product features

Within the BDB process the detailed functional requirements of the project are identified on a collaborative basis by the Client and the Supply Team through the use of value management tools. Through a structured and collaborative process which involves those supply chain members relevant to the design options under discussion and the key risks associated with them, the team identifies some basic design options and consolidates a design strategy which specifies the basic spatial layout.

2.4. Costing the project at early stages: producing initial cost estimates

In order to undertake an informed evaluation of the spatial layouts which have emerged from the collaborative design, these need to be roughly costed before major VM events.

Within the "Building Down Barriers", for example, rough estimates were produced prior to the high level value engineering workshop aimed to produce the project design strategy (see Tool C.2 for details). The two project teams, in collaboration with some external consultants, used existing proprietary and publicly available databases, such as e.g., the BCIS one, to derive top down estimates for the capital and through life elements for the major design-strategy options under discussion.

Because major VM events always comprise a brainstorming phase in which new options are brought to bear, it was also decided that besides preparing the cost estimates for the design strategy and spatial layouts, experienced QS needed to attend the event to help with costing ideas as they were produced. The presence of such expertise at the VM workshops proved indeed valuable in that some of the major variations of the design were priced in real time providing valuable data for the decision making process.

2.5. Collecting and proving TLC data

The objective of service life planning is to assure, as far as possible, that the service life of the building or component is at least as long as its design life. Achieving this may of course require maintenance during the service life of the building and/or the component. As we cannot know in advance precisely how long the service life will be, the objective becomes to reliably forecast the service life and required maintenance using the available data. Estimation of the service life at design stage allows factors to be considered for that specific site. It will assist planning of future maintenance operations, selection of the optimum specification and design, and avoidance of waste.

The process of service life planning can be applied to both existing and new constructions. For existing buildings and components, many of the choices have been predetermined, and the building is already some way through its service life. Therefore, planning the service life will focus on assessing the residual service life of components and optimising their replacements. For historic buildings, severe constraints on choices result from historic or aesthetic considerations or legislation. Service life planning consists of three major steps:

1. *Identify the components*

This is achieved using Value Management as indicated elsewhere in the handbook.

2. *Predict though life cost of each component*

Following the Value Management activities different sources such as manufacturers' documentation, publicly accessible databases (e.g., HAPM) are consulted and the service life of each component ascertained

3. *Compare, choose and document*

Capital and through life cost are combined and converted into net present value. In view of the results, the appropriate component is selected and used in the project. Data supporting the decisions are recorded for future audit trail purposes. Further details of the process for collecting and documenting service life data are provided in tool III.C.7 "Collecting And Documenting Through Life Cost Data".

2.6. Establishing the TLC cost gap at a project and at a cluster level

On the basis of the technical and commercial decisions taken using collaborative design and Value Engineering techniques, cluster leaders and suppliers can establish the cost of the work packages both in capital and in TLC terms. These costs need to be aggregated at the cluster and project level and compared with the established target.

Using the cost model as a support, the Prime Contractor identifies the cost gaps at Project and Cluster level, and VM activities are carried out at Cluster level until the set target is achieved. The Prime contractor integrates the cost information produced by Clusters and manages the achievement of the cost target at Project level.

The Prime contractor also addresses the cost trade-offs deriving from the adoptions of innovative solutions at Cluster level. For example, in the one of the BDB Pilot Projects, the adoption of a lighter, less expensive Steel frame required to increase the specs (and the cost) of the foundations work. Using the cost model, the Prime contractor was able to establish that the trade off was largely positive, and that the saving obtained largely exceed the cost incurred. The new design of steel frame was therefore adopted, and the appropriate transfer mechanisms were put in place to reimburse the substructure Cluster leader for the extra expenses contracted.

2.7. Finalising capital price negotiations with suppliers

At the end of the Scheme design phase the Prime Contractor consolidates the work of the clusters. Although every effort should be produced *during* the design activity to avoid double counting of cost items and to including in the prices allowance for the risks associated with project interfaces, the cost implications of these interfaces should be reviewed at this point of the project. Residual double counting and contingencies are identified and subsequently eliminated through negotiations between the Prime Contractor and Supplier.

Other savings derived from CI based activities aimed at optimising construction sequencing and site layout (e.g., diminished prelim costs) are also negotiated and taken into account at this stage.

2.8. Starting Continuous Improvement based cost reduction activities

The activities of cost management do not stop with the end of the design phase and continue throughout construction. The use of Continuous Improvement principles and techniques are covered in Section II.4 and Tool C.6 "Planning and managing construction to minimise waste and optimise programme".

3. COST MANAGEMENT EXPERIENCES IN THE TWO PILOT PROJECTS

The application of the "Target Costing" approach in the two Pilot Project revealed to be one of the most challenging aspects of the new process.
Problems with the target setting process emerged both at the outset of the project, during the establishment of the Historical TLC Baseline, and later in the project when targets had to be set for the different work packages carried out by the different project clusters. Both Pilot projects determined the design in terms of functionality first, and only afterwards tackled the task of costing and cost reduction. However, this is contrary to the target costing spirit which states that the objectives of functionality and cost should go hand in hand. They should emerge together through a process of innovation, amendment to design, costing and reconsideration. The value engineering process should be a never ending loop, balancing functionality against cost until the best possible approximation to the client's desired functionality and cost has been achieved. In these projects this process seems to have begun well. In the initial stages of planning, options were considered alongside their likely cost, but these costs were in outline form largely based upon what would seem to be reasonable market charges for such activities/ attributes. As the process moved forward to a more detailed level, design for functionality and design for cost seem to have drifted from each other and the whole process tended to move back towards more conventional contracting.
There was an additional fundamental problem. Suppliers provided the prime contractor team with the necessary performance and durability data, and with the related running and maintenance costs. The prime contractor team then computed the impact in terms of net present value of the whole life cost of the different solutions and fed back this information into the value engineering decision processes. But it was impossible in many cases to obtain realistic quotes from suppliers and sub-contractors until the concept design was relatively frozen. It appeared that it was industry practice not to identify detailed elements of cost, but to submit an initial price built up upon their supplier's perception of the acceptable price for that work package in the marketplace.

This situation created a substantial problem in that, until very close to when a bid was supposed to be submitted to the client (the project had to go through a hard stage gate at the end of the concept design at which a firm price would be agreed), it was impossible to identify the cost gap between the established target and projected cost. As a consequence both Pilot projects had to be granted some extra time to iterate the value engineering activity.

Setting targets is, of course, a step common to all competitive offerings, but the gist of target costing is to achieve the target by improving the ratio between value and cost instead of affecting the expected level of profitability. However, as evidence from the two Pilot Projects suggests, the simple process of setting realistic, market-competitive targets requires the capacity to identify with some certainty what the market will bear and what the internal costs are for separate sub-stems, components and activities involved in the project. This seems to be a capacity that many firms in the industry lack at this point in time. In fact, the commercial functions of most construction sector organisations appear to have abandoned working with accurate apportionment of underlying process costs, profit and corporate overheads, in favour of working with market-driven lump sums. In many ways, this industry appears to apply a peculiar costing strategy that can be described as "Price-Plus": the price for the client at any point of the value chain is determined by tendering out much of the work, selecting one of the offers, and adding a set percentage for overhead recovery and profit. The problem with this widespread approach is that very few players appear to understand what the construction processes actually cost, so the idea of setting targets and achieving continuous improvement becomes highly problematic. The lack of data on costs of production throughout the supply makes the setting of middle or long term cost strategies almost impossible.

At the same time the use of the price - plus approach, combined with the prevailing practice of project by project competitive tendering at all levels, produces a paradoxical situation whereby industry prices are always determined as the highest price the next client in the value chain is ready to pay. As a consequence, companies often rely on competitors to know the "right" price and the cost of their own jobs. Within a target costing scenario this gives rise to a "catch 22" situation: the prime contractor cannot set the price for the job until he tenders the design, while the product cannot be designed until the price of the different work packages is known.

A challenge for the future is to explore to what extent, or in which contexts, elemental "lump-sum" costing can be replaced with "bottom up" estimation of actual labour, plant and materials costs throughout the supply chain and how this can be viably achieved.

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Collaborative Working Centre – www.collaborativeworking.co.uk
The Collaborative Working Centre of Be is a not-for-profit organisation set up from members of the team that facilitated *Building Down Barriers* to provide consultancy, training and other continuous improvement services to support the development and implementation of collaborative working.

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