Should Cost Modelling. The Strategic Tool for Maximising Return On Investment for the Construction Industry.

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Abstract

In many industries it is widely recognised that the cost of the product is an important strategic factor that should be decided by management rather than by designers. However, in the UK construction industry the prevailing, traditional approach to cost estimating and modelling consists of a bottom-up cost estimate based on the proposed design, followed by a value engineering exercise to bring this cost estimate closer to a pre-set development budget. As a result of this reactive 'design pricing' approach, construction projects are frequently characterised by a costly re-design process and design programme overruns. This traditional approach to delivering projects in the construction industry is progressively being replaced by a proactive, top-down form of cost analysis that influences the entire development process from the start: Should Cost Modelling. This cost modelling methodology revolves around establishing key commercial success criteria and efficiency ratios for all asset components, allowing the resources to be allocated where they generate the greatest value before the design commences. Should Cost Modelling has the potential to revolutionise construction cost estimating and design methodologies. It can also help to challenge the prevailing misinterpretation of project, cost and commercial management practice in the construction industry as one that delivers buildings, as opposed to broadly understood value, to their clients.

Keywords: Should Cost Modelling, estimating, design

Introduction

Today, the value of the construction industry's products is no longer measured in either square metres or market value, but revolves around an understanding of the construction industry's clients' business activity (Chomicka, 2012). This concept underpins modern project and cost management practice, known in the industry as Built Asset Consultancy (BAC), which in essence revolves around the delivery of the maximum value from the money spent on building, operating, using and owning assets (ECH, 2013). To deliver the maximum value, BACs rely on bespoke tools that allow their clients to make better-informed decisions in pursuing business opportunities.

One of the predictive analytics tools utilised by BACs to optimise capital expenditure on projects, which is a key driver for most clients, is a Should Cost Analysis method. Should Cost Analysis, and a specific Should Cost Analysis tool researched in this study – Should Cost Modelling – is a cost management tool based on desired functionality and performance, instead of on a proposed design, that allows the analysis and determining of strategic success factors for the project before the design commences. Should Cost Modelling provides real-time cost information throughout the whole design development process, addressing one of the biggest problems for the construction industry's clients': the necessity of making important decisions and commitments with limited cost information and with an inadequate understanding of the cost implications of such decisions. In Should Cost Modelling methodology, cost efficiency is the determinant of the asset's scope, design and specifications, and provides a framework for the procurement strategy, programme and any other project management aspect of the delivery of the asset. Should Cost Modelling is therefore a design and development steering tool that enables the monitoring of, and challenges to, the design development, project and commercial delivery processes, ultimately maximising value for the client.

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This approach presents an attractive alternative to the prevailing contemporary cost management systems in the UK construction industry, which, in essence, are based on cost consultants pricing architects' designs, i.e., establishing how much the project 'will cost'. This traditional approach yields a bottom-up cost estimate based on design: i.e., the cost estimate is a direct outcome of the design. 'Will cost' cost estimates are usually greater than the client is able to, or should, pay, and clients who reject them typically then instigate a value engineering exercise to bring this cost estimate in line with their pre-set development budget. This value engineering exercise is an iterative process of re-design and re-costing, which ends when there is an acceptable fit between the cost estimate and the development budget. This cycle of design and estimation – or re-design and subsequent cost estimate revision – is nowadays considered to be inefficient, reducing the value that can be profitably delivered to construction clients (Theodorakopoulos, 2009). Moreover, this traditional, backward-looking, 'will cost' methodology is becoming increasingly inappropriate for management purposes, because 'will cost' information is reactive, tends to be too late, too aggregated and too distorted to be relevant for project planning and control (Johnson and Kaplan, 1987).

The proposed 'should cost' alternative, and the Should Cost Modelling technique in particular, addresses the identified issues associated with the 'will cost' approach, and enables the maximisation of the client's Return on Investment (ROI) on built assets. Should Cost Modelling is a specialised form of cost analysis which is essentially a cost model, tailored to the distinct circumstances involved in construction design and delivery processes. It is focused on ensuring that cost decisions – and subsequently design solutions - are linked to income and value.

Should Cost Modelling methodology provides a missing link between the economic structure of clients' business activity and the design and delivery of construction products, and, by transferring the pricing power form a supplier to a purchaser, contributes to the aspiration of creating a robust and responsive supply chain built on collaboration, transparency and cost-efficiency.

Research Methodology

The primary purpose of this research was the documentation and interpretation of the specific Should Cost analysis tool, the Should Cost Modelling methodology created by EC Harris LLP for the advancement of knowledge, and included a review of confidential case studies from the construction sector context.

The following two research methods have been selected for this study: a literature review and case study analysis. This study had six phases: 1) the diagnosing of the problem encountered in the construction industry associated with current cost management practice; 2) research into the current cost management practice; 3) research into the Should Cost analysis methods and Should Cost Modelling tool, used by EC Harris LLP; 4) an investigation of the existing research and literature on should cost analysis, design steering, lean costing and target costing; 5) the exploration and interpretation of three case studies, and 6) conclusions, and the consideration of the adoption of the Should Cost Modelling methodology in the wider construction industry and recommendations.

The results of this research describe a unique EC Harris LLP design-steering method, which allows management of the design process toward a set value target for the project.

Should Cost Modelling Background

One of the first known references in literature to the Should Cost concept is found in the US Army Materiel Command (US Army Procurement Research Office) Should Cost Analysis Guide (1972). According to this guide, Should Cost began as a civilian application, and originated in a large, nationwide consumer goods chain applying the method to the supply of its appliances, and other items. The method has been deemed successful in obtaining

consistently low prices from suppliers (USAMC 1972), and, following this observation, in 1967 the US Department of Defence, after experiencing runaway cost overruns on many military programmes that generated severe criticism in the press and continual debate in the Congress, implemented a programme to aggressively apply and expand the Should Cost methodology on major procurement programmes.

Initially, Should Cost analysis was a highly analytical and labour-intensive exercise, which required a team assembled by the Department of Defence to devote several weeks or months to analysing a given supplier's processes and production metrics while located at their supplier's office or plant (GBMC, 2011). As a result of this situation, the individuals whose task was to understand and analyse suppliers' processes worked in a hostile environment for extended periods of time, as their role was effectively to challenge inefficiencies in the products and services provided by the team they had become part of. The Department of Defence team would identify inefficiencies such as, for example, the unproductive or inadequate sourcing of parts, and re-calculate the cost of the product based on the elimination of these inefficiencies, providing the supplier with their observations and recommended improvements. While, according to the Department of Defence, results proved that the Should Cost approach brings significant cost savings and long-term management improvements (USAMC 1972), the type of approach adopted in this example could probably work only in circumstances in which the party undertaking such analysis is the dominant or the only customer of a given supplier. However, even in such circumstances the process implemented is expensive, time- consuming and labour-intensive, especially if undertaken as part of a competitive procurement process that involves an analysis of multiple potential suppliers.

At present, Should Cost is used to describe a variety of approaches to pricing (Chomicka, 2012). According to the National Society of Cost Estimating (1986) 'Should Cost is a concept of contract pricing (…) to identify uneconomical or inefficient practices in the contractor's management and operations, to quantify the findings in terms of their impact on cost, and to develop a realistic price objective for negotiations (…)'. Sourcing Innovation (2010) recognises that '[Should Cost] knowledge is critical for identifying mis-priced parts, parts with high mark-ups, parts improperly sourced from vendors who are not suited to produce the part, and overly complex parts in need of simplification and re-engineering'.

In line with these various definitions and applications there are various recognised approaches to this method, including Should Cost analysis based on industry averages, sequential, bottom-up strategies, top-down strategies, cooperation models, negotiation models and combined negotiation and cooperation models (iprocurement 2011).

Should Cost analysis and the Should Cost Modelling tool, similarly to other strategic cost management tools such as, for example, Strategic Sourcing, generally consists of aggregating, categorising and analysing costs. When considered across various industries, services and products, Should Cost analysis is deemed not to be appropriate for every circumstance (GBMC, 2011). There are circumstances and projects in which traditional cost management techniques deliver the optimum output; however, in the construction industry context Should Cost analysis provides a valuable tool that can drive cost reductions and supply continuous improvement efforts. The relationship between the type of product or project (based on characteristics such as volume, cost, supply base and level of engineering) and the potential benefit of the application of Should Cost analysis versus other recognised strategic cost management tools (Strategic Sourcing) is shown in Figure 1.

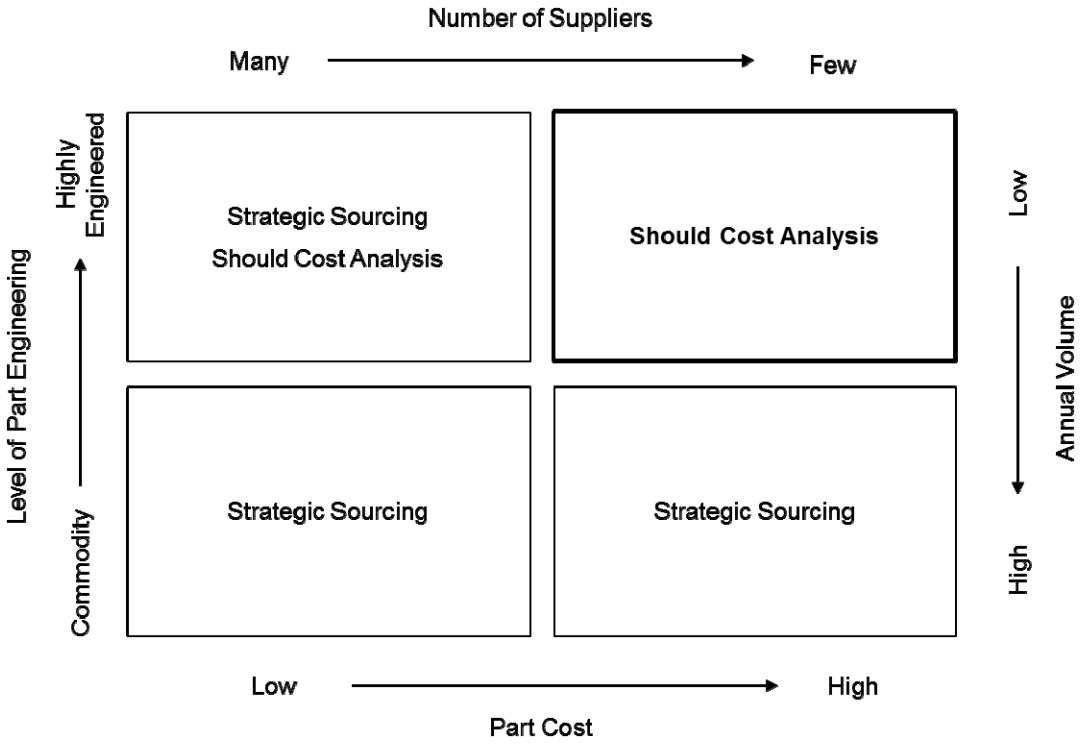

Figure 1 – The relationship between the type of the product or project (based on characteristics such as volume, cost, supply base and level of engineering) and the potential benefit of application of Should Cost analysis versus other recognised strategic cost management tools (Strategic Sourcing). Based on (GBMC, 2011).

In the construction industry, particularly the sector of the industry that delivers corporate real estate and luxury housing, there are few suppliers and relatively low annual volumes. In addition, the products delivered by the construction industry are effectively untested prototypes. In these specific circumstances, the reliance on supplier competition to drive down prices does not allow the achievement of best value as it would in cases where the products in question are comparable. This is why Should Cost analysis in the construction industry proves viable and desirable.

In many industries, Should Cost analysis is typically applied to specialised or unique elements. In the aviation industry, when a customer is purchasing a part or assembly for an aeroplane, the supplier typically specifies much of the manufacturing process. Based on these specifications, the customer can determine whether the manufacturing process delivers the required functionality and quality of the sought part or product. Even when the pricing is complex, as is the case in industries such as, for example, telecommunications, shipping or information technology, the actual product or service is fairly comparable and the assessment of suppliers' proposals is relatively straightforward. What the customer is not able to determine is the cost structure of the supplied part or assembly, as shown in Figure 2. This is where should cost analysis demonstrates its true value.

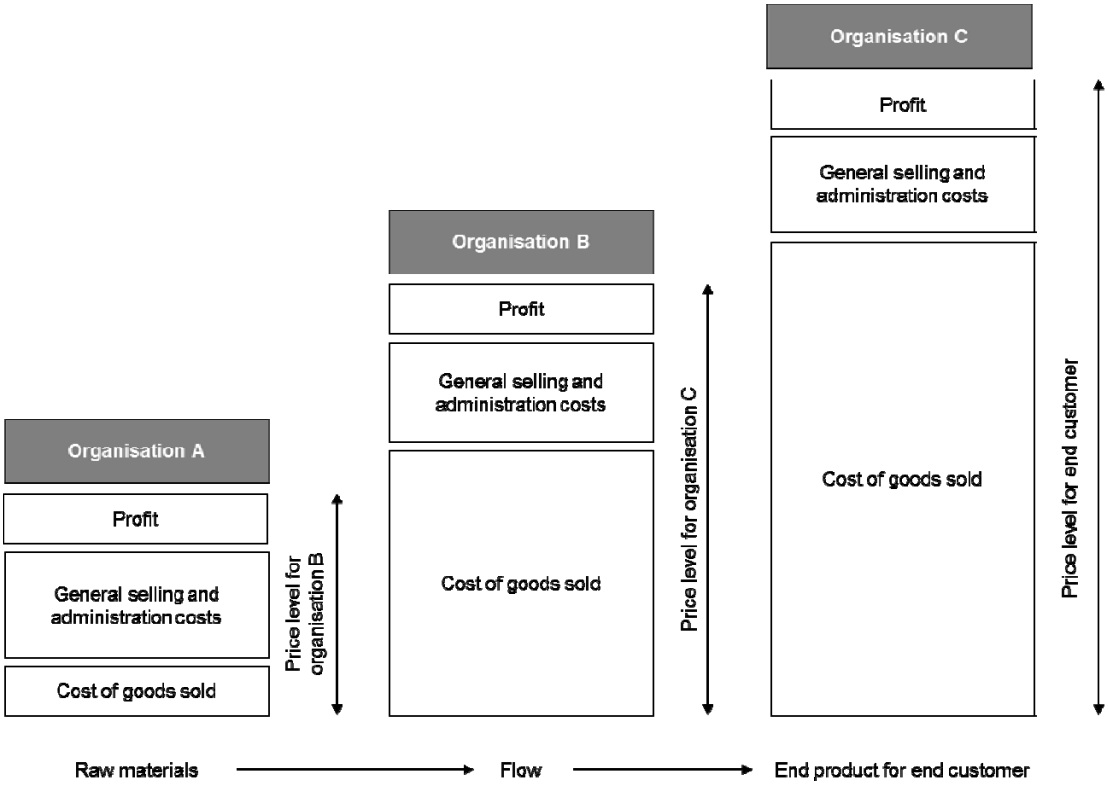

Figure 2 – Cost route in the supply chain. After Lemmens, 2013.

Should Cost analysis helps customers to understand what drives the cost of the product, and allows the exploration of a variety of scenarios such as how changes in procurement strategy or product design and delivery processes might impact on the final price of the product for a customer. The Should Cost models then provide insight and aid to negotiations with suppliers (sourcing innovation, 2010).

Should Cost Modelling Methodology

At the core of Should Cost analysis in any industry are statistical models and a database. Initiating Should Cost analysis requires a good understanding of the production or assembly processes used to create the product to be procured. The determination of the industry is the first, and most important, aspect of Should Cost analysis (Lemmens, 2010), because this method relies on industry averages and benchmarked data from final accounts and priced cost plans.

The EC Harris LLP proposal for the construction industry is a top-down form of cost analysis based on benchmarked data. The aim of the proposed Should Cost Modelling tool is to provide an initial indication of the current out-turn costs of the development that has been derived from benchmarked data from final accounts and priced cost plans (ECH 2011). Should Cost Modelling is used by EC Harris LLP as a cost and design management tool for reducing the cost of the product and the identification and protection of value for the customer. This approach is based on Tanaka's (1993) proposition that the cost of the product is considered to be an important strategic factor that should be decided by management, not designers. Should Cost Modelling is based on desired functionality and performance instead of on a proposed design.

The Should Cost Modelling tool provides a commercial strategy to deliver predictability in business outcomes. It revolves around the establishment of commercial success criteria for the delivery of projects and programmes of work, at the earliest opportunity. The Should Cost Modelling approach ensures that resources are allocated where they generate the most value, and that the overall cost plan progresses in parallel with the design and delivery of the project.

Should Cost Modelling permits: (1) the establishing of key efficiency ratios for all asset components, (2) the creating of a cost model to reflect the minimum achievable cost of the product that meets the brief, (3) the clear identification of extra costs for specific site conditions and constraints, (4) the clear identification and review of additional costs associated with the enhanced design over the base and the facilitating of approval on a business case basis, (5) the establishment of the basis against which future design variances can be monitored, (6) the identification of value management opportunities to meet or improve the cost estimate, (7) the identification of cost risks and opportunities, (8) the support of the client in making design direction decisions, (9) the development of an informed budget for each asset component (for example, the façade, the façade access system, the lifts and so forth).

The Should Cost Modelling methodology proposed by EC Harris LLP has three distinct steps, as shown in Figure 3.

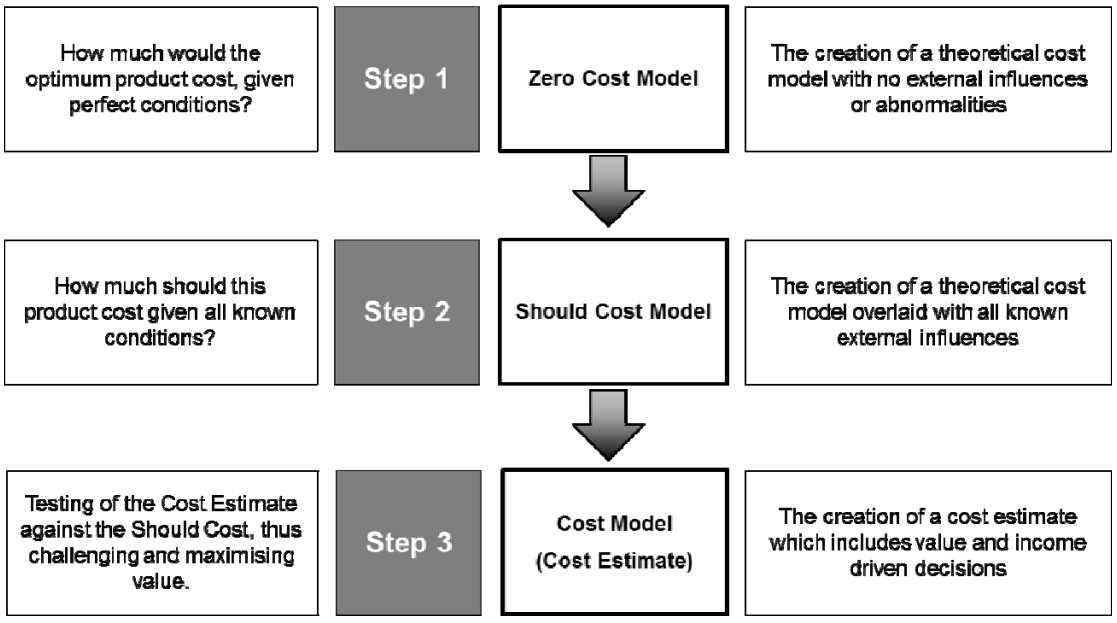

Figure 3 – Should Cost Modelling methodology proposed by EC Harris LLP. Based on ECH, 2011.

The Should Cost Modelling methodology makes transparent the basis of a cost estimate and allows the explanation of why the delivery of Zero Cost optimum product is not possible or desirable, why the Cost Estimate differs from the Should Cost Model, and what value and income decisions were made in order to arrive at the Cost Estimate. For example, in step 1, Zero Cost Model, there might be an allowance of £500 per m^2 for the façade cladding. In step 2, the Should Cost Model, a planning requirement for an enhanced façade would be taken into consideration, increasing the cladding allowance to £600 per m^2. In the step 3, the Cost Estimate, there could be a further allowance of £100 per m^2 for special cladding to appeal to a certain type of tenant.

The Should Cost Methodology therefore transparently identifies – and more importantly, *explains* – any additional costs, arming the client with the right information and allowing the client to judge emerging design proposals and associated cost estimates on their objective merits to see if they would genuinely add value to their business case. It also informs the basis of the design (the client's brief) and the design team's development of detailed design proposals.

From a cost management perspective, the main difference between Should Cost Modelling and traditional cost-estimating is that Zero Cost and Should Cost allow the client and his or her teams to understand the basis of the Cost Estimate (Chomicka, 2012). It also allows for project-specific circumstances (project abnormalities) to be incorporated into the ideal (Zero) position resulting in a realistic (Should) position.

Step 1: The Creation of a Zero Cost Model

The starting point of the creation of a Zero Cost Model is a robust database containing benchmarked data from final accounts and priced cost plans. The Efficiency Database of EC Harris LLP, one of the largest cost consultancies in the world, collects, categorises and stores valuable benchmarking data (such as value, function, time, and design and cost efficiency) from every project undertaken by the company. This data creates the starting point for project cost estimation - an ideal Zero Cost Model. The creation of a Zero Cost Model follows a three-step process, as shown in Figure 4.

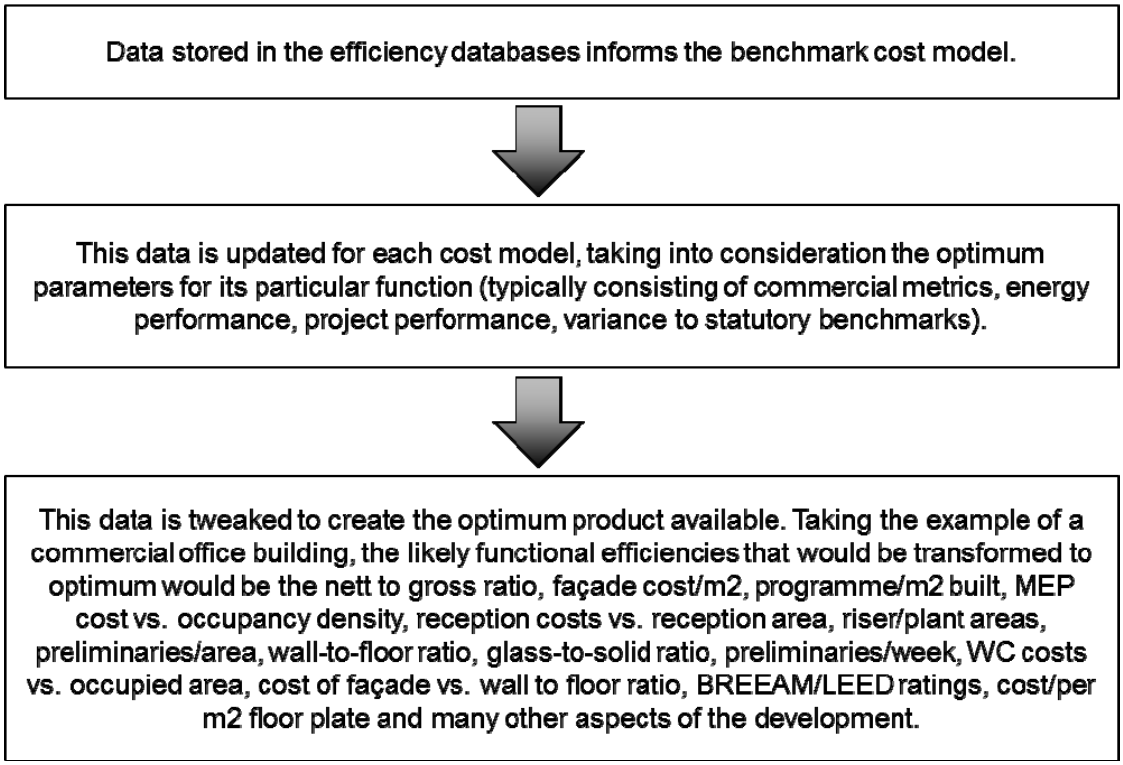

Figure 4 – Zero Cost Modelling sequence. Based on ECH, 2011.

Once the three steps above have been completed, the end result is a Zero Cost Model for a hypothetical building, based on must-have, extreme functional efficiencies and no external influences (such as shape, size, planning, rights of light, site constraints or existing conditions).

The key cost influencing factors, such as architectural intent, procurement and buildability, are not included at this stage; in the Zero Cost Model only the most efficient design for its particular function is allowed for. The Zero Cost Model is therefore not an estimate per se, but the optimum outcome for a project if all the influencing conditions are perfect.

Step 2: The Creation of a Should Cost Model

To create a 'live' cost model, the Zero Cost Model has to be overlaid with project-specific details and project-unique circumstances. This exercise involves overlaying the cost information with the cost implications of inefficiencies driven by, for example, the site constraints, client brief, commercial business case, budget, design criteria, functional efficiencies, statutory implications and any other known influences on the end product. Architectural intent, buildability issues and the chosen procurement strategy are taken into account at this stage.

The end result of this exercise is a Should Cost Model detailing how much a particular building *should* cost, based on all the known external factors and circumstances.

Once completed, the Should Cost Model is shared with the design team as a starting point for the development of design proposals.

Step 3: The Creation of a Cost Model (Cost Estimate)

The beginning of the design development process also marks the start of the evolution of the Should Cost Model towards a Cost Estimate. At this stage the value of the Should Cost Model becomes apparent, as the subsequent cost estimates are constantly evaluated against the development baseline. As the design progresses, this comparison exposes deviations from the Should Cost Model and enables the assessment of inefficiencies and their impact on the project.

In parallel with the evolution of the design, the original Should Cost Model is updated to reflect other essential project activities, such as market testing or the quantification of risks. All these activities feed into the cost estimate as part of the estimate testing cycle against the Should Cost Model until the actual Cost Model (project cost estimate) is completed.

The Value of Should Cost Methodology - Review of Case Studies

Three case studies were used in this research – two confidential large, complex mixed-use schemes located in the UK (£3+bn and £411m) and one confidential project located in the Middle East (£undisclosed). In each case study, the Cost Model was prepared using Should Cost Modelling methodology at RIBA Stage C (i.e. after the initial, concept design commenced, which resulted in the need for a certain amount of re-design). The estimate was prepared on the basis of the building areas assumed by the architect within their Concept Design submissions. As described earlier, to achieve maximum value from the deployment of this method there is a need to involve the cost team before the design commences.

Composite rates per m^2 of built area were generated from EC Harris LLP's in-house database system, which provided geographically-specific rates from the final accounts of previous and similar projects that EC Harris LLP has delivered in a particular region. All rates were amended to reflect current market conditions (e.g., commodity prices and labour markets), which are tracked by the EC Harris LLP research team on an ongoing basis. Where information was not available, lump sum allowances were made and subsequently refined. The focus of the Cost Estimate created with the aid of Should Cost Modelling was to provide an initial indication of out-turn cost on the development.

In all three case studies, the Should Cost Models identified targets that had to be achieved to maximise the return on investment and that informed the design development. This resulted

in, for example, additional extra over-costs associated with the residential specification uplift and the façade uplifts required within the clients' brief and the improvement in the ratio of gross to nett lettable floor areas (GIA to NIA). The Should Cost Models also identified key components that required review in structured workshops to ensure that the approach of 'design-to-budget' was maintained (e.g., the basement and car parking, lighting options, external landscaping, façade specifications, LEED and environmental strategy review, MEP strategy review, interior options or traffic study review). The project teams were provided with a clear understanding of the cost to develop the schemes, and the models informed the revision of the clients' briefs.

The design 'steering' provided by the Should Cost Models allowed the design teams to ensure that project costs either equalled or improved on the budget for the development. The design teams involved in the case studies recognised that there were many possible design solutions for each project definition, resulting in a variety of building costs, but only specific solutions allowed their customers' business case requirements to be met.

Conclusions

Projects in the construction industry have to respond to wider objectives than the cost per square metre of the end product – they have to deliver broadly understood value to the construction industry's clients. This means that there is a need to develop tools that will allow the assessment of the wider impact of the project on the commercial activity of all the parties involved in the delivery of the project. The Should Cost Modelling tool developed by EC Harris LLP allows this goal to be achieved, and addresses the four objectives pursued by the company's clients: (1) agility, (2) cost, (3) risk and (4) liquidity (EC Harris, 2012). The agility objective is about being ready to react to changes in the market immediately. The cost objective is about 'spending less and streamlining more'. The risk objective revolves around recognising, mitigating and managing threats to profits, business models and corporate reputation. The liquidity objective is about freeing up cash for core business activities and contingency.

The Should Cost Modelling concept is already in use by EC Harris LLP in the construction industry both in the UK and internationally, with encouraging results. In the three case studies reviewed, this methodology provided design steering and helped to achieve a shared platform and mutual understanding of the goal among designers, cost consultants and clients, enabling the achievement of target costs and aimed for value for the clients. It is envisaged that the top-down cost management methodologies, such as Should Cost Modelling, will revolutionise cost management practice in the wider construction industry worldwide.

However, the main limitation to the wider adoption of top-down cost management methodologies in many countries, such as, for example, the UK, seems to be the cultural change required to replace the entrenched 'will cost' approach. As observed in Finland, where a form of top-down costing methodology (Target Costing) has been used since the 1980s, architects initially resisted the new approach, thinking that the design is 'right' in and of itself, and that any challenge or change to a proposed solution due to set cost targets was 'wrong'. But in 2011, Finish researchers reported that following the wide adoption of target costing, most Finnish design teams now require well-analysed target cost information before commencing design work, proving that the top-down approach also benefits the design process (Pennanen, et al. 2011) and the designers' profits.

Broadening the use of this methodology in the UK would probably require the incorporation of Should Cost Methodology into the RIBA Plan of Work, with the Zero Cost Model and Should Cost Model written into the detailed description of project stages, as shown in Figure 5.

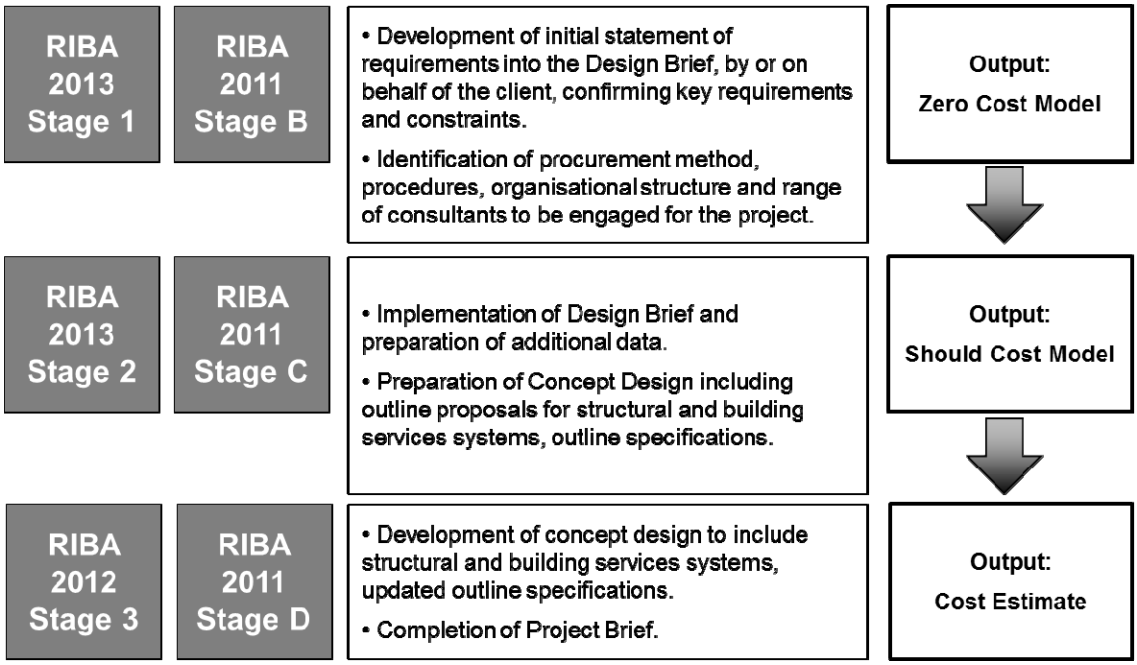

Figure 5 – Should Cost Methodology incorporated into RIBA Plan of Work. Based on RIBA Plan of Work (2008)

Recommendations

The findings of this research and the case studies reviewed suggest that greater transparency in relation to client goals is needed to support the commitment of design teams to cost model-driven design processes. A valuable area for future research is therefore cost model-design steering practice and the assessment of the outcomes of design-to-cost practices.

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