Concept Symposium 2018
Governing Megaprojects – Why, What and How

Designing to Cost in Built Environment Projects

Designing to cost has a long history, reaching back at least 70 years. Its primary roots are Value Engineering, the Design to Cost initiative of the U.S. Department of Defense in and after World War II, and the target costing practiced by Japanese manufacturers in their development of new products. The latter was adapted for use in built environment projects in the early 2000's, and now goes under the name Target Value Delivery (TVD). This presentation provides 1) an overview of TVD: what it is, how it works, and what results have been achieved through its use; and 2) a report on current research to evaluate cost models used to estimate costs at completion of building projects from programmatic data alone, prior to design.

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The Concept Symposia on Project Governance

The Norwegian Ministry of Finance and the Concept Research Program hosts every second year a symposium on project Governance. Project governance, in brief, is concerned about investments and their outcome and long-term effects. In view of the problem at hand, the aim is to ensure that the best conceptual solution is chosen, that resources are used efficiently and anticipated effects realized. Resource persons from ministries, governmental agencies, academia, international organizations, and industry are invited. In order to facilitate professional exchange and direct communication between participants, the number of individuals is restricted. The aim is to initiate further international cooperation and research on important issues related to project governance.

Glenn Ballard – a brief CV

- Previous Experience
  - Pipefitter, Foreman, Construction Engineer, Productivity & Quality Specialist, Internal Management Consultant for Brown & Root and Bechtel
  - Independent Management Consultant. Clients include Petroleos de Venezuela, U.S. Dept. of Energy, Pacific Gas & Electric, Koch Refining, BAA (Heathrow Terminal 5), Channel Tunnel Rail Link (St. Pancras Station), Aera Energy, & Hess Oil
- Current Position
  - Research Director, Project Production Systems Laboratory, UC Berkeley
  - Adjunct Professor, Building & Transport Engineering, NTNU
- Education
  - M.B.A. (Production Management)
  - PhD (Civil Engineering)
- Co-founder
  - International Group for Lean Construction (1993)
  - Lean Construction Institute (1997)
  - Project Production Systems Laboratory (2005)

Designing to Cost

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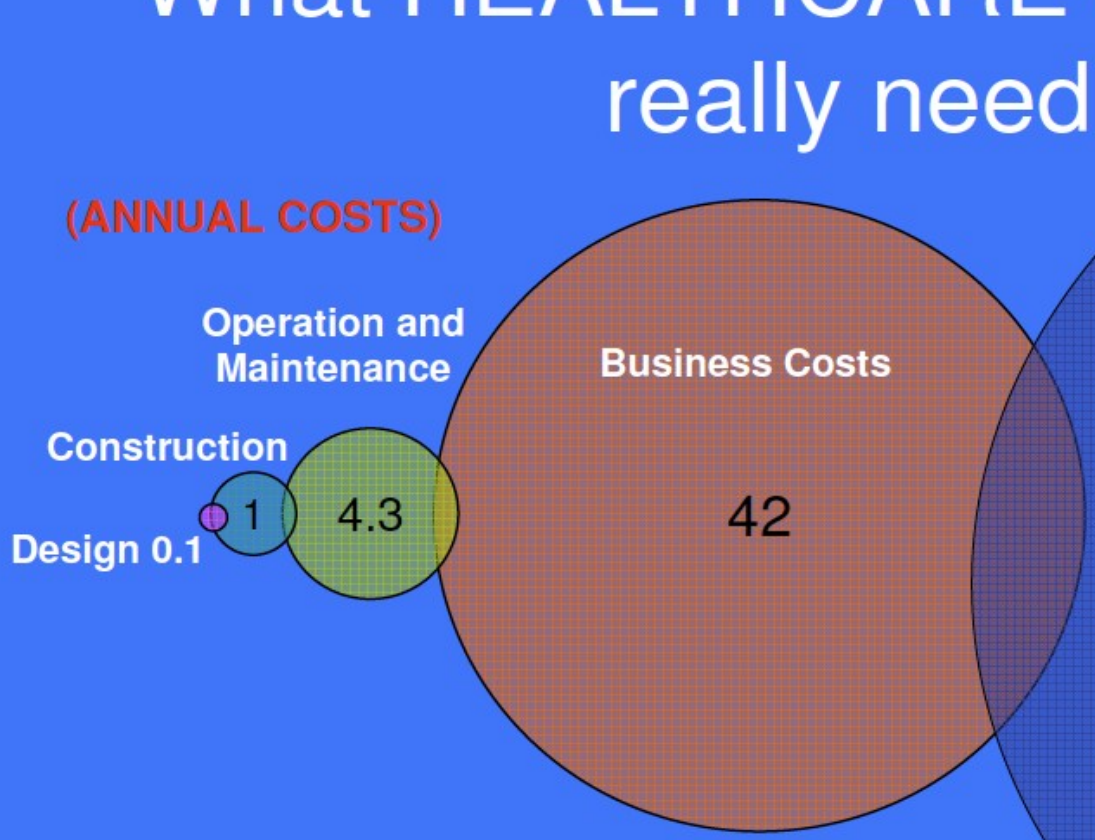
What HEALTHCARE customers really need



NHS Estates

Healthcare outcomes

- Clinical outcomes
- Hospital-acquired infection rates
- Safety outcomes
- Medication error rates
- Medication rates
- Re-hospitalisation rates
- Length of stays
- Patient transfers
- Costs per unit of service
- Patient satisfaction
- Visitor satisfaction
- Staff morale
- Staff turnover

From Evans, et al. 1998

Key Points

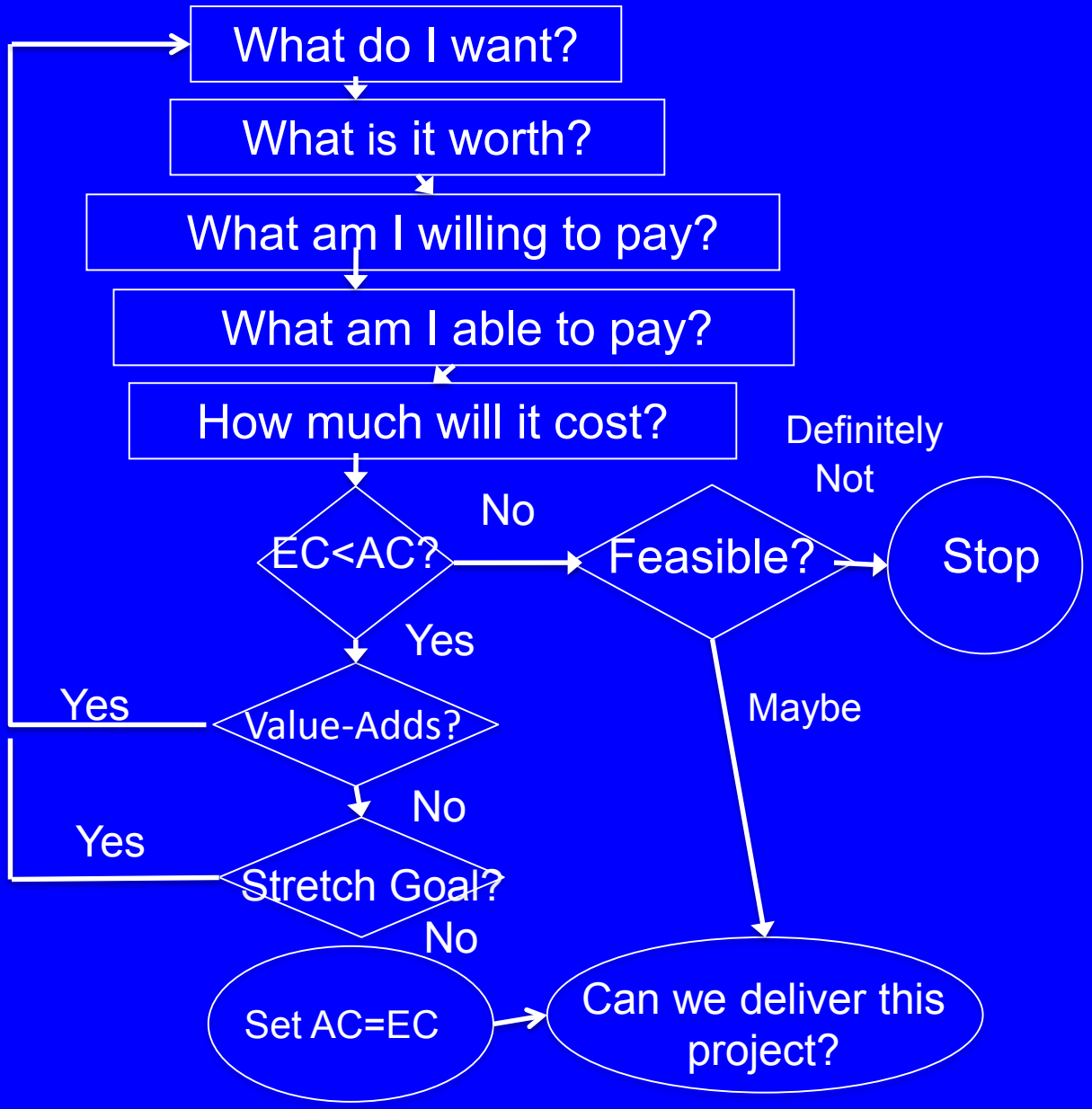
- The natural target for built environment projects is to provide the customer acceptable net benefits in use of the constructed asset.
- Some corollaries:
  - Design for the whole life of constructed assets, including costs and benefits from using the asset.
  - Don't just do what customers ask. First help them understand what they want by revealing the consequences of their desires and by making them aware of alternatives they had not previously considered.

Project Definition

- The first phase of projects is commonly called Project Definition. It starts with an idea for a project and ends with a decision if to fund the project.
- Major parts:
  - "What would we build if we could?"
  - "Can we build it?"

Allowable Cost (AC): what I am willing and able to pay.

Expected Cost (EC): what it would cost based on the market.

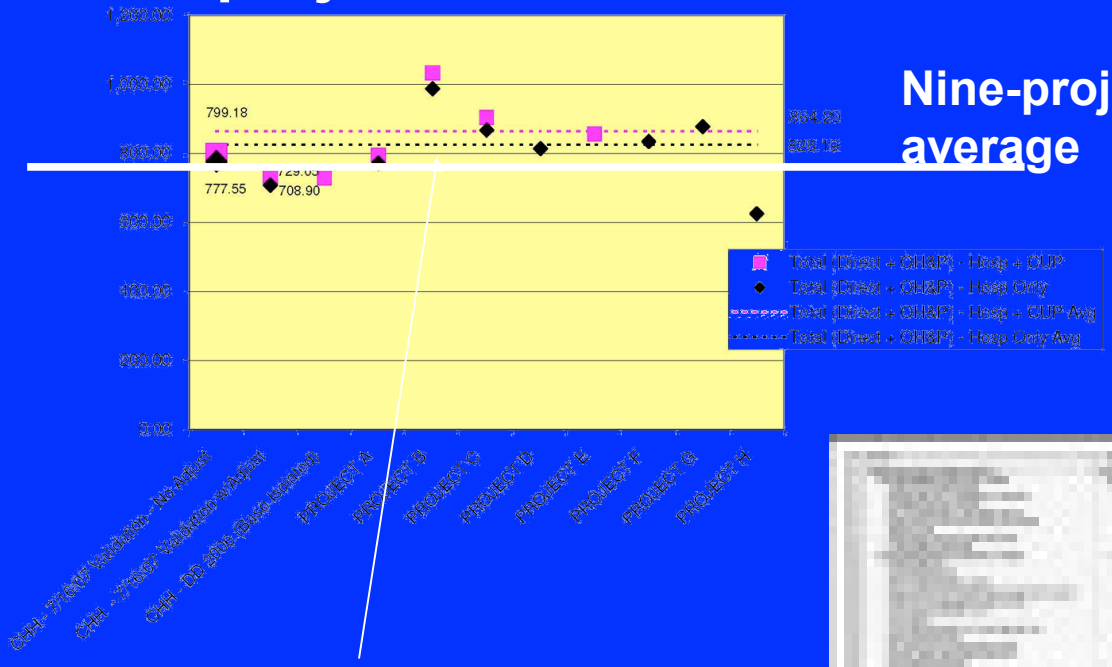


Accuracy of Conceptual Cost Estimates

The feasibility of producing sufficiently accurate estimates to support investment decision making has been questioned:

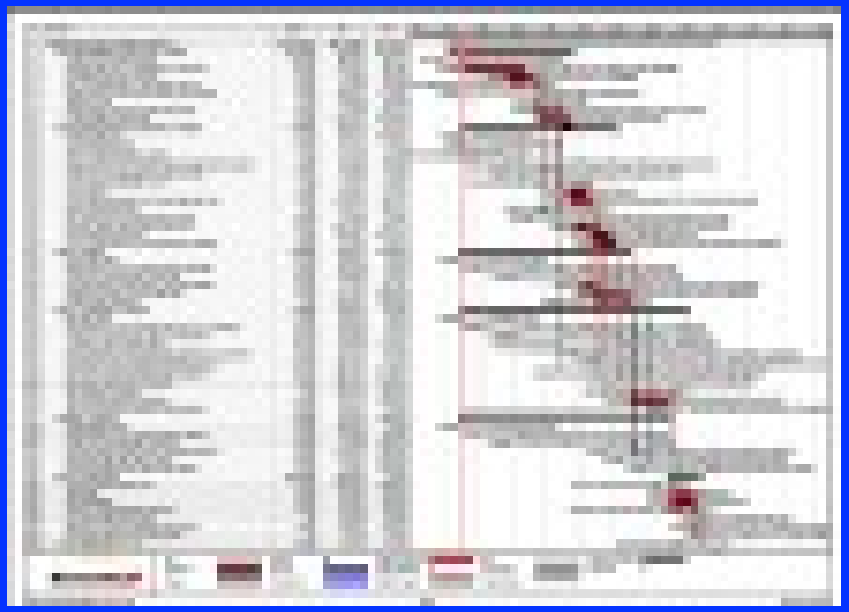
"…at this stage, almost nothing is likely to be known about the building except its general size, and therefore it is pointless to go into detail about the cost before any designing has been done." (Ferry et al. 1999).

Setting the target cost and project schedule



Nine-project marketplace average

Target set 14% ‘below’ marketplace



Accuracy of Conceptual Cost Estimates

Analysis of the most recent 32 Haahtela projects found an mean difference of -3.1% between conceptual estimates and costs at completion and a range from -12% to +15%. Even one such example suggests that understanding the program provides sufficient information to construct an achieveable ‘target cost’. But what contributes to accuracy of estimates?

Hypothesis: Not only the model and expertise in using the model, but also proactive steering of design and construction to targets for what customers value and the constraints on delivery of that value; principally, program, cost, location and time.

Target costing information model

Same information as design uses

Number of luminaries needed is based on illuminance required

N= ExA/(FxnxUfxMf)
where
E is illuminance required
A is size of the space
F is efficiency of the lamp
n is number of lamps in the luminaire
Uf is a certain factor (dealing with the absorption of surfaces)
Mf is a factor (dealing with probability that lamps work)

It is not necessary to produce first a design solution to count out the number of luminaries (or size of main switchboard, or…) as the designers use the same formula to determine the number of luminaries

Haahtela's Cost Model

What is it?

A machine for producing building information models that takes input from the voice of the customer and produces an estimated cost for what's wanted.

How does it work?

By embedding algorithms and formulas used by architects and engineers to move from 'I want to be able to hear a pin drop from any seat in the theater' to the costs of impacted components and systems. Change the requirement and the estimate changes accordingly.

Implications?

Are conceptual estimates really estimates—like forecasting the weather? Might they better be understood as resulting from building a model of the asset to be constructed using customer input, then costing that model? And further, that costs are set within a range that enables steering design and construction to the paired targets for program and cost?

Sutter Health's 2012 Report

- Since they launched lean in 2004, Sutter Health had completed 22 'lean' projects > $10 million, some much larger.
- "Lean" mainly referred to use of target value delivery and last planner
- None over budget or time
- All 'fit for purpose'
- Average 3.4% under budget
- Average 15% under market

I look forward to your comments and questions