Target Value Design: Delivering the targets of Construction 2025

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Presentation Structure

• The setting: How much waste in the construction?
• Lean thinking: Current gap in the industry
• Introduction to Target Value Design
• TVD in the USA: Case studies
• How is TVD Different?
• TVD savings & Government 2025 cost targets
• Way forward
Waste in construction

Sarhan, S., Pasquire, C., & King, A.
INSTITUTIONAL WASTE WITHIN THE CONSTRUCTION INDUSTRY: AN OUTLINE.

<table>
<thead>
<tr>
<th>e.g.</th>
<th>What we have to do to enable us to create what the customer wants</th>
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<tbody>
<tr>
<td>Accidents,</td>
<td>e.g.</td>
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<tr>
<td>Delay, waiting,</td>
<td></td>
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<tr>
<td>Rework</td>
<td></td>
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<tr>
<td>Over-ordered materials</td>
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<tr>
<td>Damaged materials</td>
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<tr>
<td>Multiple handling of materials</td>
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<td>Making-Do</td>
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<td>Poor payment systems</td>
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<td>Duplicate insurance cover</td>
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<td>Settling disputes after PC</td>
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<tr>
<td>Tendering</td>
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<td>Procuring services on cost</td>
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Why doesn’t mainstream academic/professional thinking on (project) management take lean onboard?

• Lean is about waste elimination, where waste refers to unnecessary use of resources
• This is not a new idea, rather it is an old idea!
• It is an idea that has been once rejected, pushed aside in the 20th century, as incompatible with the tenets of neo-classical economics, with *optimal allocation of scarce resources* as the key idea – this is now the commonly accepted starting point
Mainstream economics is fundamentally incompatible with lean

<table>
<thead>
<tr>
<th>Economics</th>
<th>Lean</th>
</tr>
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<tbody>
<tr>
<td>• Scarce resources</td>
<td>• Resources are scarce as we are wasting them; elimination of waste should be the first line of attack</td>
</tr>
<tr>
<td>• Optimal allocation</td>
<td>• Even if allocation decisions are optimal, there will always be waste in their implementation – economics is silent about this questionable idealization</td>
</tr>
</tbody>
</table>
Interest in elimination of waste reduced along with the rise of modern economics.

Scarce resources
To increase productivity
Elimination of waste
“Optimum” pushed “waste” aside

Optimum production

Waste in production
Initially, the potential of lean construction was demonstrated by pioneering champions in organizational pockets.

A more systematic implementation approach is starting in some companies thanks especially to Highways Agency initiatives.

Nevertheless, academic teaching and research on lean construction and lean project management almost absent in the UK – difficult to think about greater gap between commonly accepted academic theory/professional doctrine and new emerging industrial practice.

The issues:
- Academically, acknowledgement of lean would require rethinking of foundations of economics and management.
- Sector-wise, deep implementation of lean would require rethinking of contracts, organizational forms of projects and working methods.
Consequences

- Many of the traditional procedures and methods have actively increased waste in construction, or allowed its formation, through
  - Sub-optimization
  - Dominant focus on front-end planning (at the cost of execution)
  - Dominant reliance on deduction (at the cost of induction/abduction)
- Consequently, the share of waste is in construction project activities is high
- However, examples from the last 10 years show that it can be considerably reduced through focused and sustained efforts (= lean, TVD)
Target Value Design
Target Value Design (TVD) is a management practice that drives the design [and construction] to deliver customer values (cost, function, sustainability targets etc.) within project constraints (Dr. G. Ballard, University of California, Berkeley).

- First major lean construction method to eliminate waste for the client side.
- Based on Target Costing from manufacturing industry.
- Toyota Planning System’s practice of self-imposing necessity as a means for continuous improvement.
- It embraces the project life cycle approach.
Target Value Design in the USA
Target Value Design development in the USA

Number of TVD Projects

Year


0 10 20 30 40 50 60 70 80 90 100 110 120 130 140

1 18 55 85 150

# TVD Projects case studies in the US

<table>
<thead>
<tr>
<th>Project</th>
<th>Contract</th>
<th>Result (Expected)</th>
<th>Partners</th>
</tr>
</thead>
</table>
| University of California, SF Hospital, Mission Bay, San Francisco       | Two Stage GMP (Guaranteed Maximum Price) | • $765 million for design and construction – Feb 2015  
• Roughly 10-15% Savings Expected                                   | Alta Bates Summit Medical center, Oakland |
| Alta Bates Summit Medical center, Oakland                                 | IPD, IFOA (Integrated Form Of Agreement) | • $245 Million                                                                 |                      |
| UHS Temecula, South California                                          | IPD, IFOA                             | • $159 Million Project  
• 30 % – US Standard  
• 40% - California State                                               |                      |

**IPD – Integrated Project Delivery**
### TVD Projects case studies in the US

<table>
<thead>
<tr>
<th></th>
<th>Sample size</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Spent-budget ratio</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CII (health care)</td>
<td>168</td>
<td>0.986</td>
<td>0.132</td>
<td>0.584 – 1.702</td>
</tr>
<tr>
<td>TVD (UHS)</td>
<td>47</td>
<td>0.946</td>
<td>0.071</td>
<td>0.752 – 1.073</td>
</tr>
<tr>
<td><strong>Contingency %</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CII (health care)</td>
<td>134</td>
<td>0.079</td>
<td>0.035</td>
<td>0.013 – 0.254</td>
</tr>
<tr>
<td>TVD (Sutter)</td>
<td>10</td>
<td>0.035</td>
<td>0.005</td>
<td>0.03 – 0.043</td>
</tr>
</tbody>
</table>

CII – Construction Industry Institute

**Study: UC Berkeley**

**TVD Clients in the US construction Industry**
- Sutter Healthcare
- United Healthcare services
- Google
- Disney

**TVD supported by various Professional Bodies**
- American Institute of Architects
- Lean Construction Institute US
- Association of General Contractors
- Associated Builders and Contractors Inc.
Tampere Highways Tunnel, Finland

- 2.3 km tunnel in Tampere city centre.
- Owners Budget – €185M
- Alliancing Contract Model – Integrated team – Integrated Project delivery
- Target Value Design used for innovations to drive down cost.
- One joint commercial model – shared risk and opportunities.
- Current Scenario – Project midway – already €20M saved using TVD process
How is TVD different?
Target Value Design

- Design based on detailed estimate
- Design together, Review together, Take decisions together
- Target Costing
- Set Based Design
- Collaboration
- Production System Design
- Collocation
- Carry solution sets far into design process
- Don’t evaluate constructability – Design the constructible
- Work in groups, face to face – structured Integrated decision process
Tools in Target Value Design

• Target Costing – Lean cost control approach
• Set-Based Design/Concurrent Engineering
• The Big Room co-location – Process based structured co-location
• Choosing by Advantages – Decision making tool
• The Last Planner™ System – Collaborative Pull Planning
• A3 Problem Solving and Reporting
• Building Information Modelling (BIM)

“A single comprehensive and unifying approach to achieve innovation”
Traditional Approach

Identify Scope → Design → Estimate → Construct → Operate

Target Value Design

Set Target → Steer Design → Steer construction → Steer operation

Value Definition → Value Representation → Value Realization → Value Capture

Pre Project Planning → Feasibility Study/Project Definition → Criteria Design → Detail Design → Construction → Operation

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Early involvement of participants

Traditional Design Process

Integrated Design Process

Agency
Owner
Designer
Design Consultants
Constructors
Trade Constructors
Jointly developed feasibility study

California Pacific Medical Center
Cathedral Hill Campus
Integrated Project Delivery Team

Technical Report on TVD Projects – DPR Construction
Setting the Target cost

- **Allowable cost** – Money available as per Business case
- **Market Cost** – Identified through detailed collaborative market benchmarking
- **Estimated maximum price** – Identified by selected team through detailed feasibility study
- **Target Cost** – Set as stretched goals to spur innovation
- **Common risk and profit pool** is used to drive innovation through pain-gain share commercial mechanism
Cluster organisation in TVD

Cross functional teams

- Cluster Leaders
- Building Envelope
- Structure
- M/E/P
- Interior/Finishes
- Material Handling
- Site Works
- Landscape

Core Group:
- Cluster leaders
- Client, PM

Cluster group:
- G.C.
- Subs.
- Consultants
Target cost and scope are allocated to cross-functional teams
Co-location – The ‘Big Room’

Photograph courtesy: Dr Tillman, UC Berkeley
TVD and BIM

Criteria Design

Design Cycle – Repetitive cycle – Usually Two weeks

Weekly Meeting
- Big room meeting
- Cluster meetings/workshops
- Big room meeting

Information Exchange/Collaborative Discussion

Core Group Meeting

Design Alternatives – CBA, A3
- Value Management
- Risk & Opportunities
- Update Estimate

Conform

Detailed Feasibility Report
- Conditions of Satisfaction
- Stakeholders Values

Output

Risk & Opportunities Log
Area & function wise Design Criteria & Specifications

B.I.M

Project Cost Database
(Maturity Level -2)

3d Model
(Maturity level – 2)
3D modeling - Constructability

Trade partners

Contractor

Architects

Photograph courtesy: Dr Tillman, UC Berkeley
Quantity Trending

Technical Report on TVD Projects – DPR Construction
Continuous Feedback
Weekly/Monthly cost update

Technical Report on TVD Projects – DPR Construction
Cost and design steering workshop

San Carlos Hospital project, California

Photograph courtesy: Dr Tillman, UC Berkeley
Achieve cost targets through collaborative innovation

Technical Report on TVD Projects – DPR Construction
How Target Value Design is different?

**Traditional Project delivery**
- Historical benchmarking
- Traditional/ Silo organisation
- BIM can be used but without quantity trending analysis
- Staged cost feedback
- Staged/gated assessment and validation
- Traditional project management techniques
- Collaboration proposed without tools

**Target Value Design**
- Detail market benchmarking
- Cross functional cluster organisation
- BIM is used with quantity trending analysis
- Real-time cost feedback
- Continuous assessment and validation
- Lean techniques used
- Process based structured collaboration with tools and techniques in support
Is Target Value Design different from Value Engineering?
## Value Engineering versus TVD

<table>
<thead>
<tr>
<th></th>
<th>Value Engineering</th>
<th>Target Value Design</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TimeLine</strong></td>
<td>Discrete event(s) at fixed point(s) in time</td>
<td>Continuous throughout design and construction</td>
</tr>
<tr>
<td><strong>Practitioner</strong></td>
<td>Value engineer/ manager external to design team</td>
<td>Core Team (incl. owner, designer, contractor) + input from trades</td>
</tr>
<tr>
<td><strong>Targeted Outcome</strong></td>
<td>Least Cost (Value rationalized to meet set budget)</td>
<td>Most Value (Cost optimized to deliver explicit value)</td>
</tr>
</tbody>
</table>
Target Value Design relevance in the UK Context
UK Government 2025 construction Targets

Industry level targets – Project level targets

- Faster delivery
- Lower Cost
- Lower emissions
- Improved exports

Early value identification/ Target ‘Value’ Design
UK Context

TVD Projects in U.S versus proposed savings by the UK government by 2025

Iris D Tommelein (2011)

<table>
<thead>
<tr>
<th>Project</th>
<th>Target Cost - $/SF</th>
<th>Market Cost - $/SF</th>
<th>Final Cost - $/SF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project-A</td>
<td>11%</td>
<td>33%</td>
<td></td>
</tr>
<tr>
<td>Project-B</td>
<td>26%</td>
<td>13%</td>
<td></td>
</tr>
<tr>
<td>Project-C</td>
<td>12%</td>
<td>5%</td>
<td></td>
</tr>
<tr>
<td>Project-D</td>
<td>26%</td>
<td>13%</td>
<td></td>
</tr>
<tr>
<td>Project-E</td>
<td>12%</td>
<td>5%</td>
<td></td>
</tr>
<tr>
<td>Project-F</td>
<td>26%</td>
<td>13%</td>
<td></td>
</tr>
<tr>
<td>Project-G</td>
<td>26%</td>
<td>13%</td>
<td></td>
</tr>
<tr>
<td>Project-H</td>
<td>11%</td>
<td>33%</td>
<td></td>
</tr>
<tr>
<td>Project-I</td>
<td>11%</td>
<td>33%</td>
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<td>Project-J</td>
<td>11%</td>
<td>33%</td>
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<tr>
<td>Project-K</td>
<td>11%</td>
<td>33%</td>
<td></td>
</tr>
<tr>
<td>Project-L</td>
<td>11%</td>
<td>33%</td>
<td></td>
</tr>
</tbody>
</table>

- Project A to F - 5% to 18% - 12 % Avg. – Realised cost savings
- Project G to L - 5% to 33% - 17% Avg. - Projected cost savings
Enabling factors of TVD in the UK

BIM enhanced delivery in the UK
• Collaboration enabler
• Coupled with cost database system could provide real-time cost interaction

Collaboration supportive contracts
• Pain and Gain share
• Transparent commercial environment
How it all comes together

Market Cost

Allowable Cost

Cost (EMP)

Shared Risk

Shared Reward

Target Cost

Iterative cycles

Cost variables

Collaborative Design & Cost Workshops

Collaborative Design, cost & Planning Workshops

Collaborative Design Workshops

Collaborative Planning Workshops

Collaborative Planning Workshops

Owner

Designer

Design Consultants

Constructors

Trade Constructor

Facility Manager

Pre Project Planning

Feasibility Study/Project Definition

Criteria Design

Detail Design

Construction

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TVD, BIM and collaborative contracts: Way forward

- TVD Process Deployment with cluster organisation
- Collaboration supportive contracts
- BIM as an enabler
- Better project delivery
- Cost Reduction
- Better Stakeholder Value

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Thank You

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