

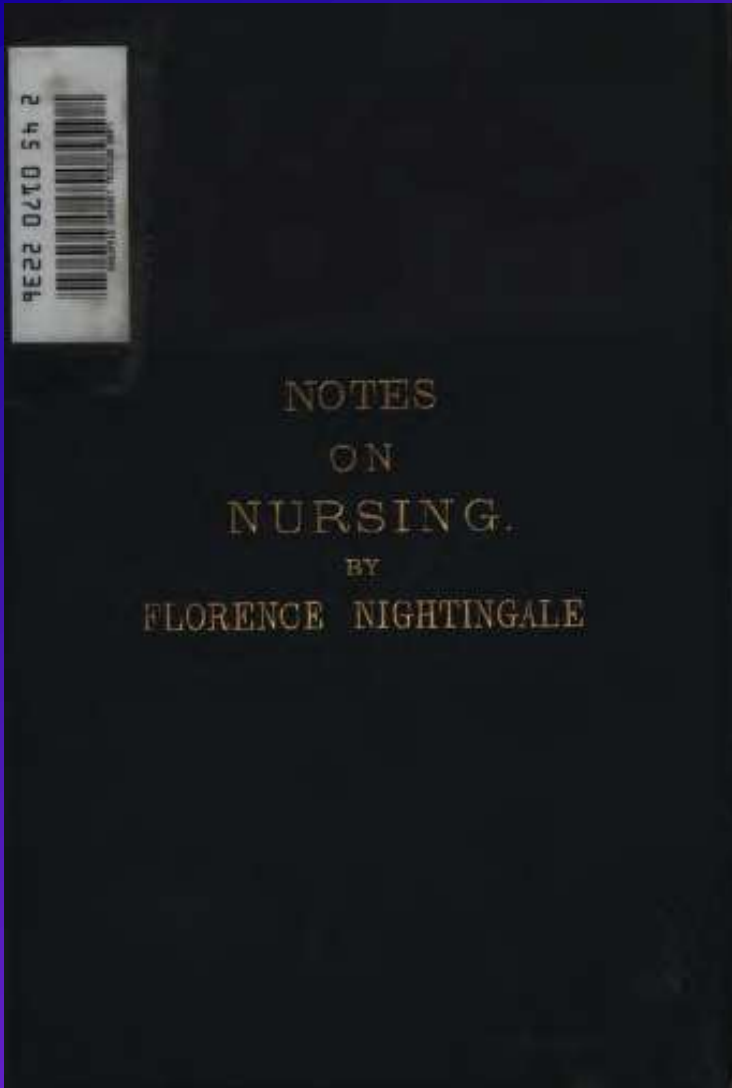
Lean Thinking and Target Value Design: Overcoming the Hurdle of First Cost

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College Station, Texas
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“

It is a curious thing to observe how almost all patients lie with their faces turned to the light, exactly as plants always make their way towards the light; a patient will even complain that it gives him pain lying on that side."

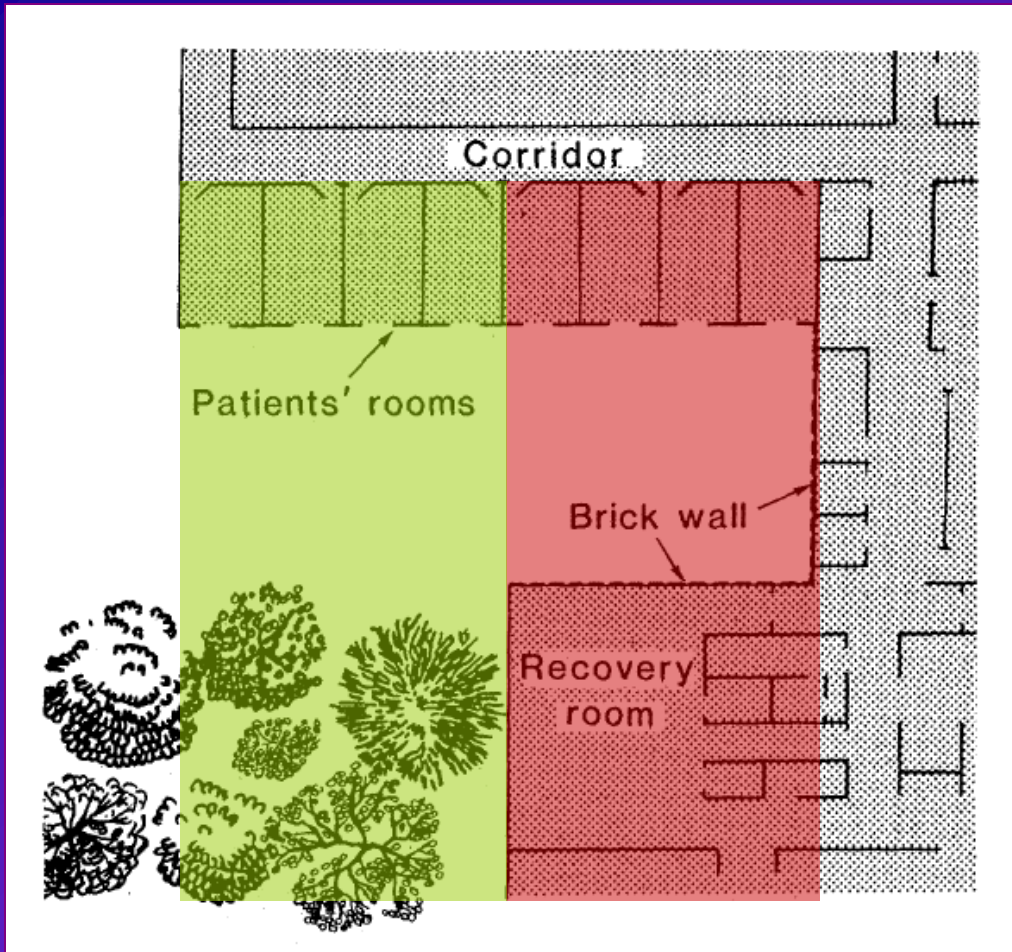
"Then why *do* you lie on that side ?" [I ask]. He does not know—but we do.

It is because it is the side towards the window.

”

What is Evidence-Based Design?

Nightingale, F. (1898). Notes on Nursing: What It Is and What It Is Not. New York, D. Appleton and Company



Roger Ulrich's discovery:

Patients recovering after Cholecystectomy between 1972-1981, in a Pennsylvania hospital:

- 1) Those who saw trees through windows spent less time in hospital than those with views of a brick wall (7.96 days vs. 8.70 days).
- 2) Those with view of trees took fewer doses of moderate and strong analgesics.

What is Evidence-Based Design?

Ulrich, R. (1984). "View through a window may influence recovery from surgery," *Science*: 224, 420-421.

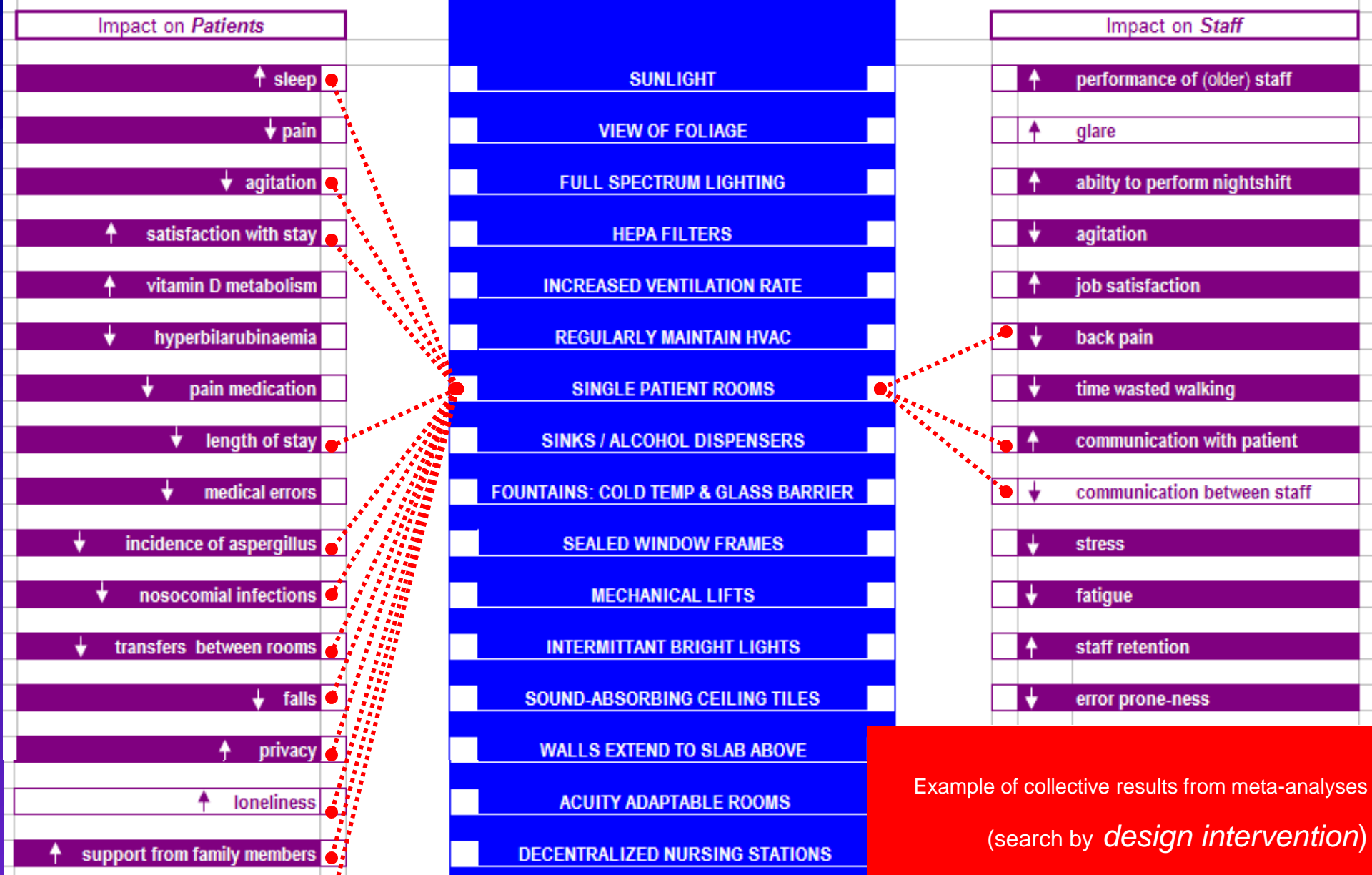
Impact on <i>Patients</i>
↑ sleep
↓ pain
↓ agitation
↑ satisfaction with stay
↑ vitamin D metabolism
↓ hyperbilirubinaemia
↓ pain medication
↓ length of stay
↓ medical errors
↓ incidence of aspergillus
↓ nosocomial infections
↓ transfers between rooms
↓ falls
↑ privacy
↑ loneliness
↑ support from family members

● SUNLIGHT
● VIEW OF FOLIAGE
● FULL SPECTRUM LIGHTING
● HEPA FILTERS
● INCREASED VENTILATION RATE
● REGULARLY MAINTAIN HVAC
● SINGLE PATIENT ROOMS
● SINKS / ALCOHOL DISPENSERS
□ FOUNTAINS: COLD TEMP & GLASS BARRIER
□ SEALED WINDOW FRAMES
□ MECHANICAL LIFTS
□ INTERMITTANT BRIGHT LIGHTS
● SOUND-ABSORBING CEILING TILES
● WALLS EXTEND TO SLAB ABOVE
● ACUITY ADAPTABLE ROOMS
● DECENTRALIZED NURSING STATIONS

Impact on <i>Staff</i>
↑ performance of (older) staff
↑ glare
↑ ability to perform nightshift
↓ agitation
↑ job satisfaction
↓ back pain
↓ time wasted walking
↑ communication with patient
↓ communication between staff
↓ stress
↓ fatigue
↑ staff retention
↓ error prone-ness

Example of collective results from meta-analyses
(search by *desired outcome*)

What has already been done wrt EBD?



Example of collective results from meta-analyses
 (search by *design intervention*)

What has already been done wrt EBD?



The Business Case for Better Buildings

LEONARD L. BERRY, PH.D.; DEREK PARKER; RUSSELL C. COILE, JR.; D. KIRK HAMILTON; DAVID D. O'NEILL, J.D.; AND BLAIR L. SADLER, J.D.

SUMMARY • The buildings in which customers receive services are inherently part of the service experience. Given the high stress of illness, healthcare facility designs are especially likely to have a meaningful impact on customers. In the past, a handful of visionary "healing environments" such as the Lucille Packard Children's Hospital at Stanford University in Palo Alto, California; Griffin Hospital in Derby, Connecticut; Woodwinds Health Campus in St. Paul, Minnesota; and San Diego Children's Hospital were built by values-driven chief executive officers and boards and aided by philanthropy when costs per square foot exceeded typical construction costs. Designers theorized that such facilities might have a positive impact on patients' health outcomes and satisfaction. But limited evidence existed to show that such exemplary health facilities were superior to conventional designs in actually improving patient outcomes and experiences and the organization's bottom line. More evidence was needed to assess the impact of innovative health facility designs.

Beginning in 2000, a research collaborative of progressive healthcare organizations voluntarily came together with The Center for Health Design to evaluate their new buildings. Various "Pebble Projects" are

LEONARD L. BERRY, PH.D., IS DISTINGUISHED PROFESSOR OF MARKETING AT TEXAS A&M UNIVERSITY IN COLLEGE STATION, TEXAS. DEREK PARKER IS DIRECTOR OF ANSHEN + ALLEN ARCHITECTS IN SAN FRANCISCO. RUSSELL C. COILE, JR., PRIOR TO HIS PASSING IN 2003, WAS EDITOR OF RUSS COILE'S HEALTH TRENDS IN WASHINGTON, TEXAS. D. KIRK HAMILTON IS SENIOR PRINCIPAL AT WATKINS HAMILTON ROSS ARCHITECTS, INC. IN HOUSTON, TEXAS. DAVID D. O'NEILL IS CEO OF ALAMEDA HOSPITAL IN ALAMEDA, CALIFORNIA. BLAIR L. SADLER, J.D., IS PRESIDENT AND CEO OF CHILDREN'S HOSPITAL AND HEALTH CENTER IN SAN DIEGO.

LEONARD L. BERRY ET AL. • 3

EBD is being used to convince facility decision-makers that initial capital costs result in long-term cost savings (Berry et al. 2004)

= 1.04 yrs

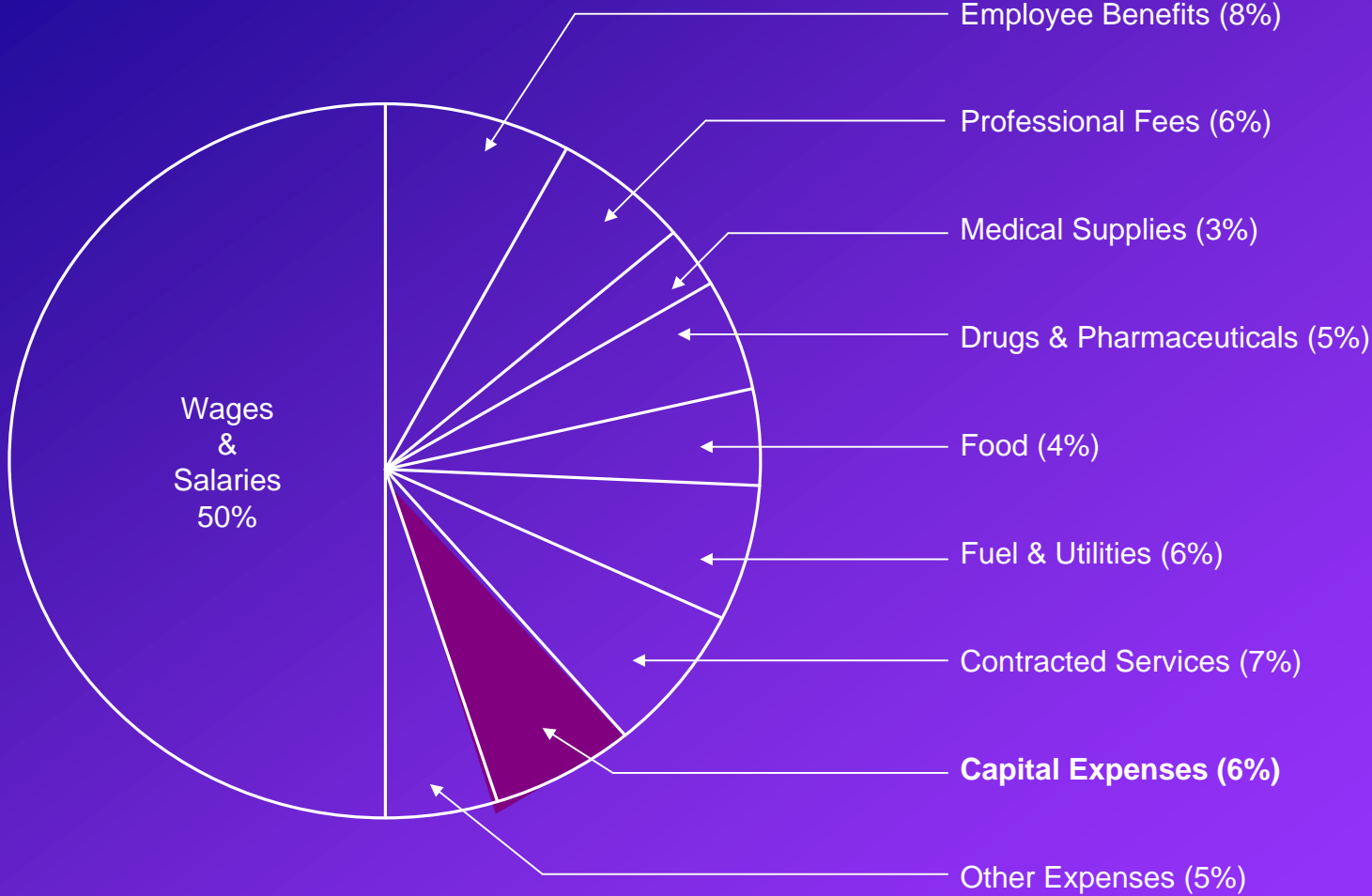
Approximate cost = \$12 million

Approximate benefit = \$11.5 million

What have others done on LCCA with respect to EBD?

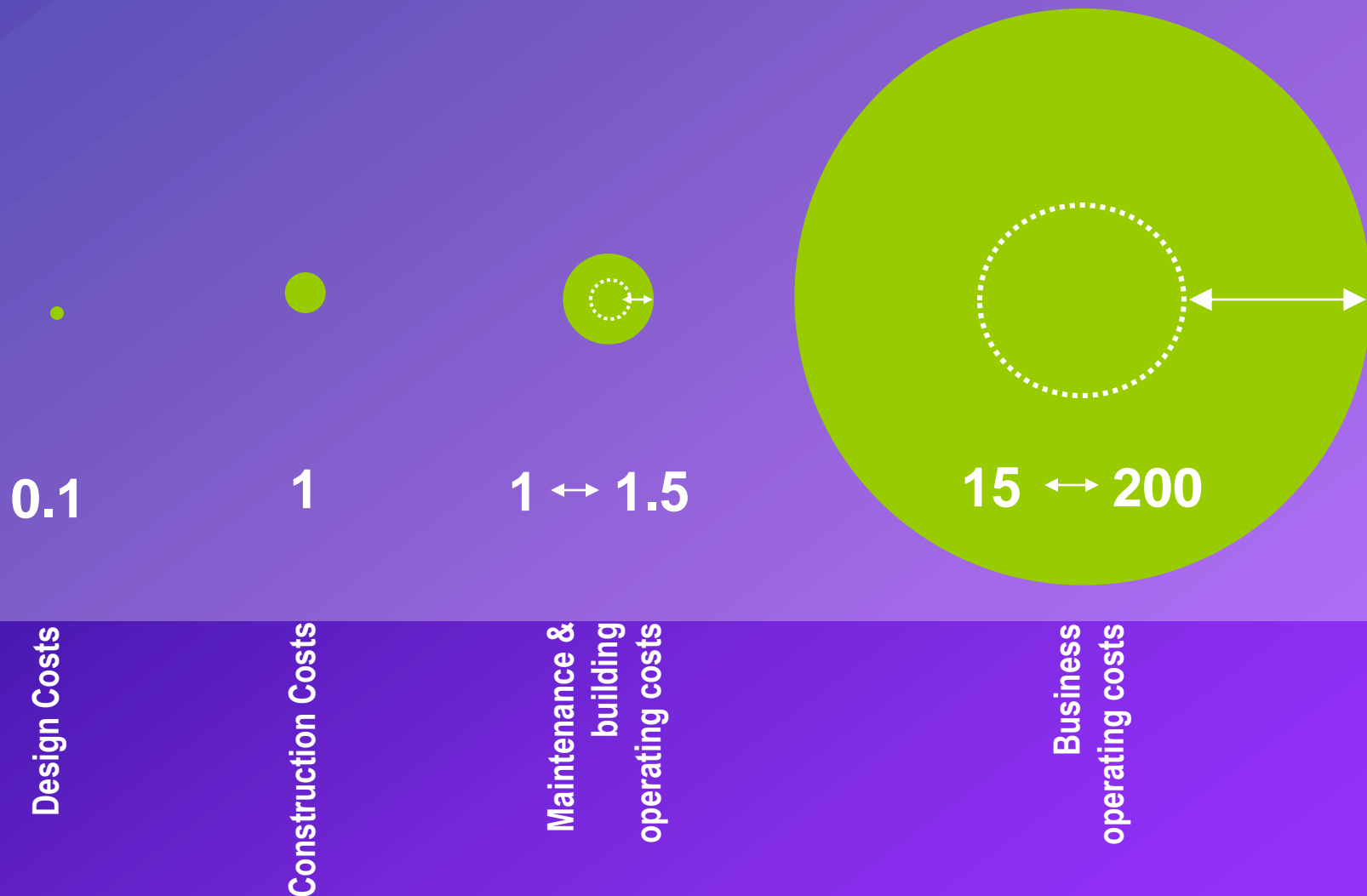
Berry, L. L., Parker, D., Russell C. Coile, J., Hamilton, D. K., O'Neill, D. D., and Sadler, B. L. (2004). "The Business Case for Better Buildings." *Frontiers of Health Services Management*, 21(2), 3-24.

Breakdown of Hospital Expenses



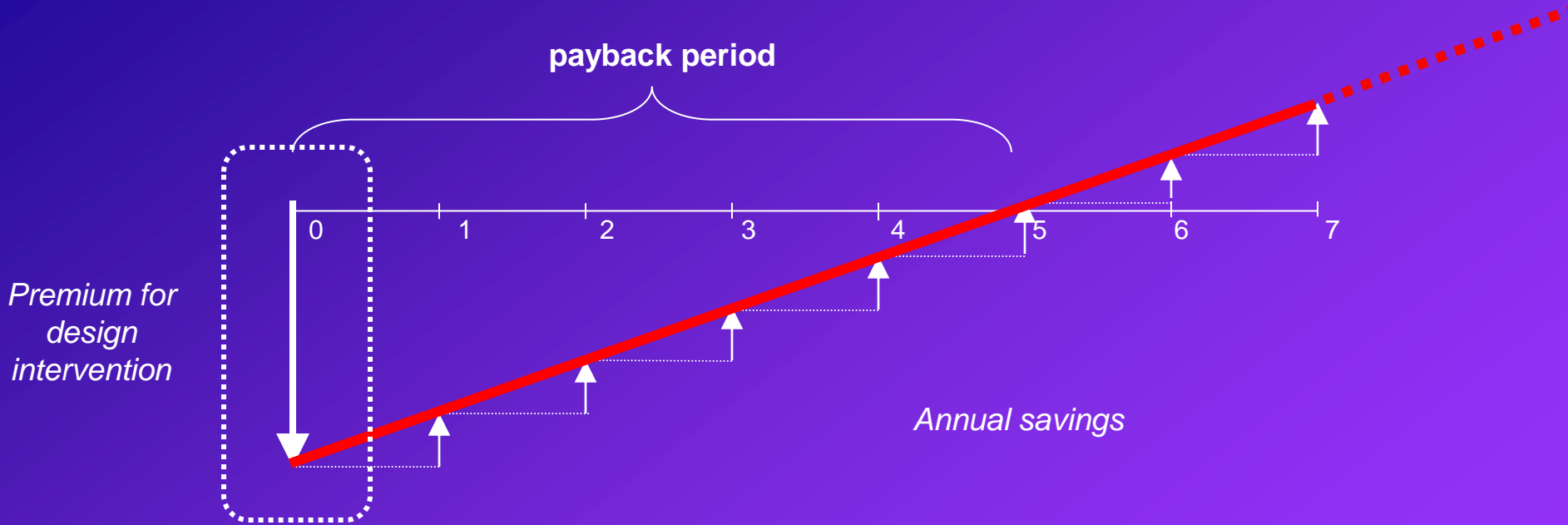
Why is EBD financially important?

Kirk, S. J., and Dell'Isola, A. J. (1995). *Life Cycle Costing for Design Professionals*, McGraw-Hill, Inc., New York.



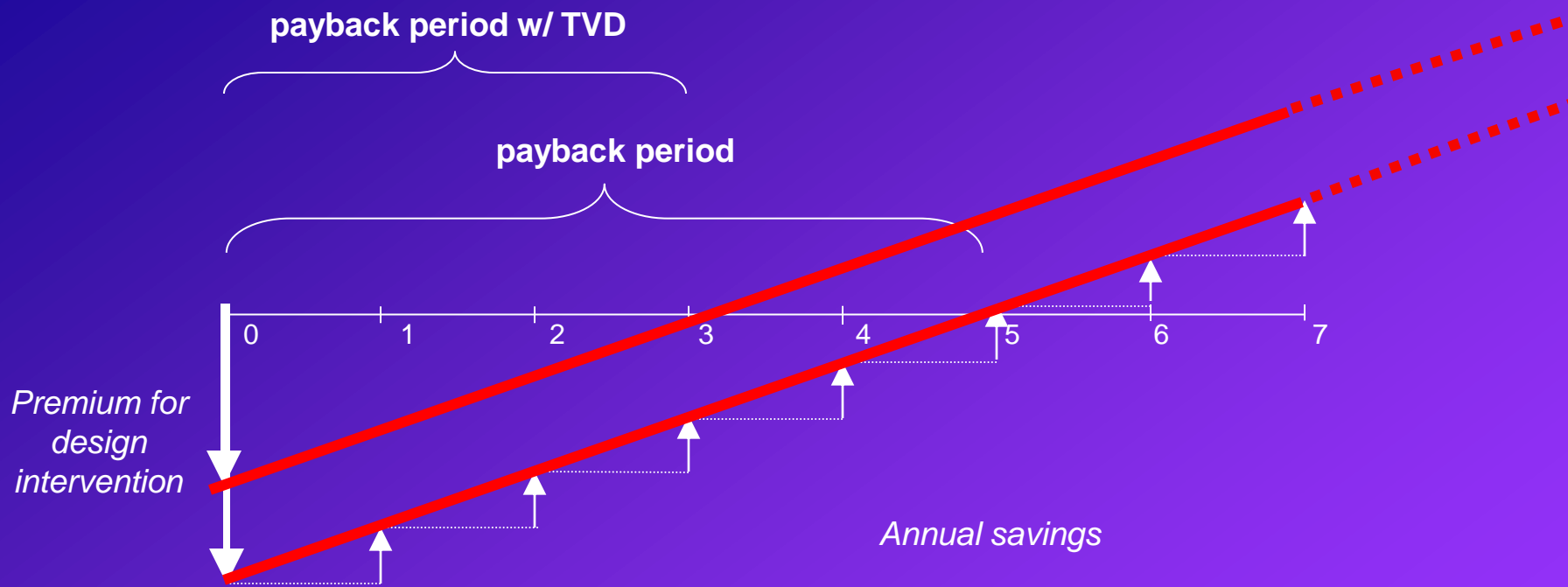
Why is EBD financially important?

Evans, R., Haryott, R., Haste, N., and Jones, A. (1998). "The long term cost of owning and using buildings," *Royal Academy of Engineering*, London.
Ive, G. (2006). "Re-examining the costs and value ratios of owning and occupying buildings." *Building Research & Information* 34(3). 230-245.



Why is EBD financially important?

Rybkowski, Z. K. (2009). The Application of Root Cause Analysis and Target Value Design to Evidence-Based Design in the Capital Planning of Healthcare Facilities, PhD dissertation, UC Berkeley, Berkeley, CA



Why is EBD financially important?

Goal:

Help make EBD financially feasible.

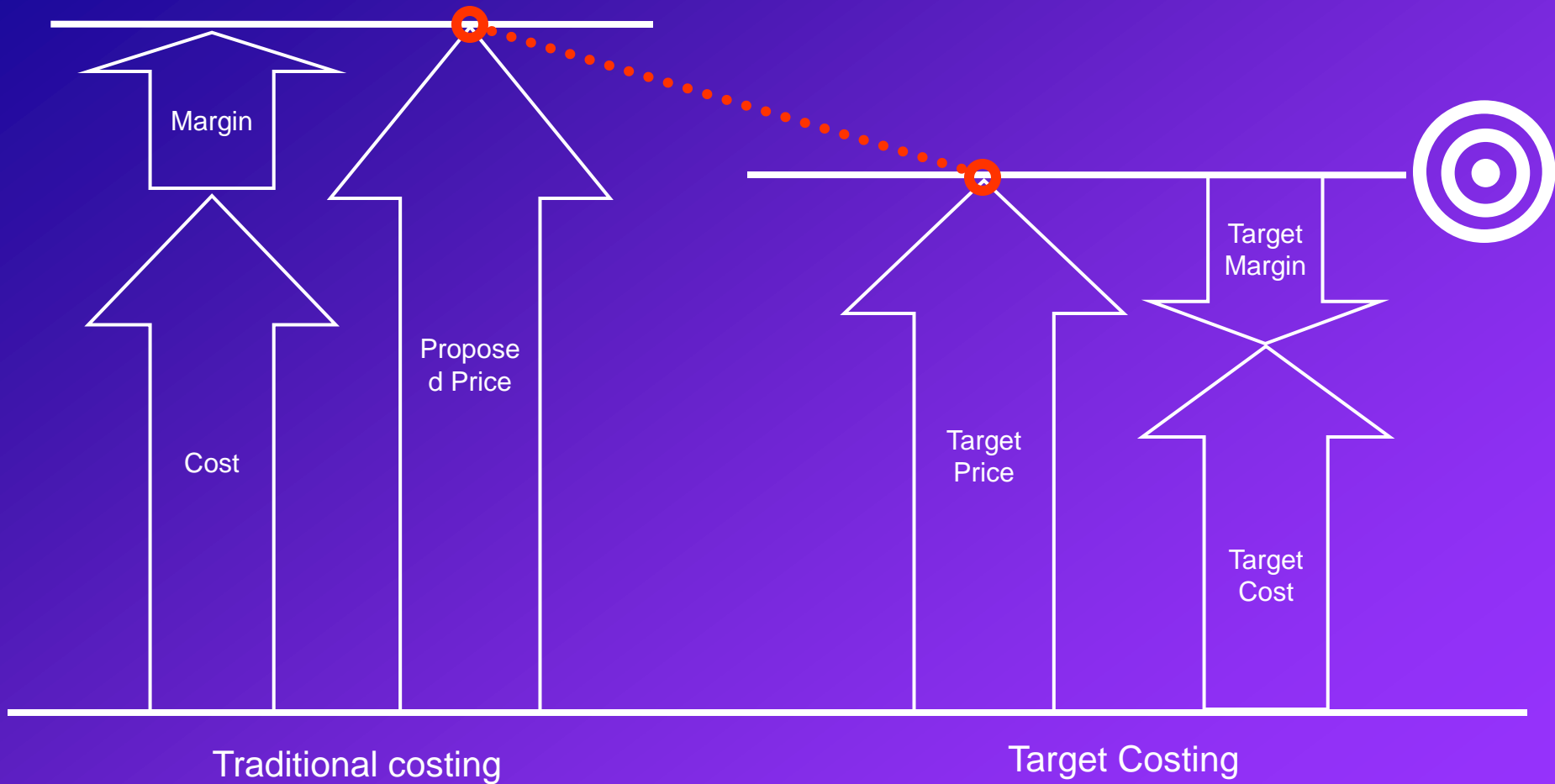
enter

TARGET

VALUE

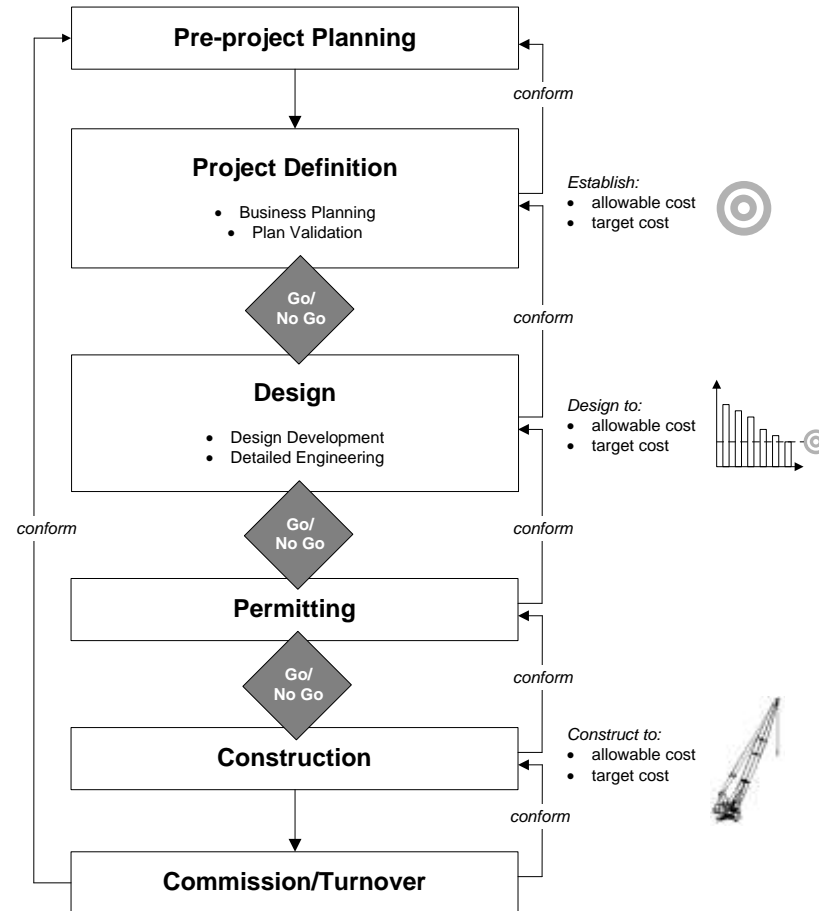
DESIGN

How do we set prices?



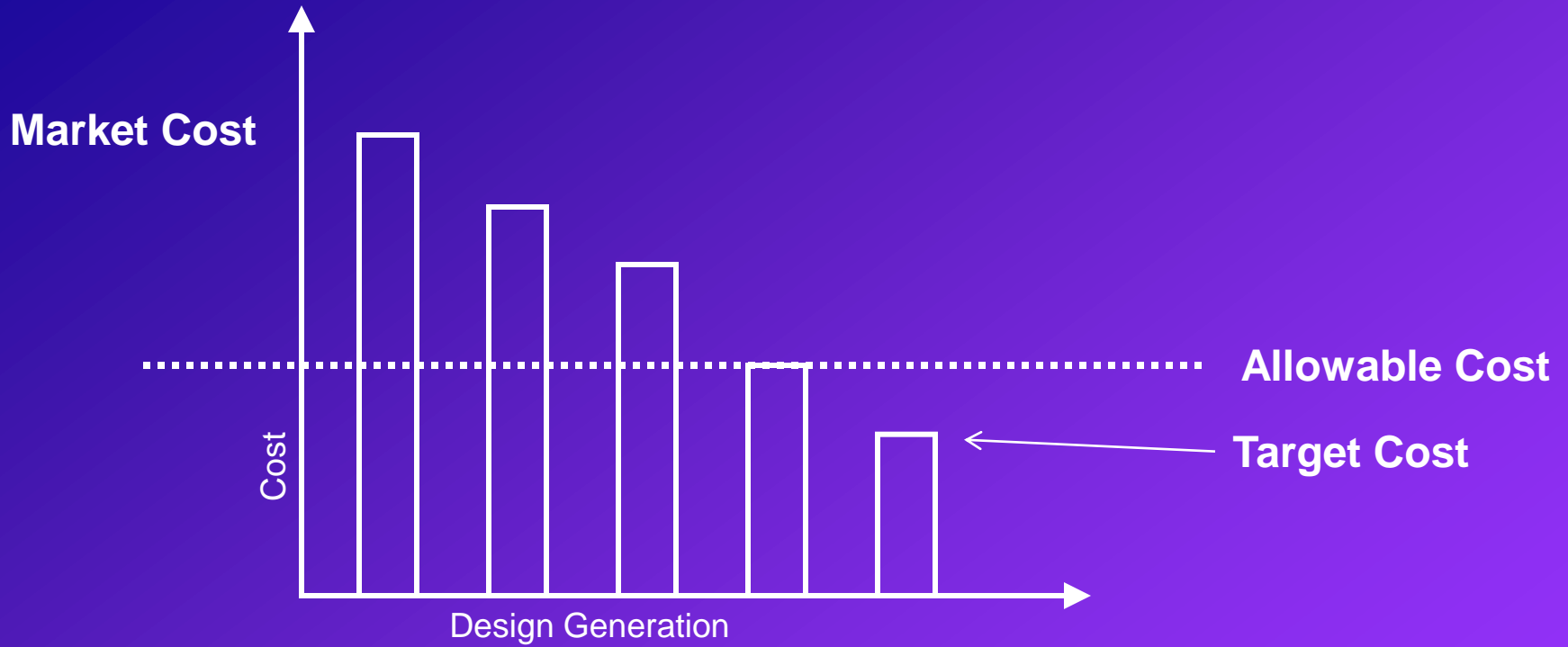
What is Target Value Design?

Rybkowski, Z. K. (2009). The Application of Root Cause Analysis and Target Value Design to Evidence-Based Design in the Capital Planning of Healthcare Facilities, PhD dissertation, UC Berkeley, Berkeley, CA



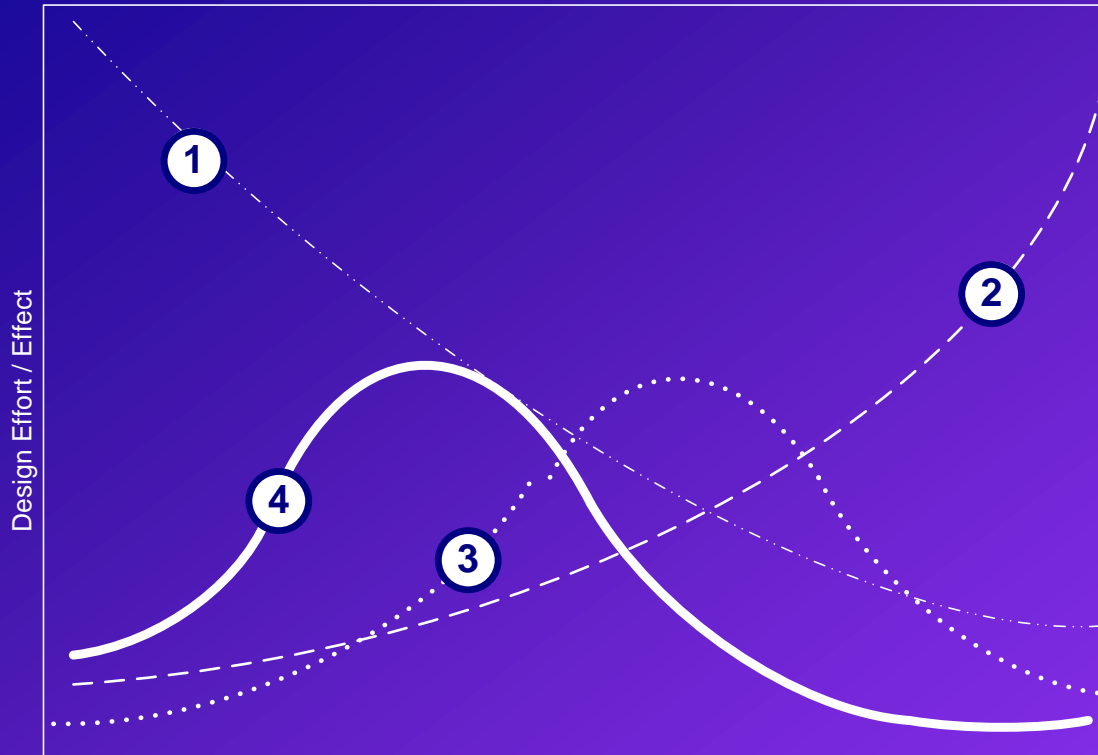
The TVD process as developed by P2SL.

Adapted from Ballard (2008).



Time / Schedule

The MacLeamy Curve



- ① Ability to impact cost and function
- ② Cost of design changes
- ③ Traditional Design-Bid-Build process
- ④ Integrated Project Delivery Process

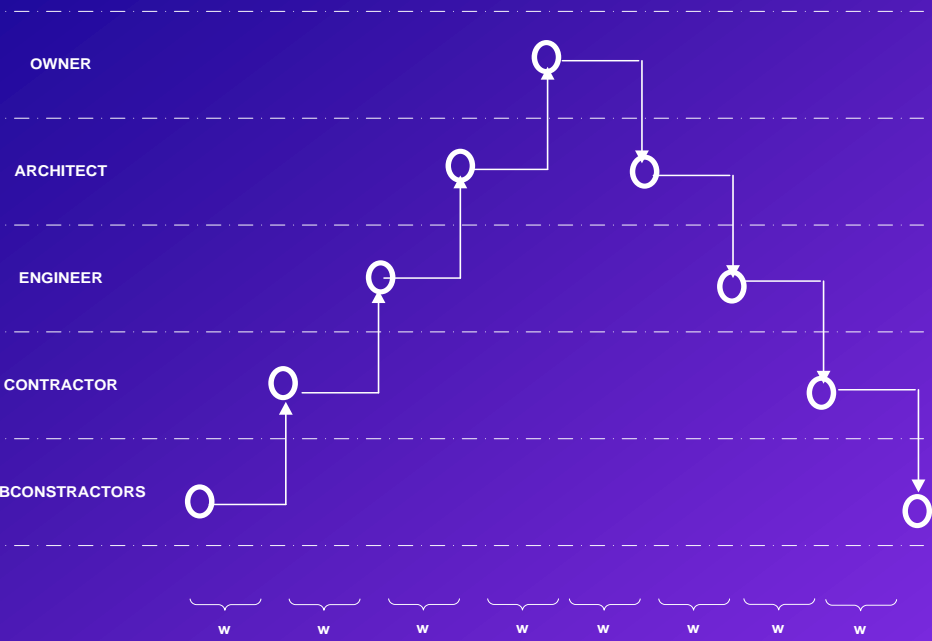
Predesign	Schematic Design	Design Development	Construction Documents	Agency Permit/Bidding	Construction
Conceptualization	Criteria Design	Detailed Design	Implementation Documents	Agency Coord/Final Buyout	Construction

Traditional Design-Bid Build

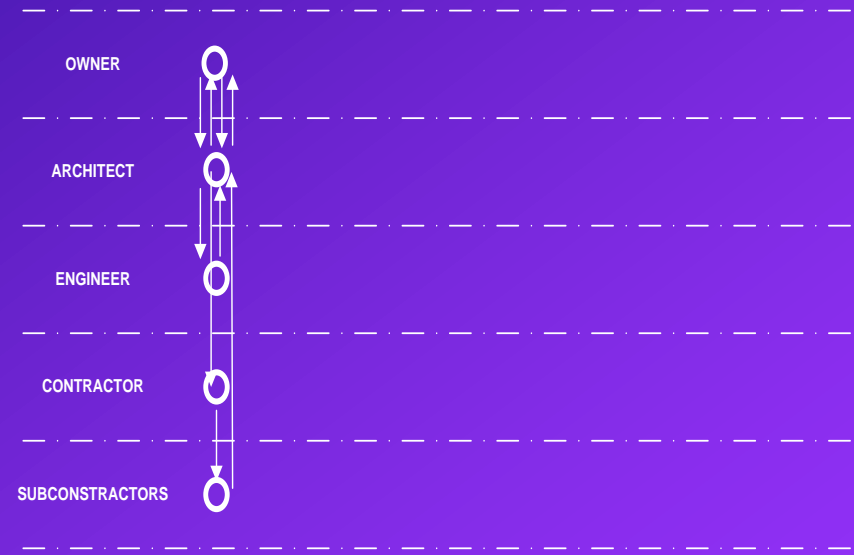
Integrated Design Delivery

Adapted from MSA (2004).

Integrated Project Delivery

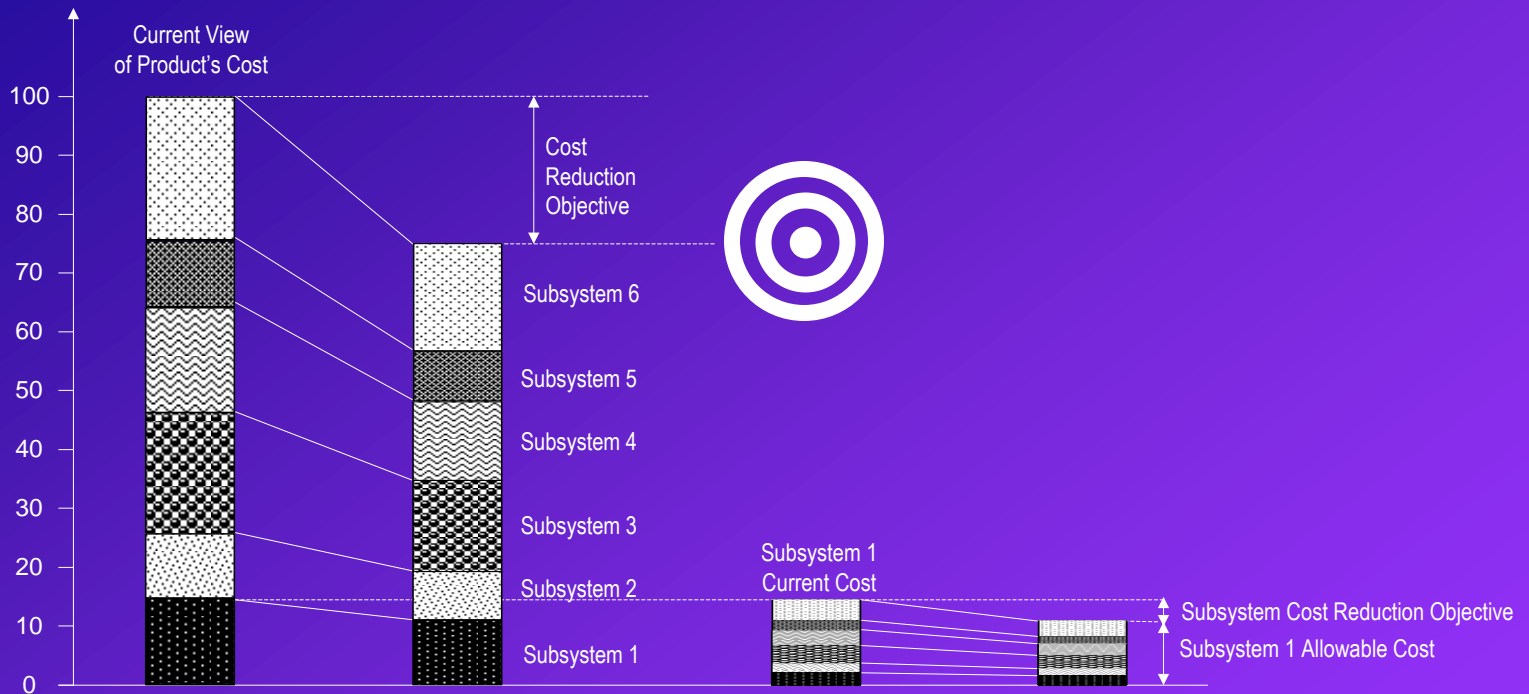


w=waste



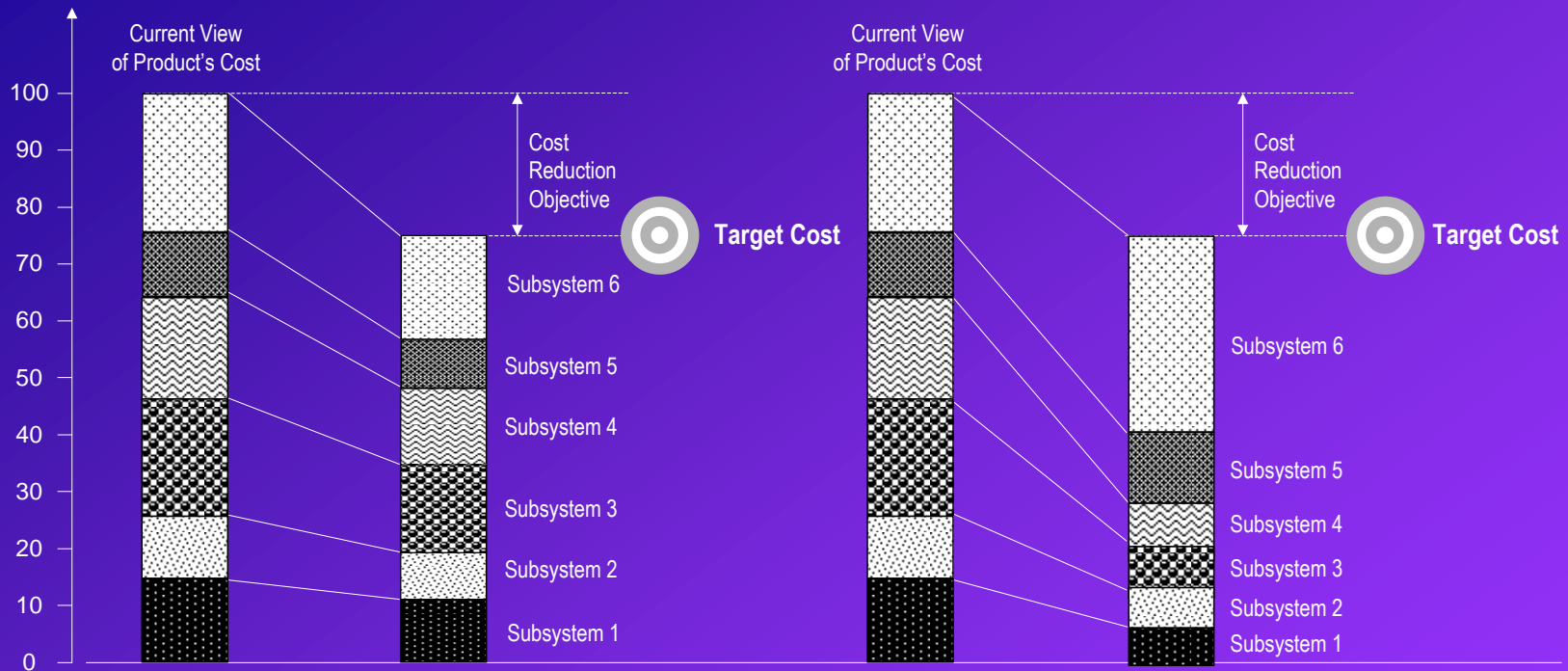
Integrated Project Delivery : Why co-location works

Rybkowski, Z. K. (2009). The Application of Root Cause Analysis and Target Value Design to Evidence-Based Design in the Capital Planning of Healthcare Facilities, PhD dissertation, UC Berkeley, Berkeley, CA



From Clifton et al, [Target Costing: Market-Driven Product Design](#), figure 5.2, p. 73

The role of cost sharing



From Clifton et al, [Target Costing: Market-Driven Product Design](#), figure 5.2, p. 73

The importance of flexible cost boundaries

	St. Olaf Fieldhouse	Carleton College Recreation Ctr
Completion Date	August 2002	April 2000
Project Duration	14 months	24 months
Gross Square Feet	114,000	85,414
Total Cost (incl. A/E & CM fees)	\$11,716,836	\$13,533,179
Cost per square foot	\$102.79	\$158.44

Comparison of two similar projects using different project delivery systems

From Ballard, G., and Reiser, P. (2004). "The St. Olaf College Fieldhouse Project: a Case Study in Designing to Target Cost." 12th Annual Conference of the International Group for Lean Construction, Elsinor, Denmark, 234-249.

Impact of Target Value Design

Rybkowski, Z. K. (2009). The Application of Root Cause Analysis and Target Value Design to Evidence-Based Design in the Capital Planning of Healthcare Facilities, PhD dissertation, UC Berkeley, Berkeley, CA

Medical Office Building

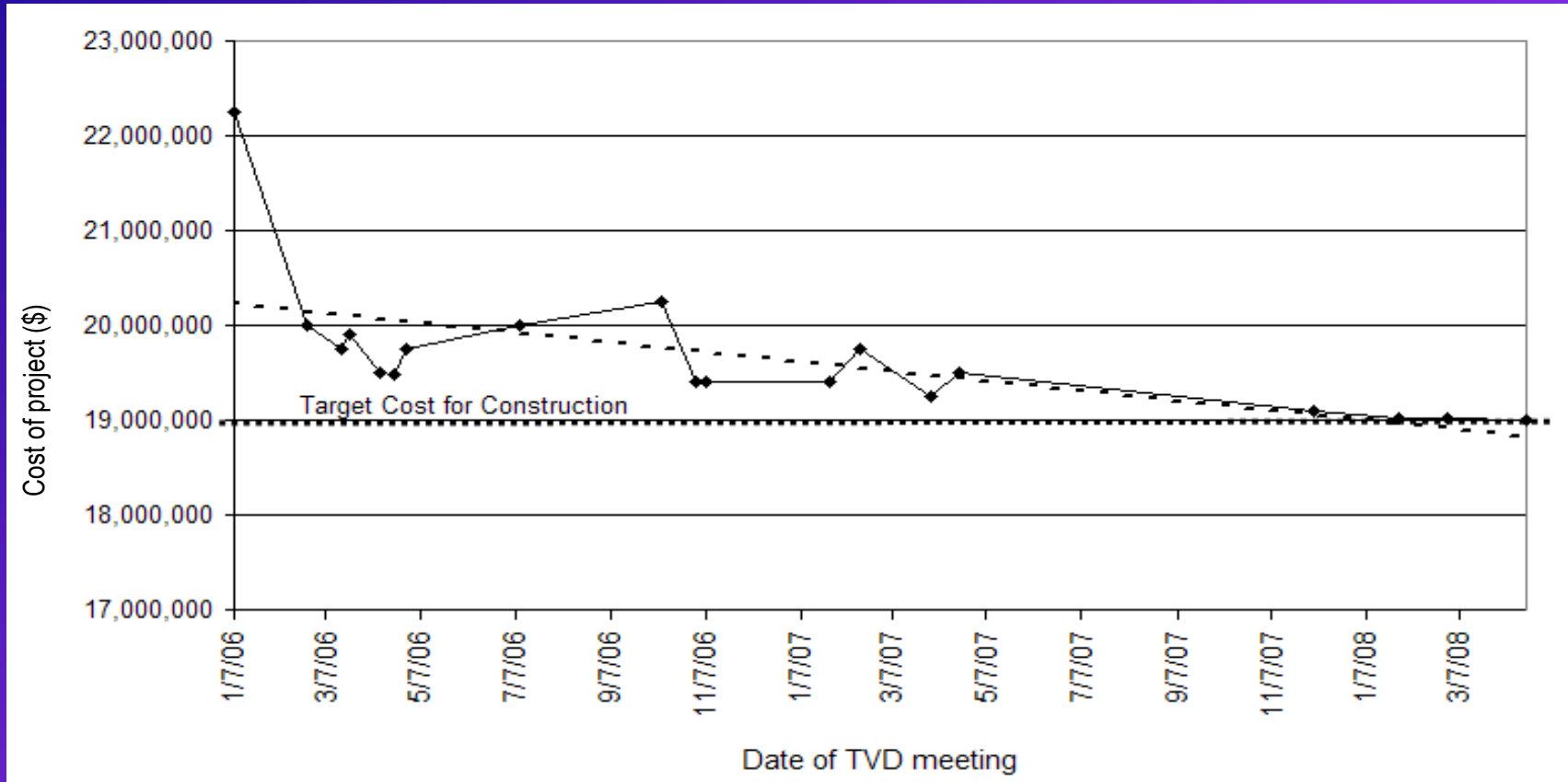
3 storey

69,251 SF

Benchmark: \$22 M

Target Cost: \$18.9 M (approx. 14% below benchmark)

Actual Cost: \$17.9 M (approx. 19% below benchmark)



TVD Early experimental results

Enter Target Value Design

California Pacific Medical Center (850,000 SF; 550 beds)

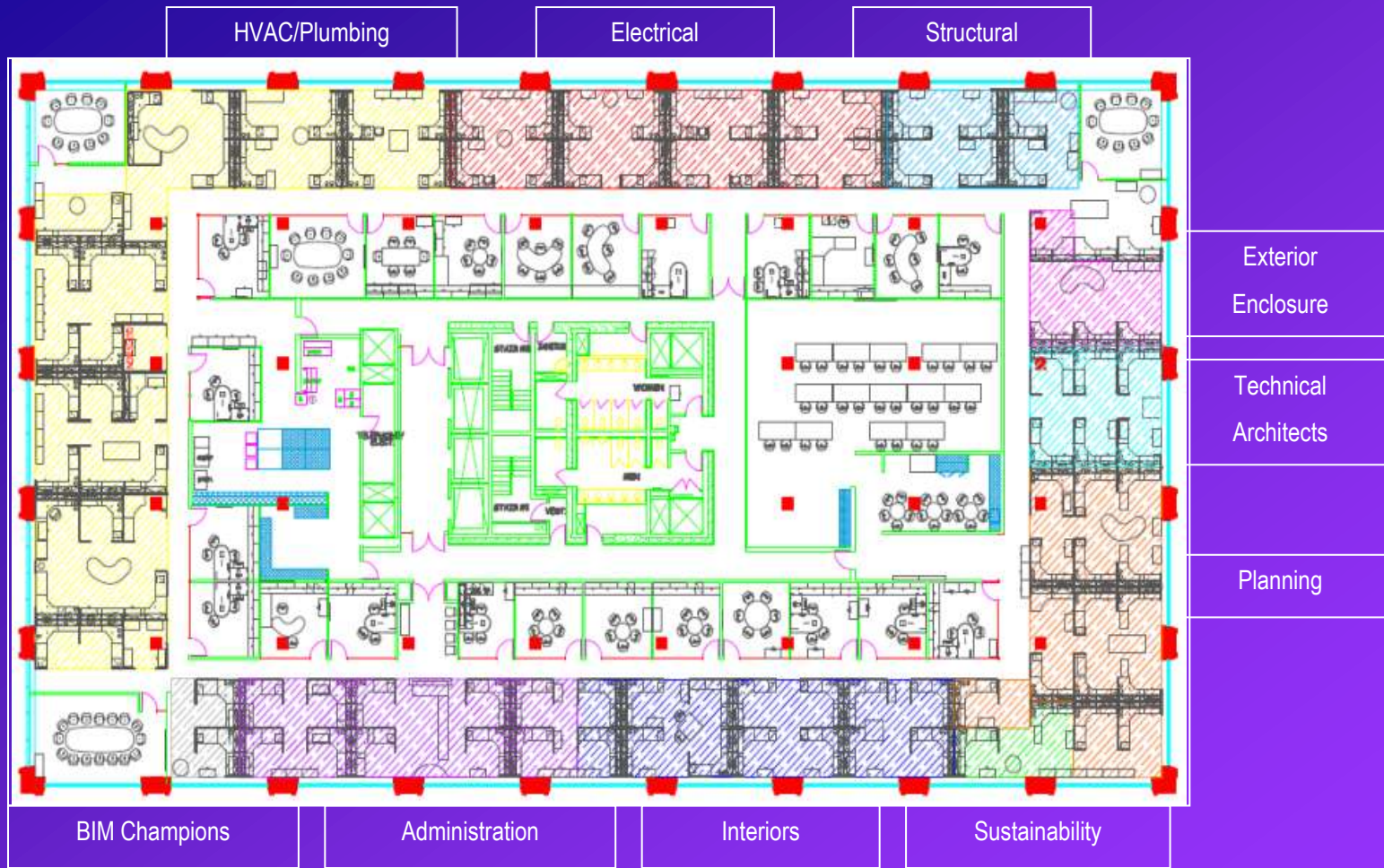
Cathedral Hill Hospital

California Pacific Medical Center is committed to a vision of healthcare for our community that will encompass a new state of the art facility and programs that will fulfill our mission of Clinical Excellence, Education, and Research.

The patient and family experience comes first:

- Patient-focused care
- Private patient rooms
- Accessibility and ease of way-finding
- Comfortable and varied environments
- Healing environments with natural light
- Visitor hospitality lounges on each floor
- Private medical consulting rooms
- Pleasant dining areas
- Awareness of diversity of cultures
- Parking convenience
- Efficient intercampus transfer and mobility
- One stop registration for all OP [operations]
- Easy access to emergency services
- A design that focuses on the patient
- Physician and staff friendly
- Sustainable
- Cost efficient and constructible

Research: The Cathedral Hill Hospital



Integrated Project Delivery : Co-location

Rybkowski, Z. K. (2009). The Application of Root Cause Analysis and Target Value Design to Evidence-Based Design in the Capital Planning of Healthcare Facilities, PhD dissertation, UC Berkeley, Berkeley, CA

Lean Project Delivery



Pull Pricing



Pull Scheduling

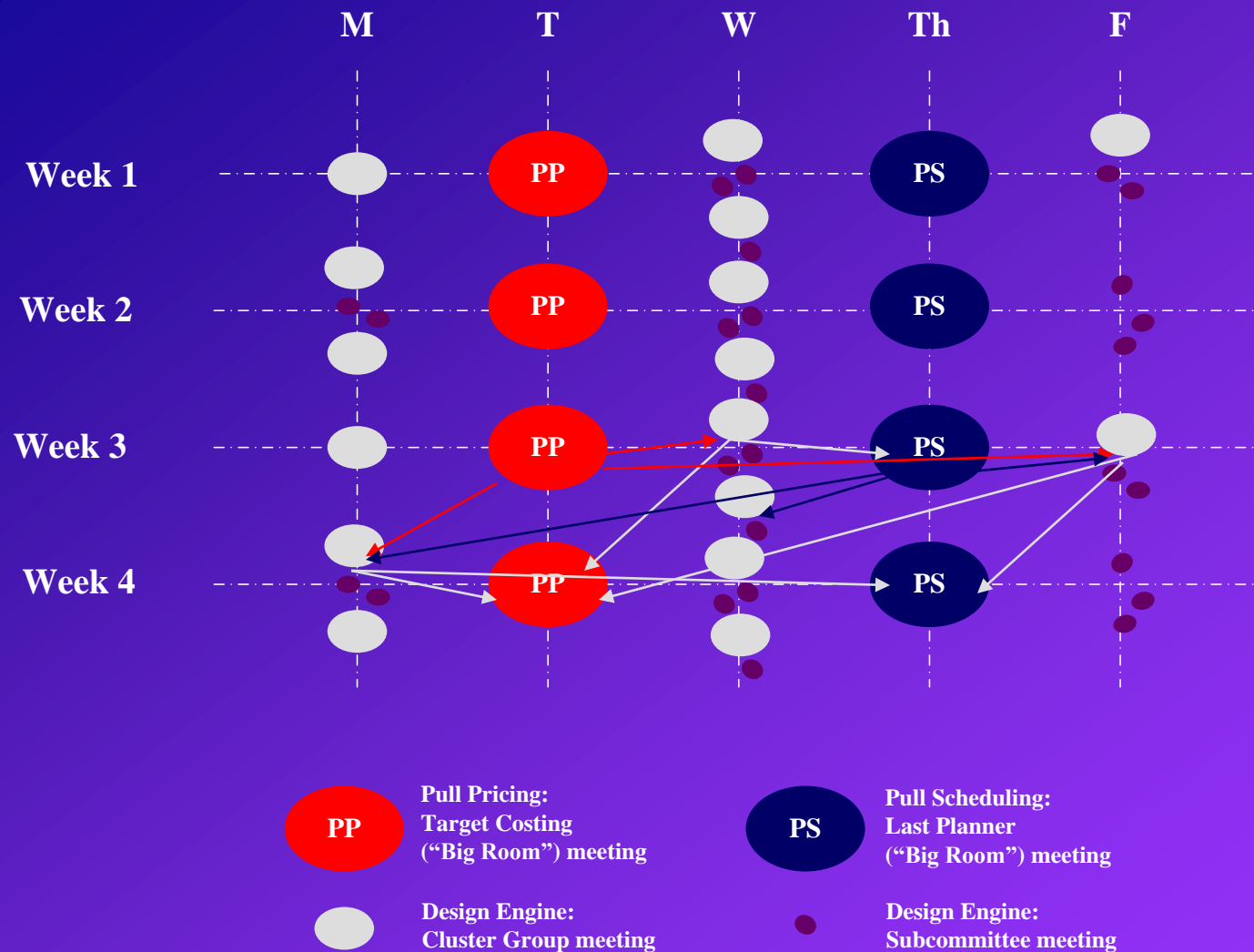


Design Engine

Culture of

Continuous
Improvement

Relational
Contract

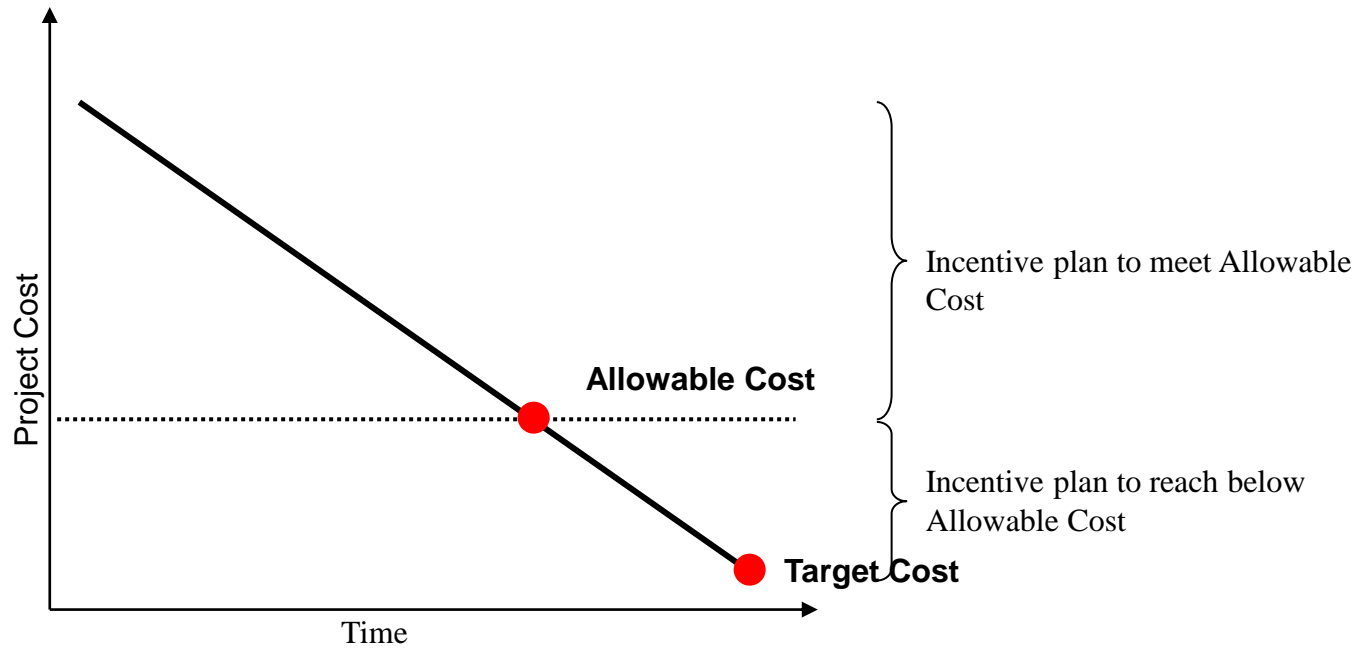


Meetings

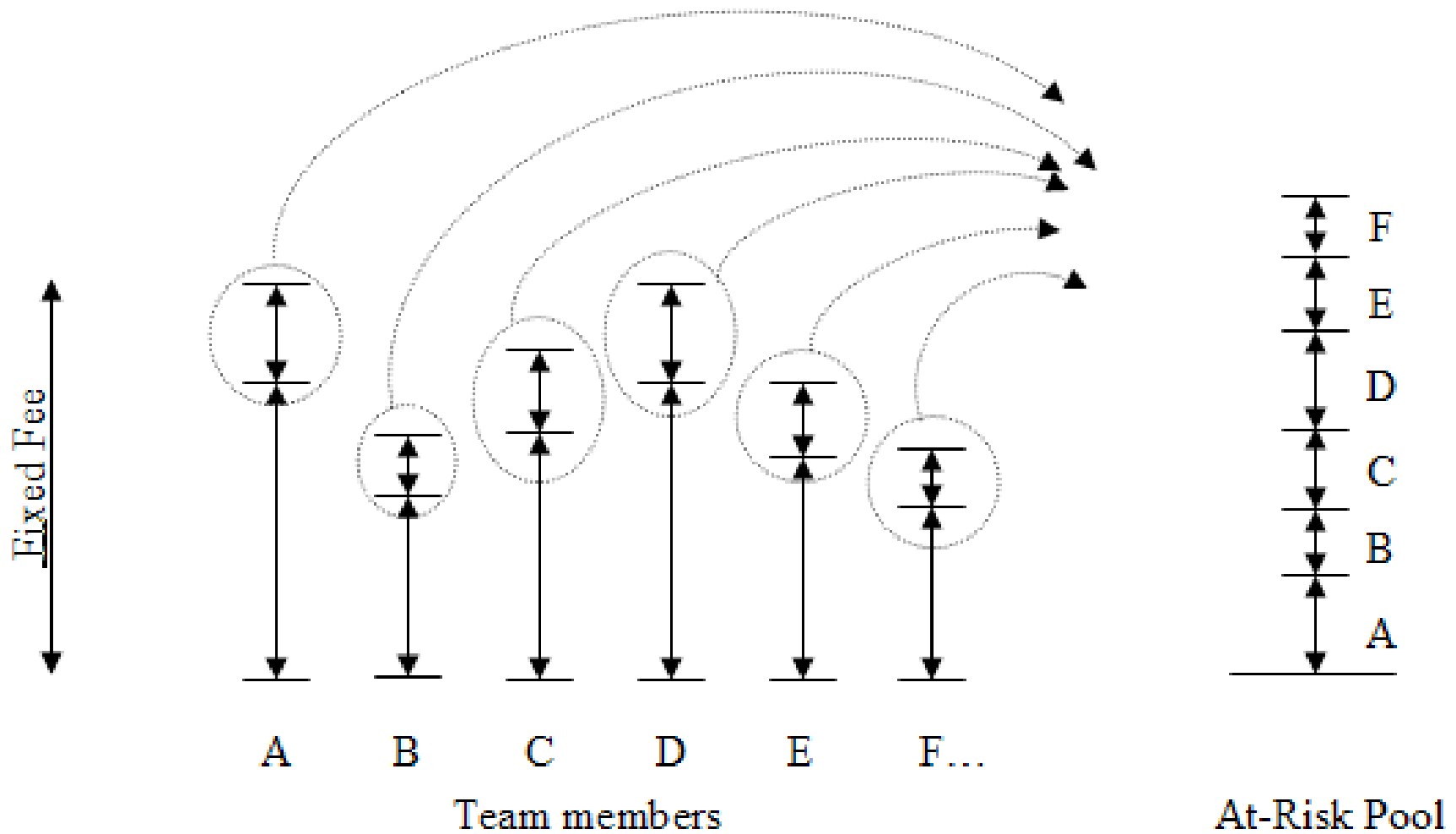
----- ● \$ 753.19/SF Average Adjusted Market Cost -----

● \$ 654/SF Allowable Cost

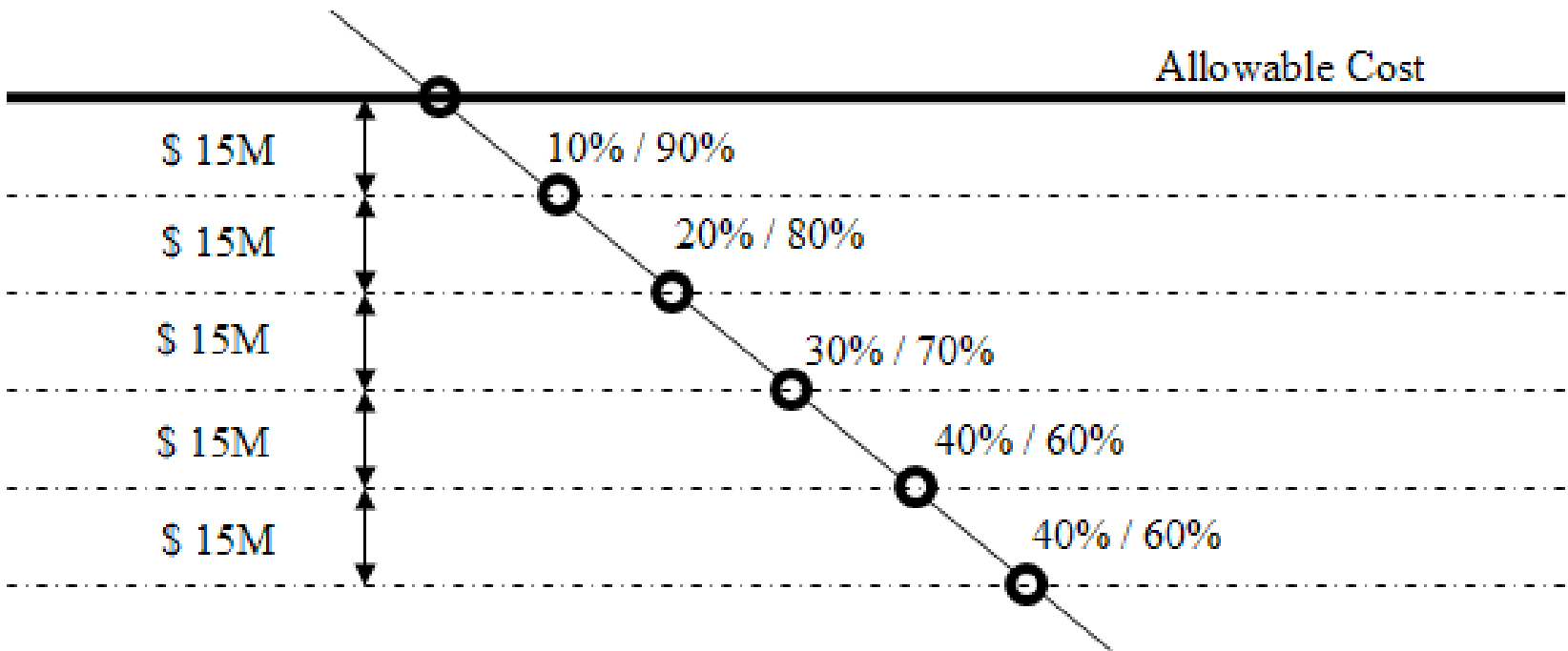
Setting the cost target against Market Cost



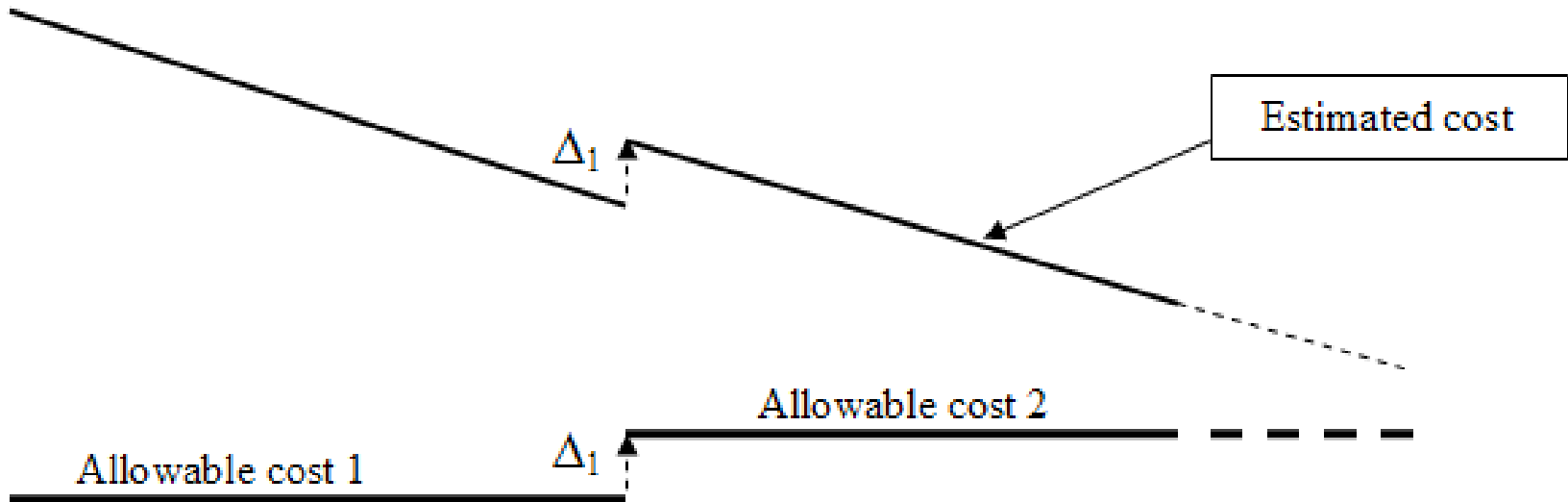
Contractual motivators



Risk Sharing



Risk Sharing



Scope change



Collaborate.
Really Collaborate

Projects as
Networks of Commitment

EXIT

ase
tedness



Ext: Joel 297



TOYOTA ROOM

The AD Works
Having a profile
is all we need to
Send us an AD

Part 1: The AD Works

Part 2: The AD Works

Part 3: The AD Works

Part 4: The AD Works



36

50

52

53

57



Lean Project Delivery

- ◆ Increasing the relatedness of members of the design and construction team (the "**Integrated Project Delivery Team**" or "**IPD Team**");
- ◆ Collaborating throughout design and construction with all members of the IPD Team;
- ◆ Planning and managing the Project as a network\ of commitments;
- ◆ Optimizing the Project as a whole, rather than any particular piece;
- ◆ Tightly coupling learning with action - Promoting continuous improvement throughout the life of the Project (Kaizen)



PLANNING WALL





Text-heavy poster with multiple paragraphs of text, possibly a technical report or project description.



Poster with a diagram and two large question marks, possibly a conceptual or research poster.



Lean Training

Introduction: Lean History, Concepts & Methods

Basic Training


- Value Stream Mapping
- 5S
- Reliable Promising
- Learning from Experiments & Breakdowns
- Choosing by Advantages
- A3 Reports

Lean Project Delivery

- Last Planner Process
- Target Value Design
- Design Management
- Supply Chain Management
- Design of Construction Operations

Lean Management for Supervisors

- Leader Standard Work
- Daily Accountability Process
- Visual Controls
- Developing People
- Leading Change
- Problem Solving and Process Improvement



Plan-Do-
Check-Act



toyota

interior

big room

you are here

lexus

matrix

prius

highland

SIXTH FLOOR PLAN

Medical Center

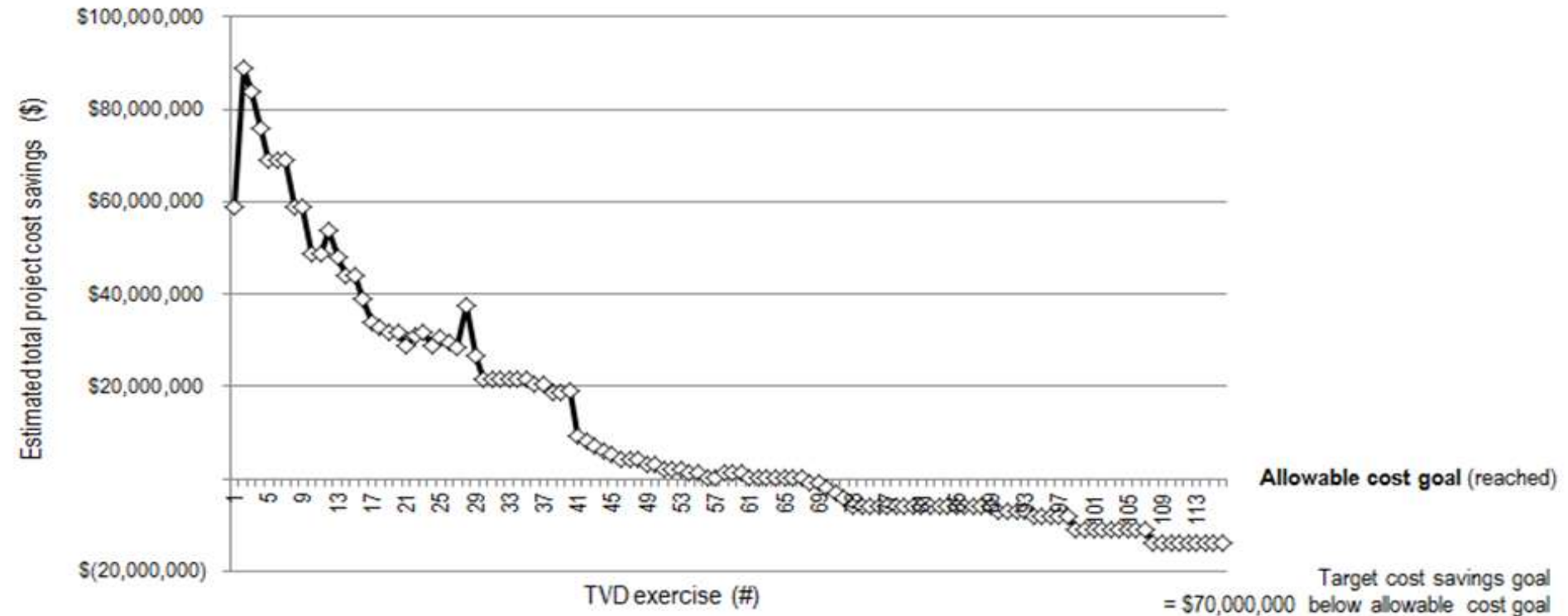
550 Beds
850,000 SF

Average Adjusted Market Cost: \$753/SF

Original Estimate: \$719/SF

Allowable Cost: \$654/SF (13% below market cost; 10% below original estimate)

Target Cost: 15-20% below market cost

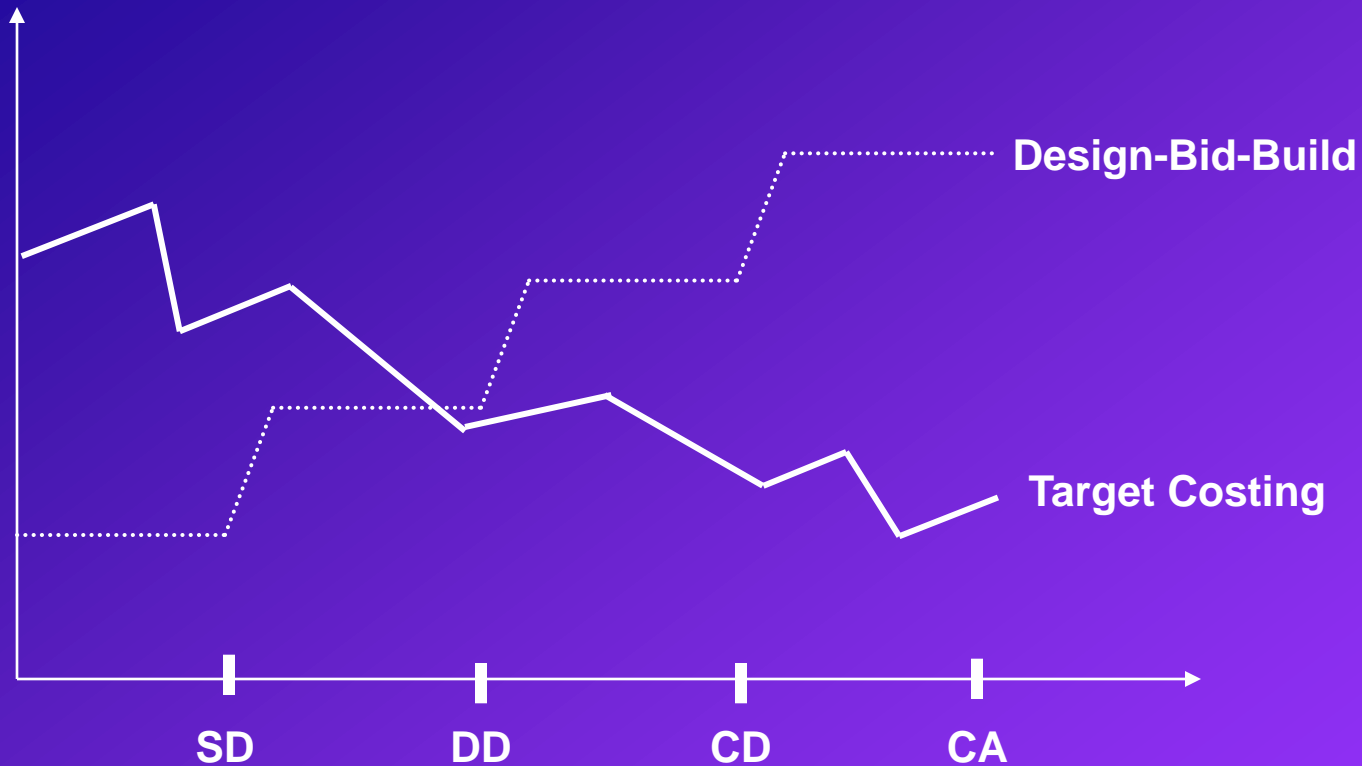


Target Value Design: Results

TVD results are being repeated:

- Sutter Medical Center, Castro Valley
- Alta Bates Summit, Medical Center Patient Care Pavilion
- UCSF Medical Center at Mission Bay

--report forthcoming by Stephane Denerolle, from DPR & the P2SL Laboratory at UC Berkeley

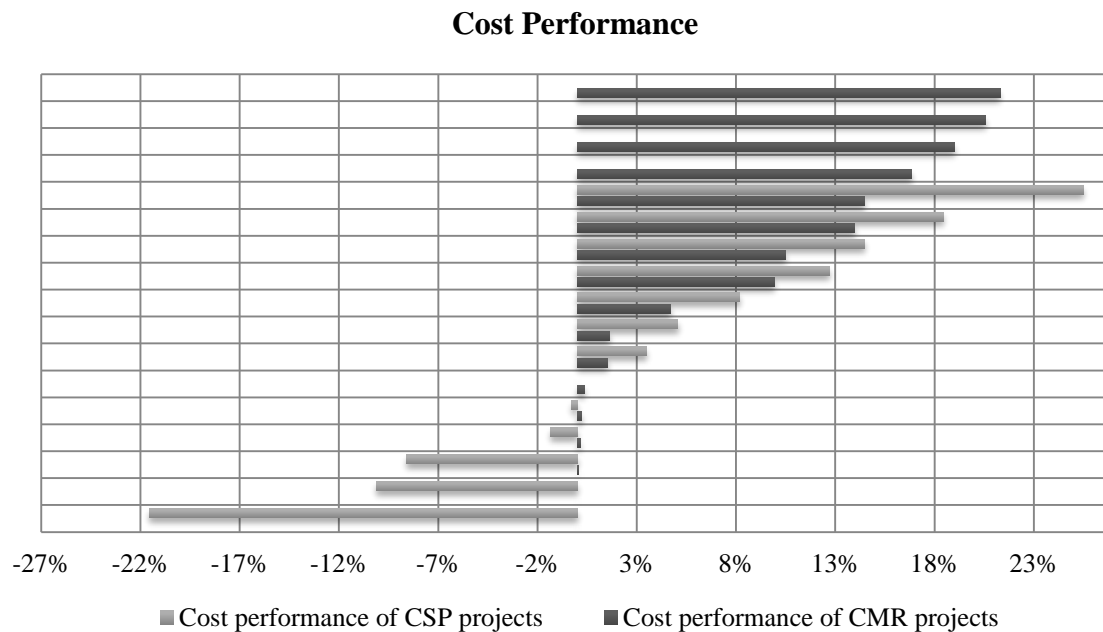


Tesmer Diagram

Overcoming initial skepticism

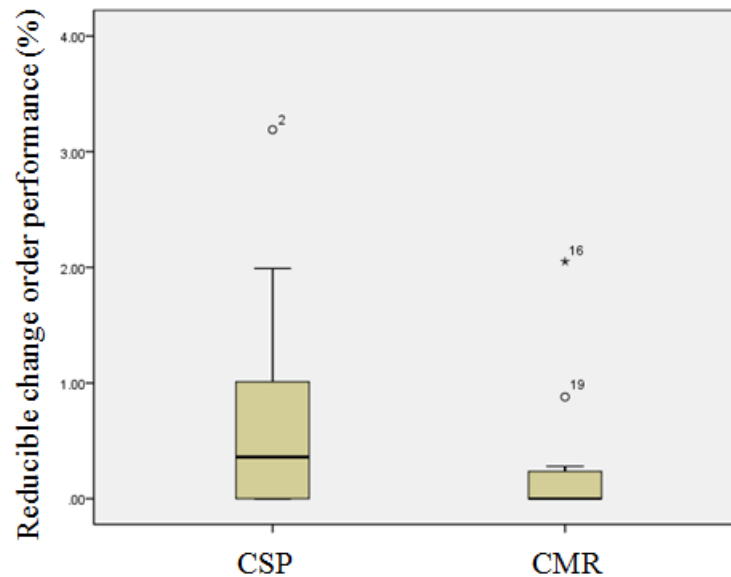
Rybkowski, Z. K. (2006). "Development of a Roadmap for Target Pricing of Medical Office Buildings in the AEC Industry (Qualifier Proposal)." University of California, Berkeley, 41.

Cost performance comparison of collaborative v. non-collaborative delivery methods



Kulkarni, A., Rybkowski, A.K. & Smith, J. P. (2012). "Cost comparison of collaborative & IPD-like project delivery methods versus competitive non-collaborative project delivery methods," *Proceedings of the International Group for Lean Construction*, San Diego, CA

Change order performance comparison



Reducible change order performance (%) categorized by project management as “omissions” for CSP versus CMR projects.

Kulkarni, A., Rybkowski, A.K. & Smith, J. P. (2012). “Cost comparison of collaborative & IPD-like project delivery methods versus competitive non-collaborative project delivery methods,” *Proceedings of the International Group for Lean Construction*, San Diego, CA

Cost performance on construction projects BEFORE Target Value Design

Problematic construction projects (adapted from Forbes and Ahmed 2011, p. 57)

Name of Project	Budgeted cost (\$ millions)	Final Cost (\$ millions)	Growth of cost (%)
Hanford Nuclear Facility (2001)	715	1,600	120
Capitol Hill Visitor Center (2008)	265	621	134
Denver Airport (1995)	1,700	4,800	180
Boston Big Dig (2005)	2,600	14,600	460

Cost performance on construction projects AFTER Target Value Design

Examples of cost results following Target Value Design exercises on reduction of capital cost
(Glenn Ballard, *personal communication*, 2012)

Name of Project (SF)	Market cost (\$ millions)	Final Cost (\$ millions)	Reduction of cost (%)
Project A (368,882 SF)	98,000,000	89,200,000	9.0
Project B (114,000 SF)	13,533,179	11,717,000	13.4
Project C (75,362 SF)	13,600,000	11,200,000	17.6
Project D: (230,000 SF)	22,000,000	17,900,000	18.6

- Target Value Design appears to have the ability to reduce first cost by 15-20%.
- Therefore, if you want to overcome the hurdle of first cost that comes with better quality facilities, consider using **Target Value Design**.

Conclusion



P2SL Sponsors

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979-446-2228 (c)

979-845-4354 (o)

Contact for more information

