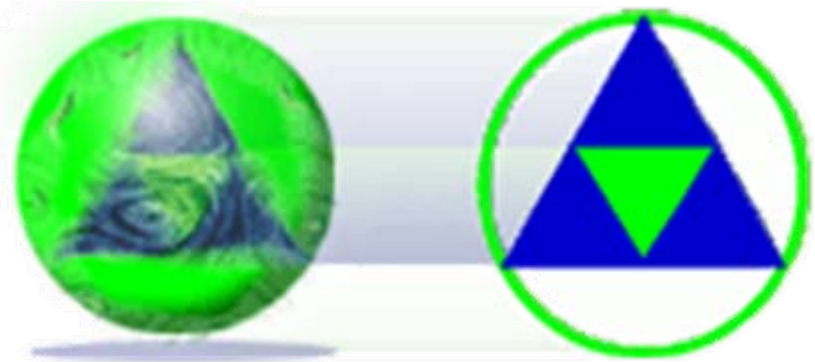
Costing Sustainable Capital Projects: The Human Factor



Dr. Annie R. Pearce

Virginia Tech

Motivation

"If you want to kill a green project, there's nothing easier than using [the prospect of higher] costs."

–Jim Goldman, Turner Construction (in Yudelson 2007)

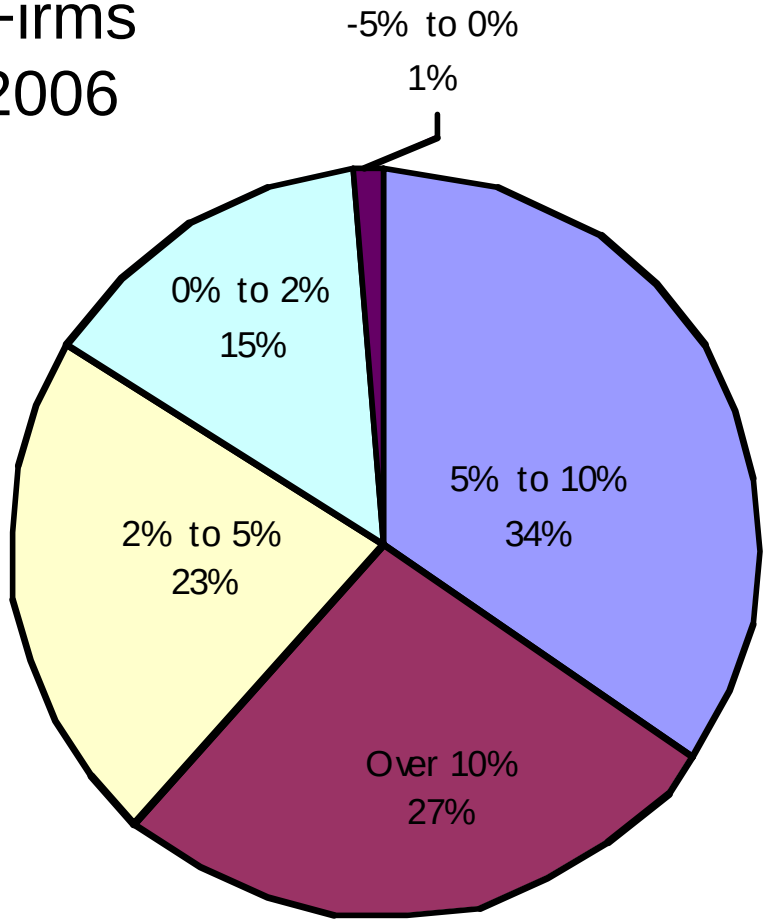
(See also Pearce & Fischer 2002; Landman 1997, and others)

Actual Cost Premium: Green vs. Conventional

Study	Cost Premium			
	Certified	Silver	Gold	Platinum
Kats 2003 8-18-6-1	0.66%	2.11%	1.82%	6.50%
Kats 2004 8-21-9-2	0.66%	1.91%	2.23%	6.80%
Steven Winter 2004	0.65%	3.29%	7.63%	-
1 each of new/renov	1.9%	3.9%	7.9%	-
Kats 2006 4-8-6-0	1.17%	1.03%	2.15%	-
Nilson 2005 1-1			0.82% & 1.56%	

Perceived Cost Premium: Green vs. Conventional

87 Construction Firms surveyed in Fall 2006



(Ahn & Pearce 2007)

Challenge

- How do contractors/supply chain establish the cost of green products and systems?
- How should policy and the project delivery process/environment be changed to reduce the first cost barrier to sustainability?
- What are the leverage points for affecting the first cost of green projects?

The Role of the Constructor

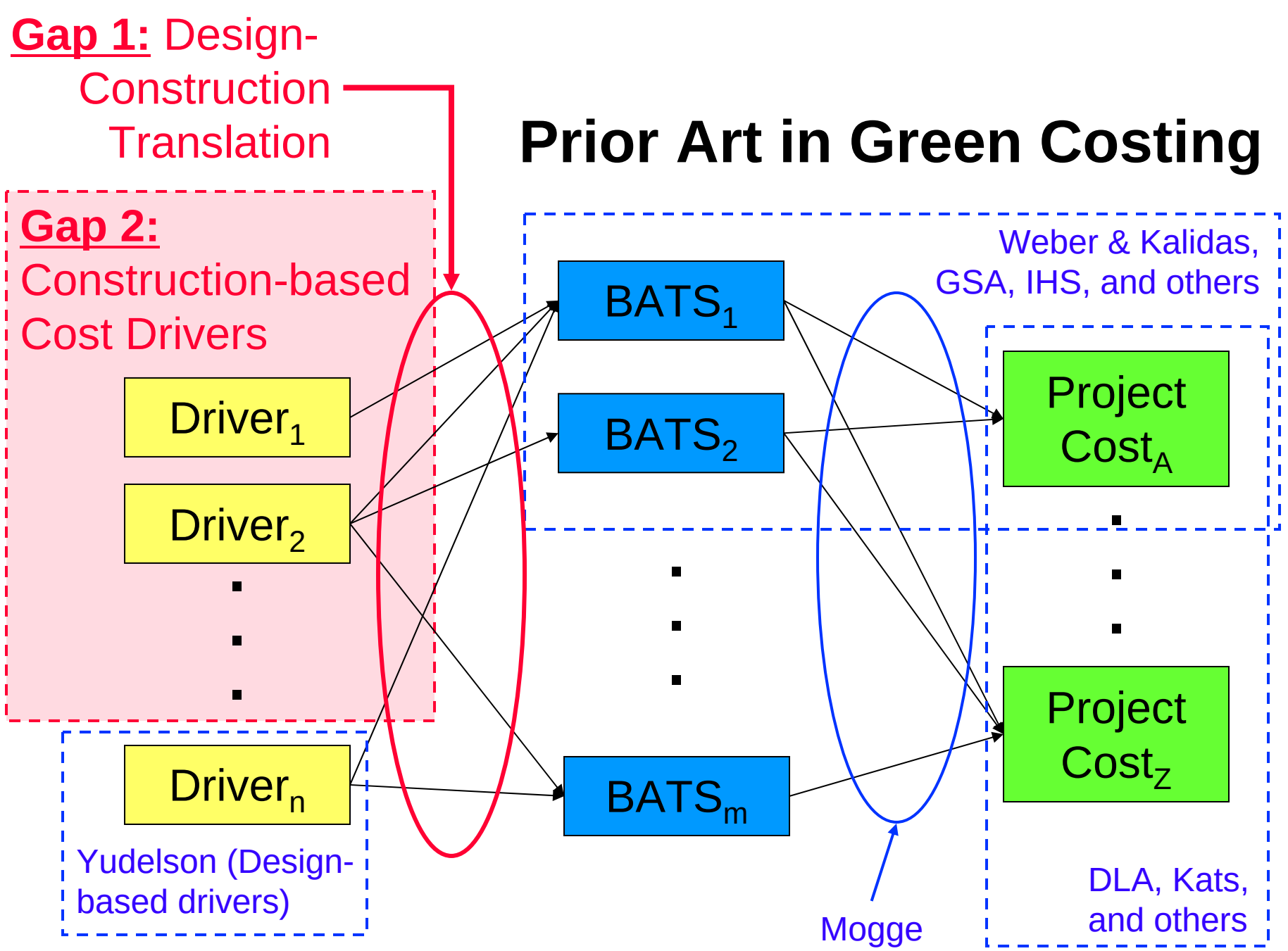
- Constructors play increasingly important roles that can influence project outcomes:
  - Preconstruction services
  - Design-build/CM-at-risk procurement
- What explains the discrepancy in their perceptions of the cost of green projects?
- To what extent is the actual project cost a function of constructor input?

Theoretical Underpinnings

- Constructivist view of project cost:
  - Project cost evolves over time based on the behaviors, perceptions, and choices of the agents within the human-technology system of a capital project
- Sustainability as innovation for constructors:
  - Normative models don’t work well for later adopter categories
  - Leverage through recognition-primed decision making in the context of existing proceses

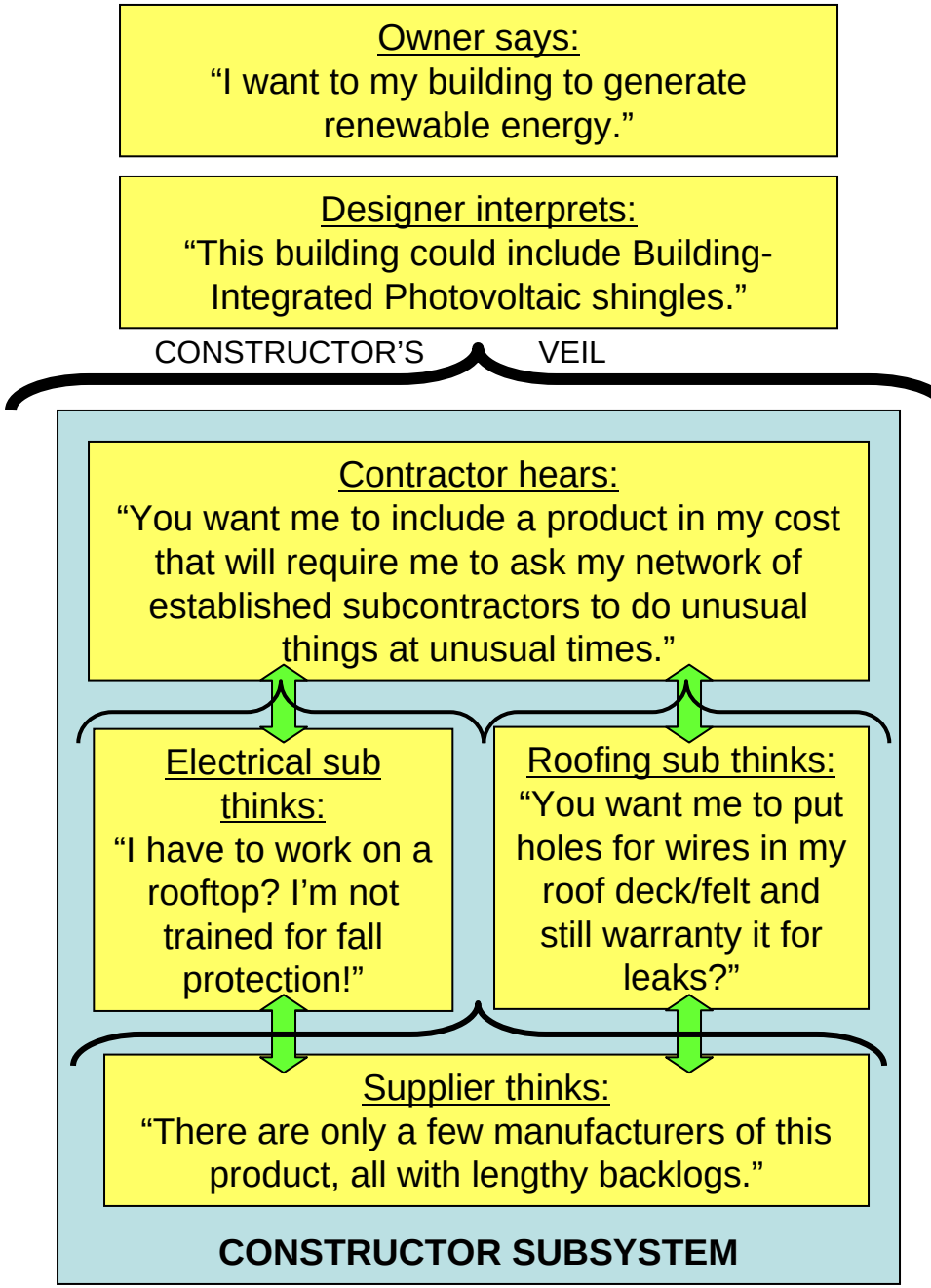
Point of Departure

- Much of the work to date on cost management for green projects has taken an owner/designer perspective
- Tactics for overcoming the cost barrier are described in the language of design
- Sustainability principles and practices are framed in a way that fails to acknowledge how they are delivered and priced by constructors

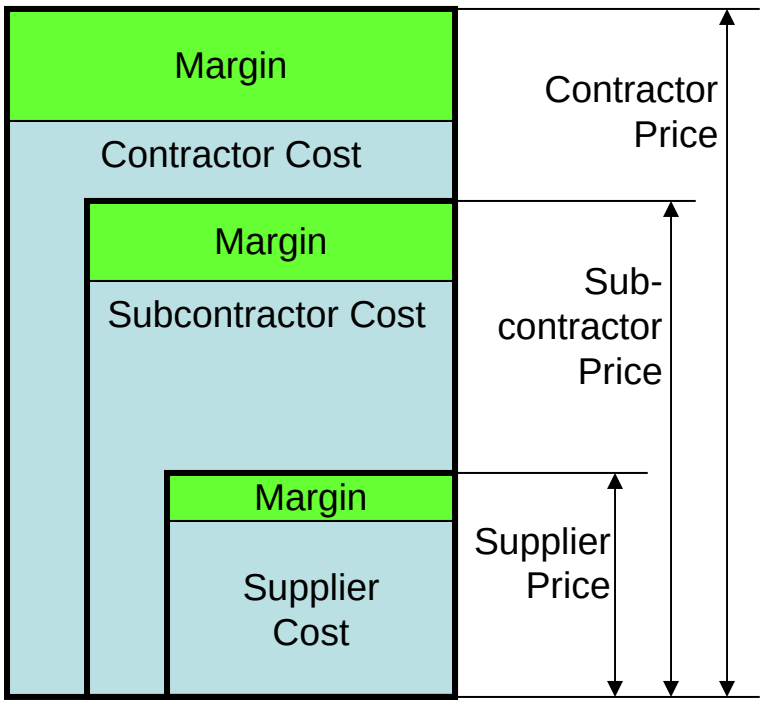

Gap 1: Design-Construction Translation
Prior Art in Green Costing
Gap 2: Construction-based Cost Drivers
Driver1
Driver2
Drivern
BATS1
BATS2
BATSm
Weber & Kalidas, GSA, IHS, and others
Project CostA
Project CostZ
DLA, Kats, and others
Yudelson (Design-based drivers)
Mogge

Constructor Subsystem

- "Black box" for producing a market-optimal cost
- Operative details are deliberately avoided by other project stakeholders to avoid retained control
- Some studies exist, but they are case-specific
- No generalized understanding exists of the construction-based cost drivers



Effect on Capital Costs



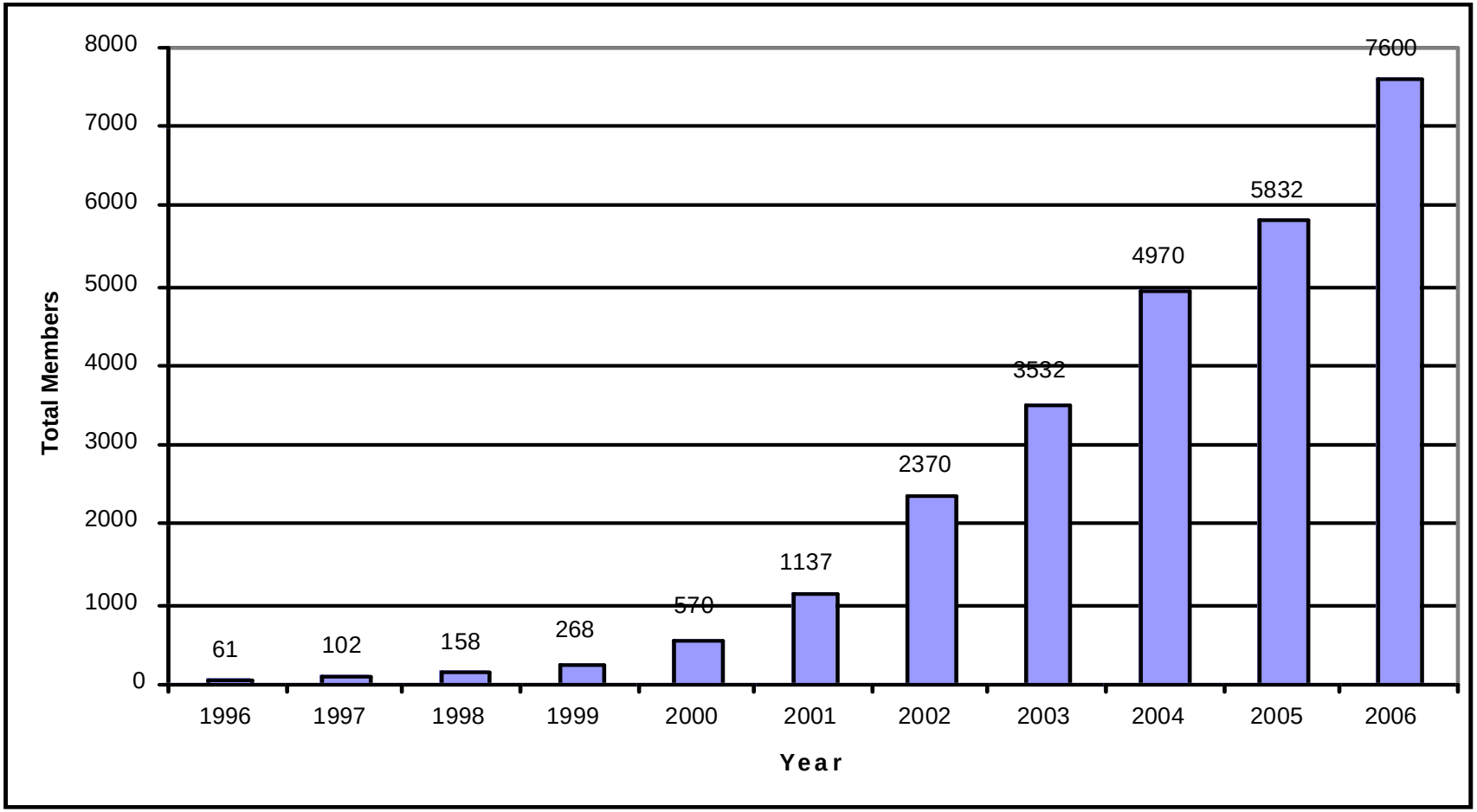
Cascading Green Cost Margins

- The green cost margin gets added in at every step:
  - Procurement risks
  - Learning curve
  - Qualification expenses
  - Data management
  - Inability to use existing strategic relationships

Point of Departure

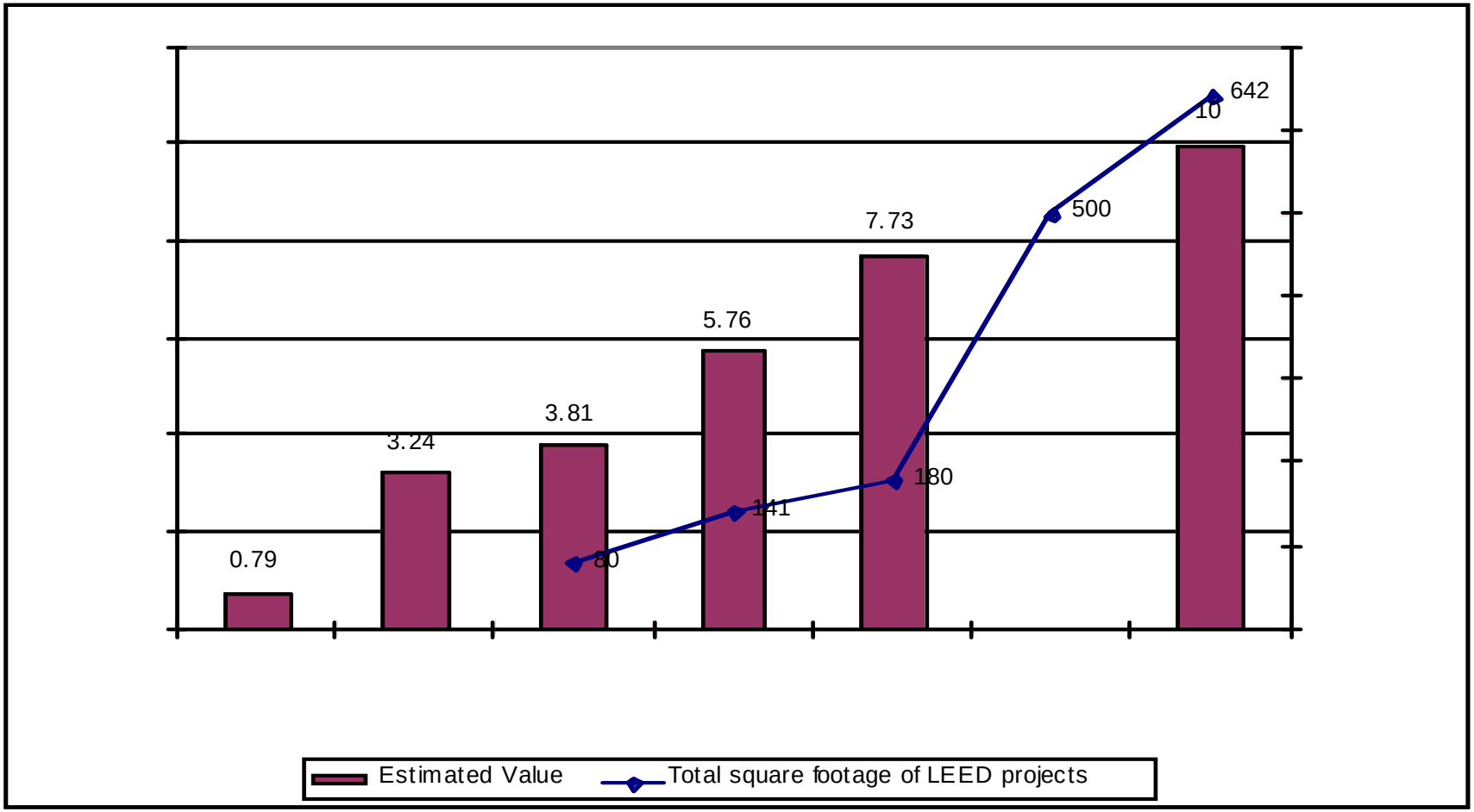
- Contractor perceptions are devalued:
  - "The construction industry is slow to change and full of laggards"
  - "Once contractors have experience with green projects, they'll see it can be done"
- It may be true that the innovators and early adopters among the population of constructors can see the potential in sustainability and successfully adopt it…

Industry Trends: USGBC Membership



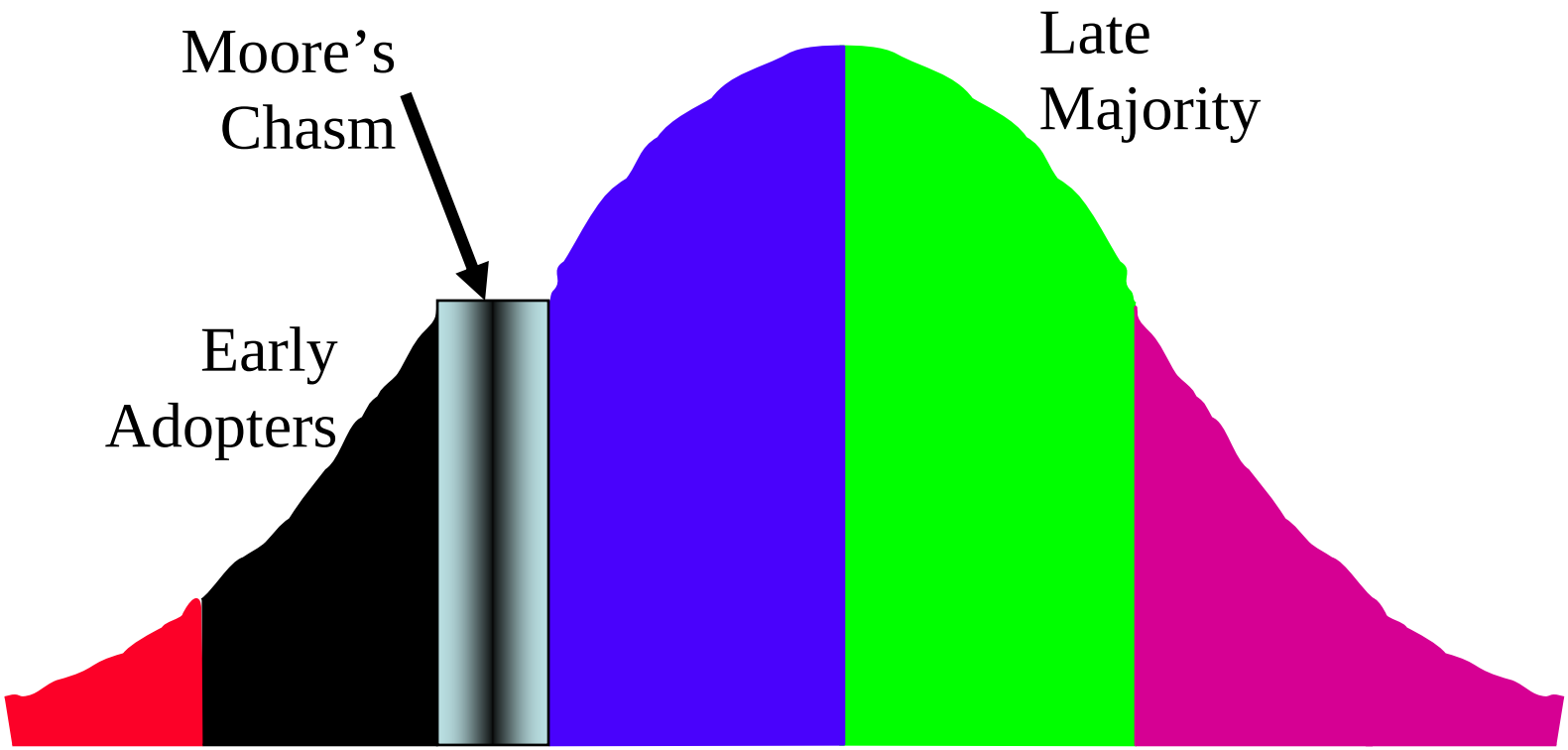
(USGBC 2006; Ahn & Pearce 2007)

Industry Trends: LEED Certified Projects



(USGBC 2006; Ahn & Pearce 2007)

…but later adopter categories need different kinds of convincing:



(Rogers 1995; Moore 1999)

From the contractor's standpoint…

- Relative advantage
  - Benefits accrue to other stakeholders and non-stakeholders, at least for later adopter categories
- Observability
  - Benefits are spatially and temporally distant from construction decisions

From the contractor's standpoint…

- Trialability
  - Integrated design requires "jumping in with both feet"
- Compatibility
  - New technologies and products require deviation from established subcontractor and supplier networks

From the contractor's standpoint…

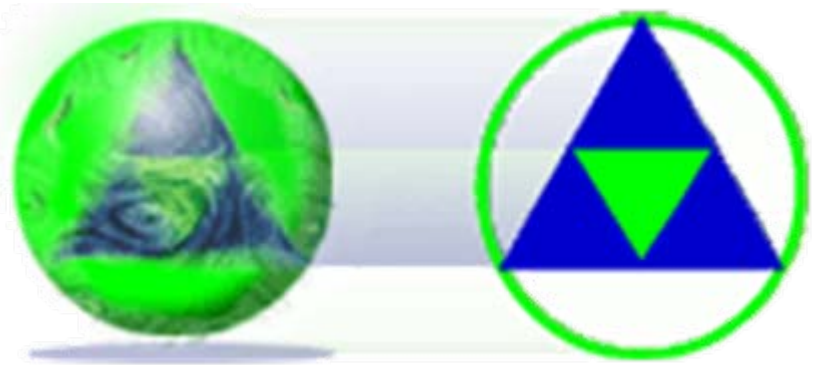
- Complexity
  - New documentation requirements
  - Product qualification requirements
  - New general requirements such as commissioning, waste management, and indoor air quality management

Opportunities for Achieving Transformative Change

Convincing the MAJORITY of the construction industry to embrace sustainability is going to take different tactics:

- Acknowledgment of their wisdom, experience, and concerns
- Translation between design-based sustainability and construction-based sustainability factors
- Addressing known adoption barriers
- Evidence to feed their recognition-primed decision making processes (experiences of peers)

Thank you for your attention!



Got questions?
Want to take it to the next level?

apearce@vt.edu
http://www.sustainablefacilities.com
(540) 818-7732