



POST-PROJECT REVIEWS:

Can you afford not to do them?

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Learning Objectives



- Understand the financial and legal impact rework has on design and construction projects.
- Learn specific ways of analyzing projects in order to improve the delivery process.
- Develop a better understanding of the barriers to conducting post-project reviews and how to cope with them.
- Gain an appreciation of how client value is improved by improving the delivery processes.



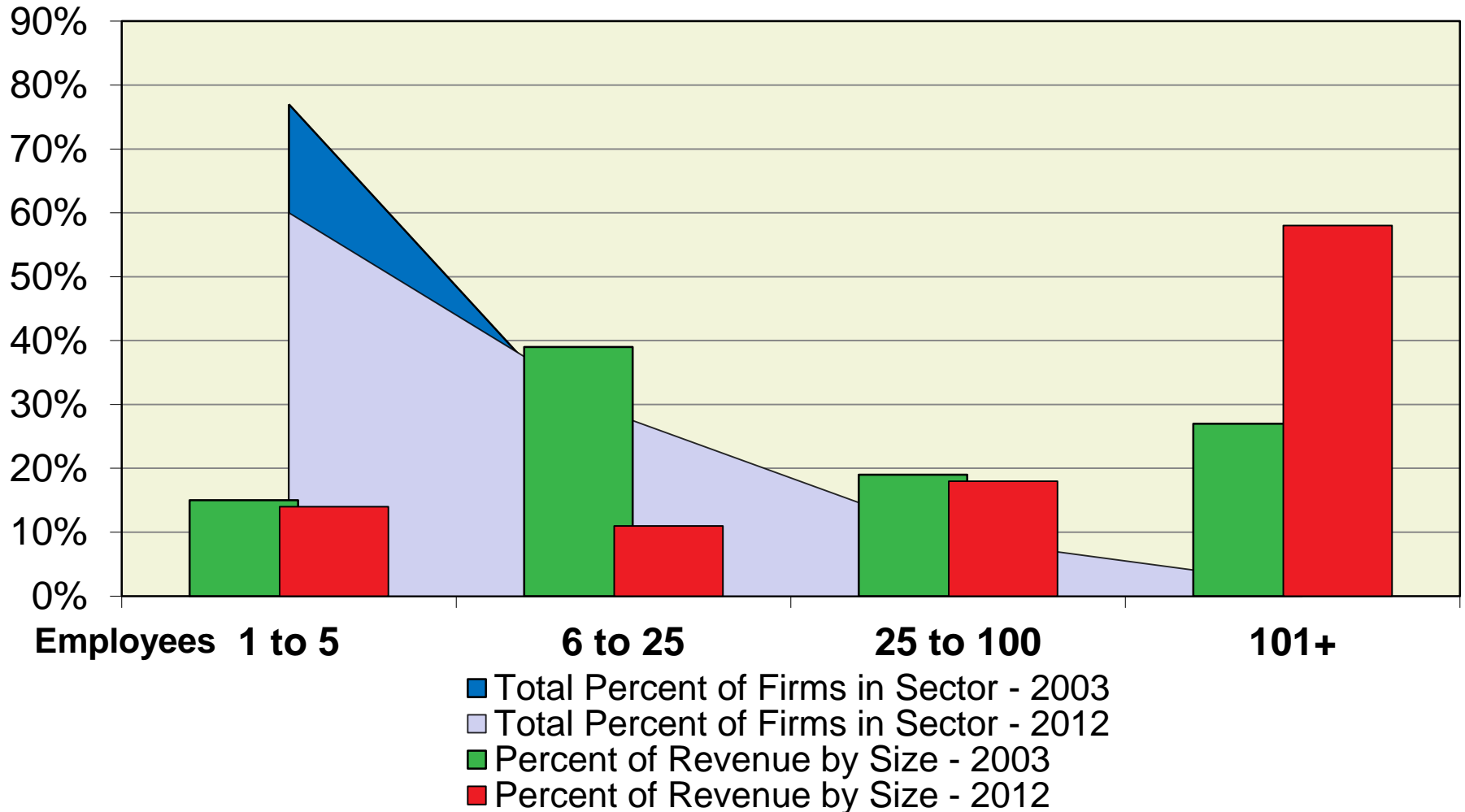
Agenda



- I have to convince you why you need to do them
- I have to show you how to do them
- I need to help you overcome cultural barriers to them
- I need to leave you with hope for change



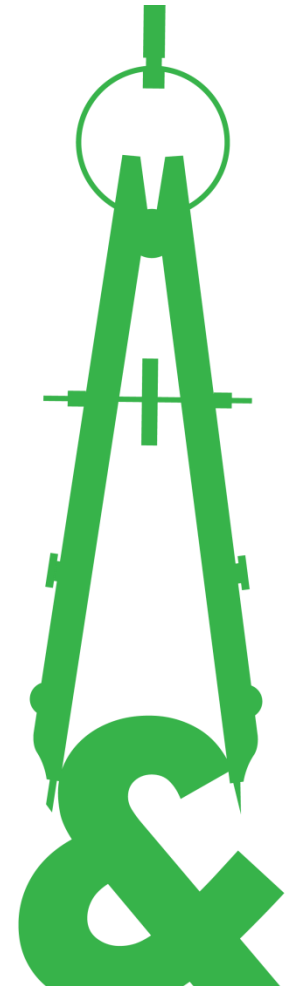
Changes in the A/E sector 2003-2014 US & Canada



Changes in the design sector



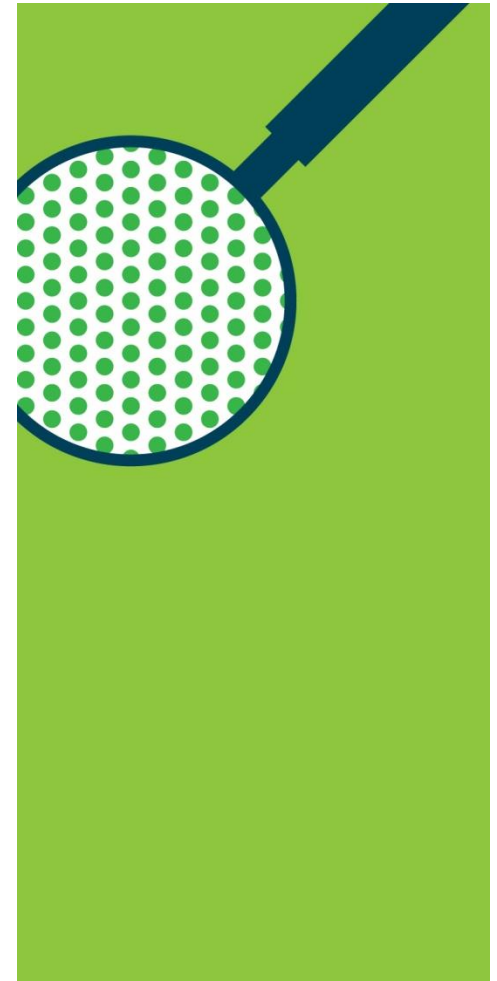
- Jumbo firms now hold almost 60% of the market share in design, and that is increasing.
- 10 years ago there were only 3 firms with net revenues over \$1B
- Now there are 26 firms with revenue over \$1B and 8 with revenues over \$2B
- This has come (mostly) at the expense of firms in the 5-25 employee range



What do these things have in common?



- Design-Build
- Construction Management
- Construction Management at-risk
- Public-Private Partnerships
- Integrated Project Delivery (IPD)
- Lean Construction



What do these things have in common?



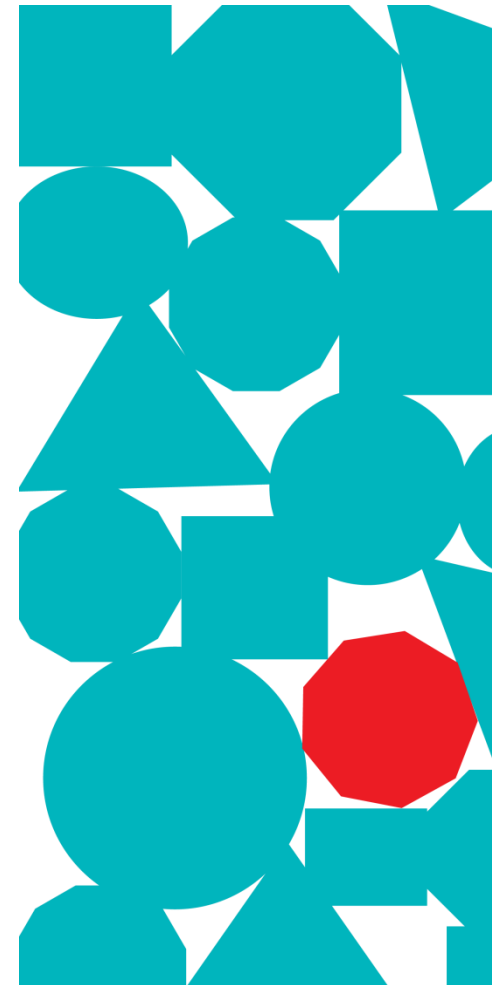
None of them came from the design sector



NIST Study on Construction Interoperability 2004 (US National Institute of Standards and Technology)



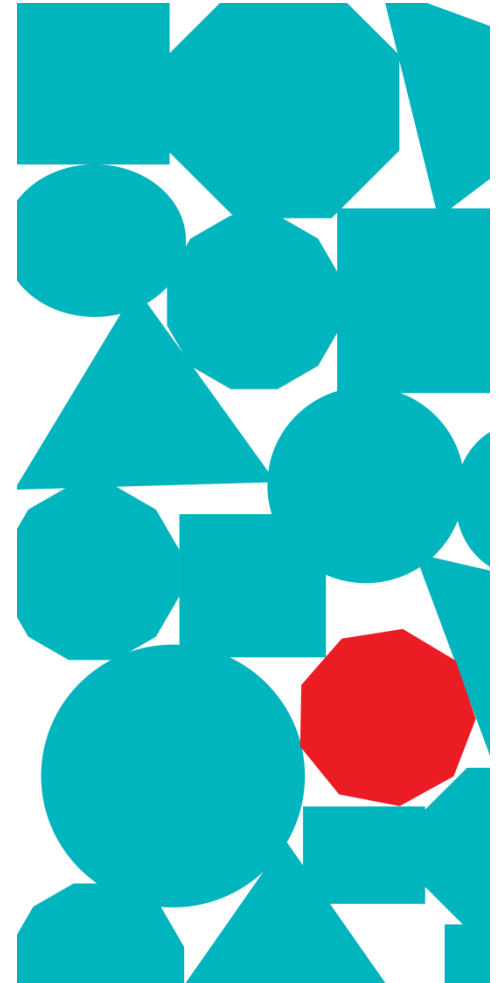
- “Cost Analysis of Inadequate Interoperability in the U.S. Capital Facilities Industry” (fire.nist.gov/bfrlpubs/build04/PDF/b04022.pdf)
- Identified inefficiencies in US federal DBB procurement amounting to \$15.8B/year
- Owners and operators shoulder 2/3 of this cost
- 7% of total comes from designers



NIST findings



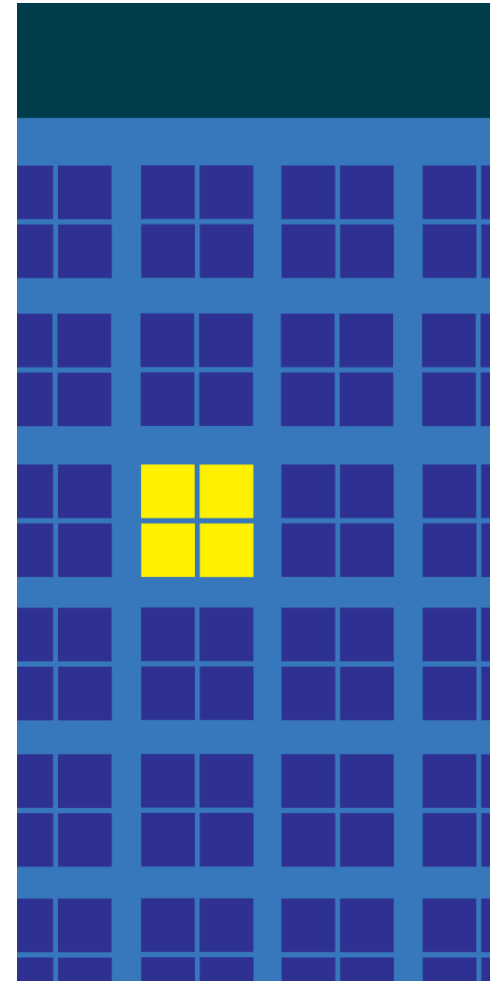
- Software incompatibilities
- Rework
- Change Orders (from poor advance planning)
- Poor logistical control



2006 – XL Catlin study



- 8 design firms from varied disciplines and sizes
- 6-month study to identify and quantify causes of project write-offs
- On average firms were writing off 5%-7% of total project profit
 - Specific causes:
 - Rework
 - Scope creep

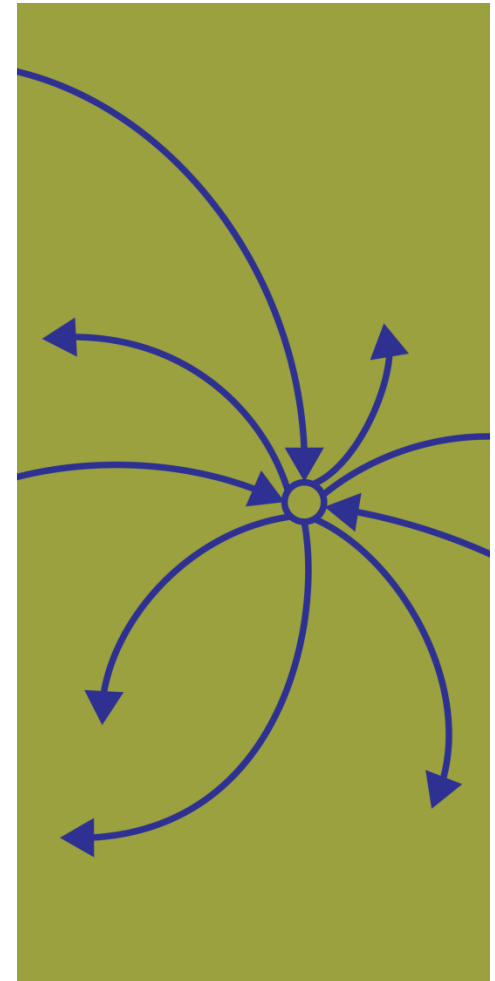


XL Catlin-sponsored research Harvard School of Design



- Major construction projects in the US and Canada over last 50 years over budget by as much as 400%*
- “On-time, on-budget” - a joke

*(A. Georgioulas, “Designing in Uncertainty: The I-SASP Model for Tactical and Innovative Risk Management in the Hi-performing Professional Practice”, PhD dissertation, Harvard School of Design 2008)

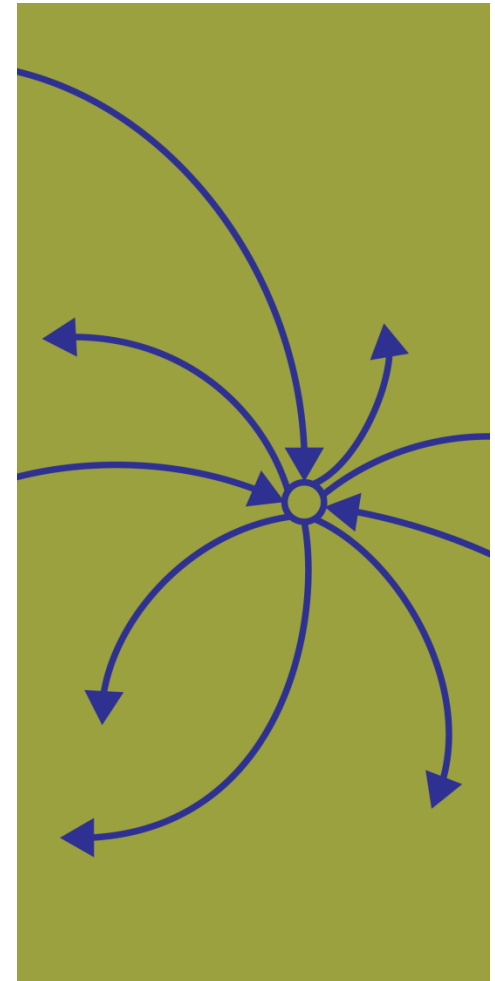


2012 Navigant Construction Forum



- Direct cost of rework is between 4.03% and 6.05% of original contract cost with a median of 5.04%
- For every dollar of direct cost there is an indirect cost of almost 80%.
- Including indirect costs results in a total range of 7.25% to 10.89% with a median of 9.07%

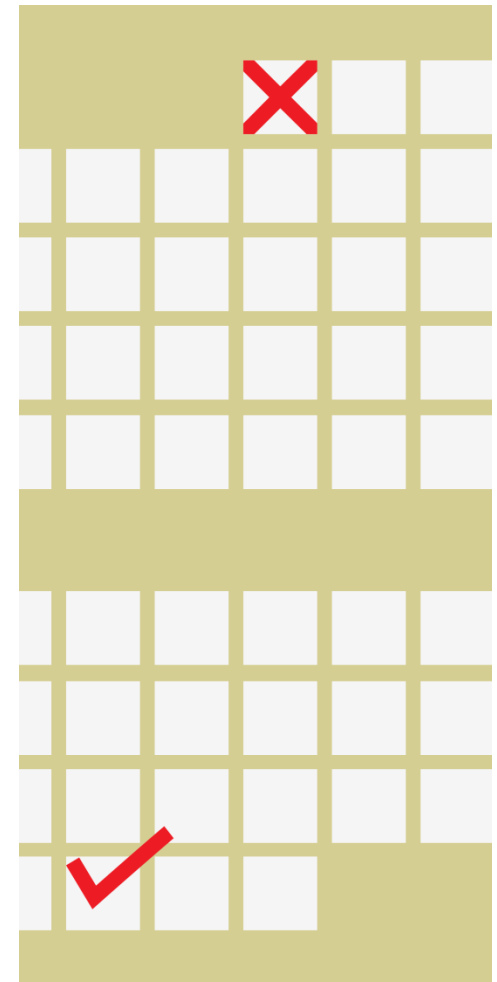
“THE IMPACT OF REWORK ON CONSTRUCTION & SOME PRACTICAL REMEDIES”
Navigant Consulting, August 2012)



More Navigant findings

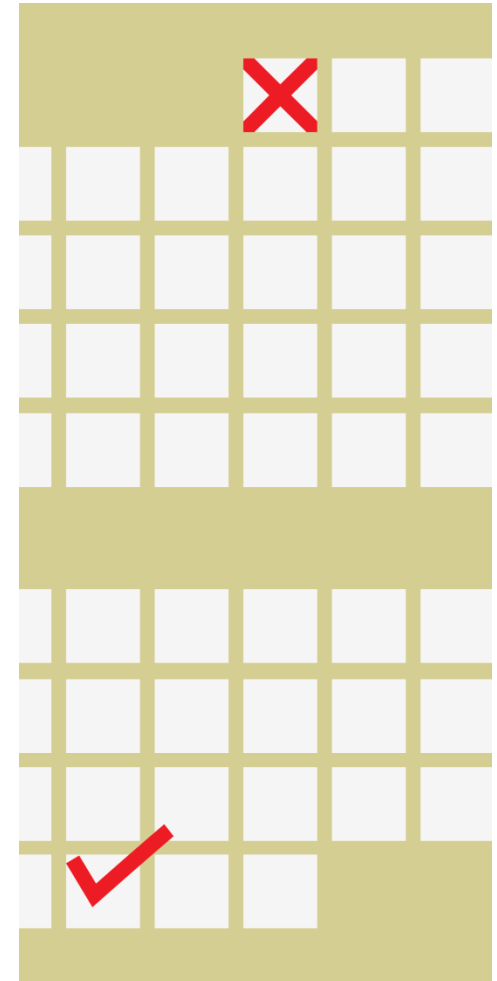


- Schedule impact of rework
 - Average delay is approximately 19% of original project schedule
 - Result is 9.82% schedule growth (72 days on a two-year project)
- Trend is going up!
 - 20 studies between 2002-2011 demonstrated 3% growth

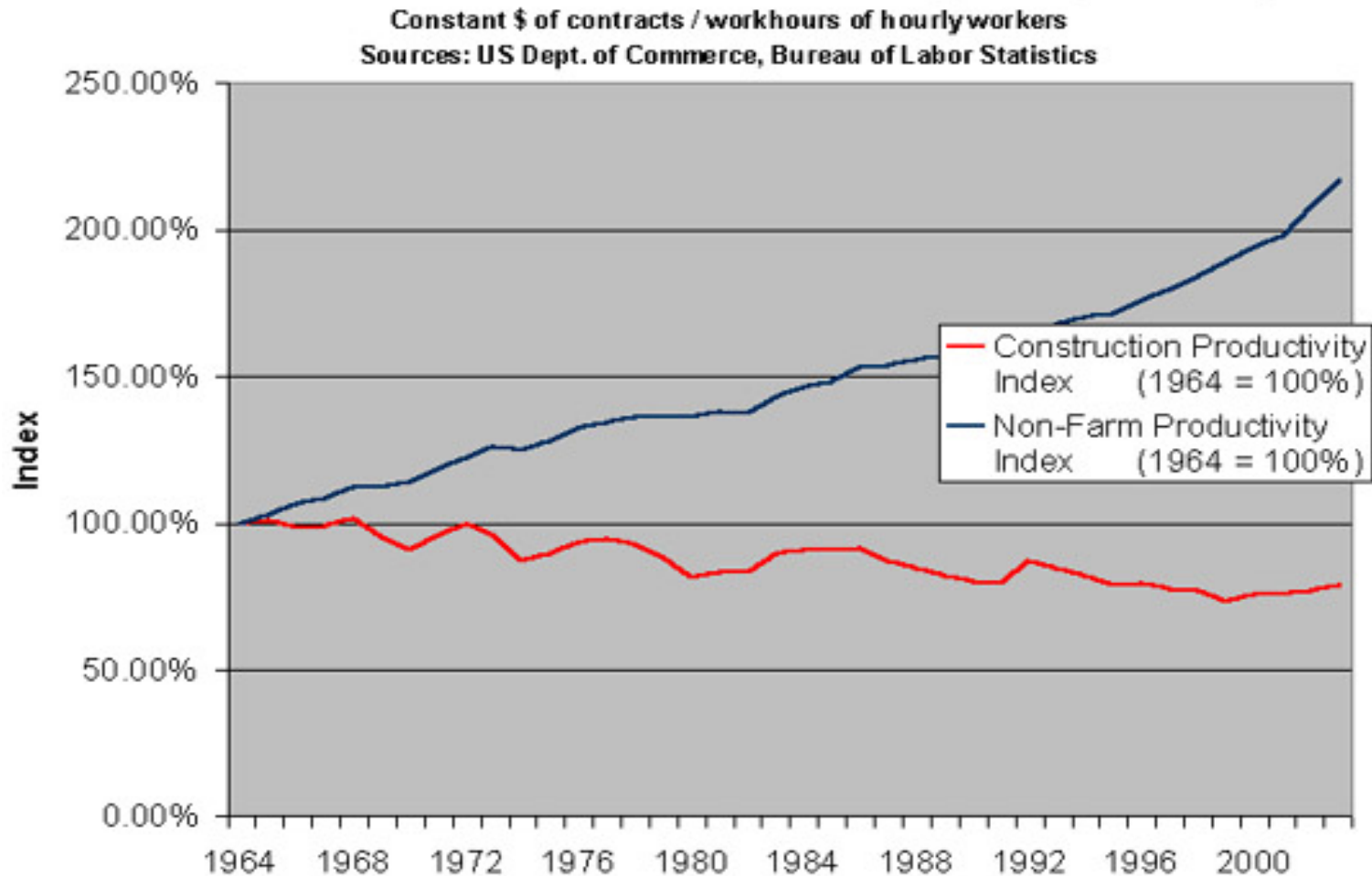


Navigant suggestions

- Use of BIM and Virtual Design & Construction (VDC)
- Early and continuous stakeholder involvement
- Design freeze prior to start of construction
- Bid-ability review
 - Necessary due to unclear scopes
 - Different interpretations of project requirements

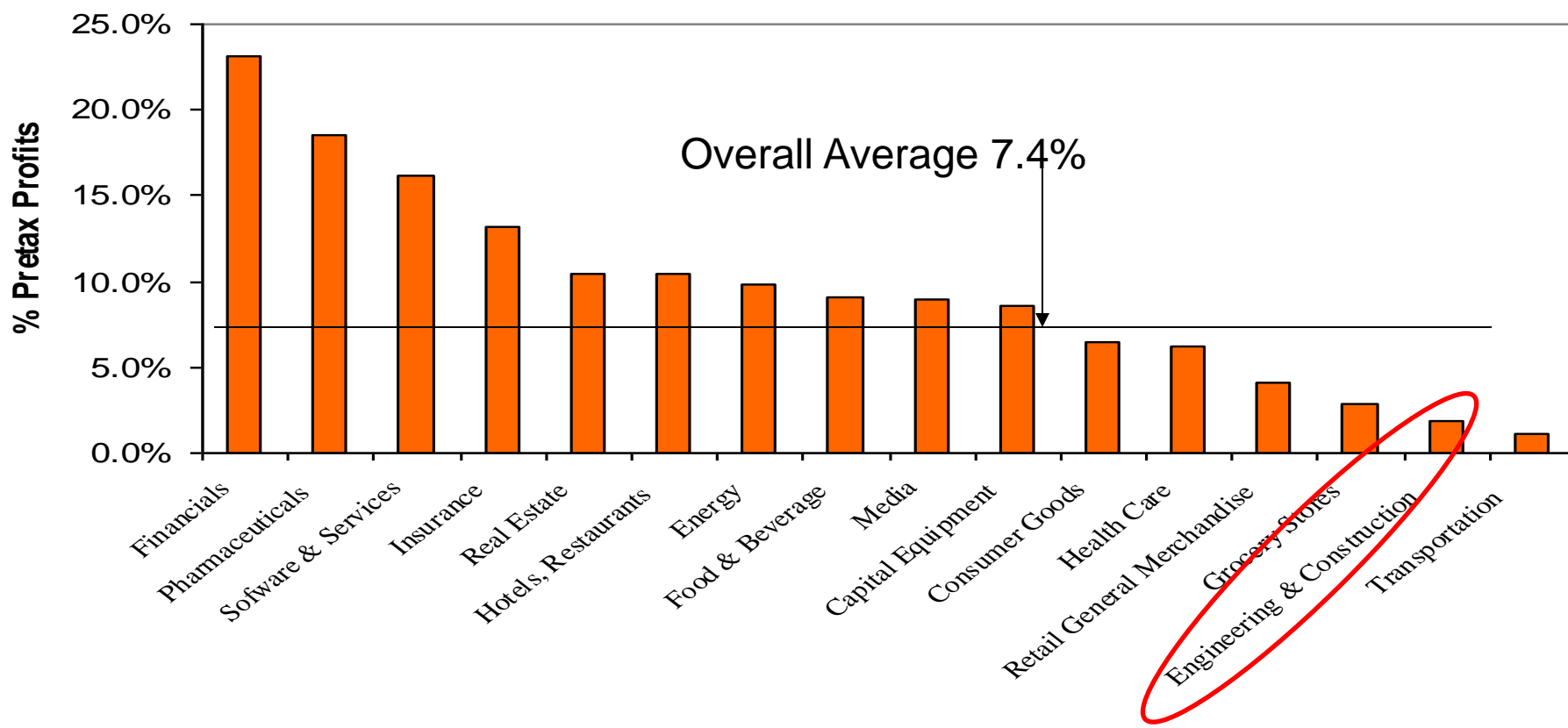


Why do we need change?



Profitability of engineering relative to other sectors

Courtesy of PSMJ



Lessons here

- You may be doing excellent design work, but you aren't addressing the owners' real needs.
- You may have your firm under control, but the entire design and construction sector needs innovation.
- Delivering value to owners will be rewarded handsomely, as few are doing it.
 - Value is in the owner's eyes, not the designer's
 - Value changes over time (Slywotsky, Value Migration)

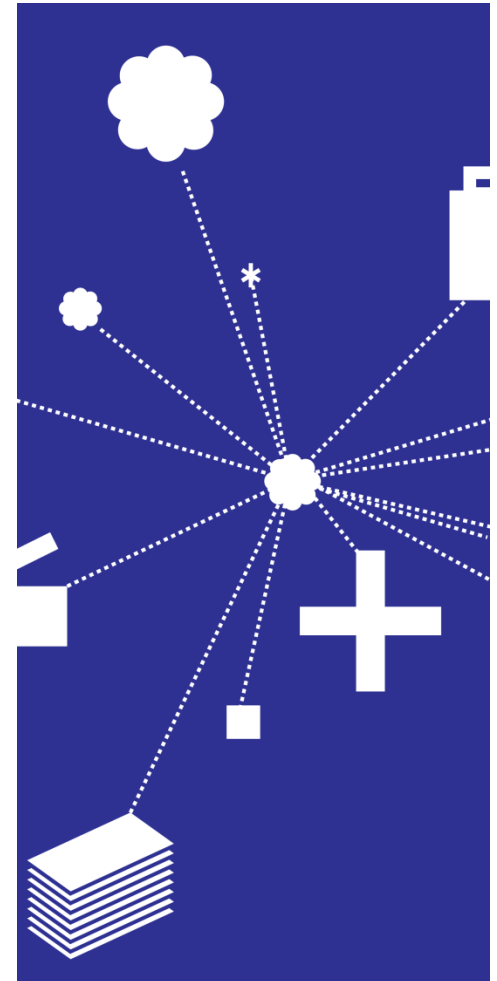


So – how is value created in a design firm?

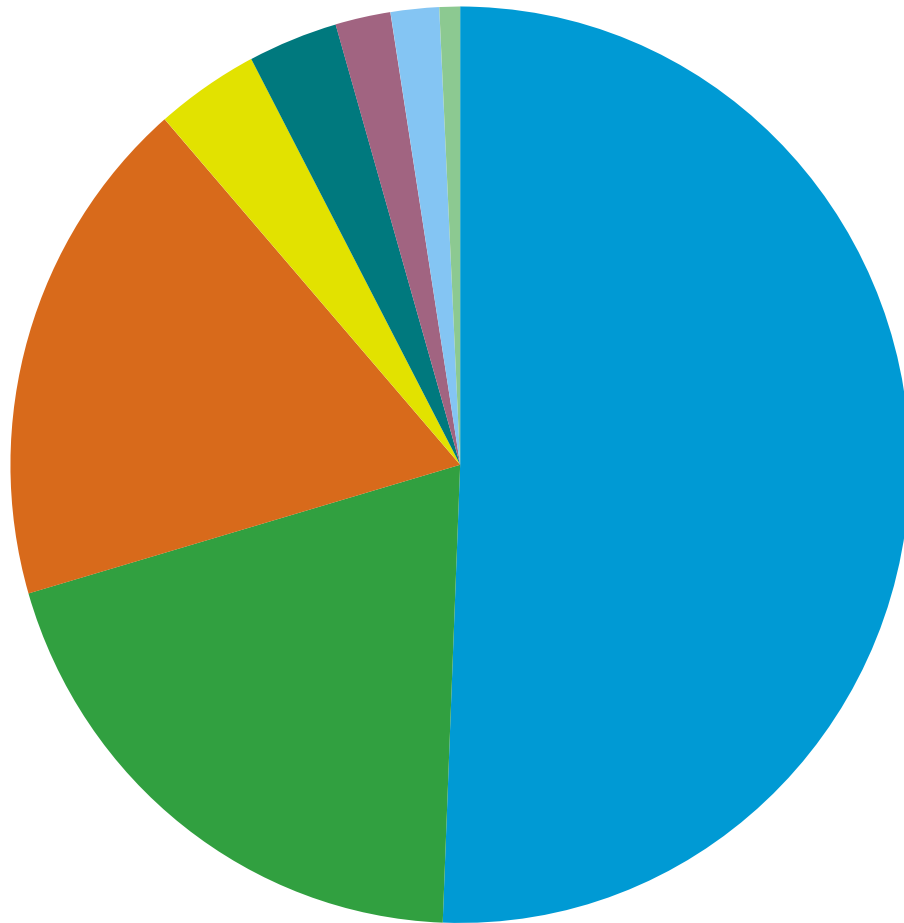


- Financial leverage
- Knowledge differentiation
- Superior service

All of this requires reinvestment in the firm,
which most firms are not doing



Project Team Capabilities



- 51% - Inexperienced design staff
- 20% - Inexperienced on-site staff
- 18% - Inexperienced project manager
- 4% - Other
- 3% - Firm inexperienced in project type
- 2% - Unqualified back-up staff
- 2% - Outside firm's normal territory
- 1% - Insufficient number of staff

How does this happen?



- Registered professionals requires years of school
- Lean staffing
- Cost control
- Misguided obsession with utilization



- Survey had 8,600 firms responding
 - 78% had net revenue <\$1MM
 - 18% had net revenues between \$1MM and \$7.5MM
 - 4% had net revenues >\$7.5MM

How do you view staff training in your firm?

1. It is a strategic imperative for the firm
2. It is important; the firm supports it, but it not a strategic issue
3. It is the role of the firm to fund training for staff
4. The firm sets aside funds, but the staff members need to pursue training on their own

Then asked: How much do you budget for staff training?

- | | | |
|-------------------------|---|---------------------------------------------|
| 1. <1% of net revenue | } | Significantly Higher Mean Loss Ratio |
| 2. 1%-3% of net revenue | | |
| 3. 4%-5% of net revenue | } | Significantly Lower Mean Loss Ratio |
| 4. >5% of net revenue | | |

Loss ratios of firms that spend less than 3% of net revenue is significantly different from those that spend >4% of net revenue on training (prob $f > 0.10$)

How long do you spend integrating new hires to the firm?

1. 1 day
2. 1-2 Weeks
3. 2 Months
4. 6 Months
5. More than 6 Months

1 Day had significantly higher mean loss ratio

6 Months had highly significantly lower loss ratio.

First, why post-project reviews?



- Biggest bang for your buck, investment-wise
- Most immediate impact on your firm, time-wise
- (Relatively) easy to instigate
- Templates already exist
 - After-Action Reviews – DoD since the 1970's
 - Physician's "M&M Conference"



Starting the process



A Post-Project Review should address four questions:

1. What was expected to happen?
2. What actually occurred?
3. What went well and why?
4. What can be improved and how?

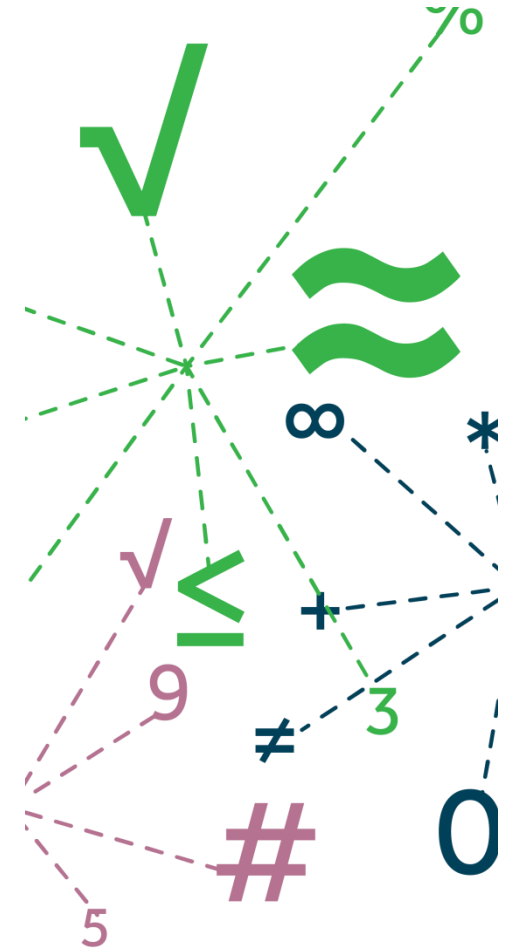
But what is the absolute first step for consulting designers?

Establish a job number for the reviews

Why a job number?



- Without a job number it isn't trackable
- Without a job number it will get combined into total overhead
- Without a job number you will not be able to measure return on your investment.



How much time is involved?



- Stick to an agenda: start and stop times
- Start with maximum two: break out problems for further study
- Rule of thumb: 20 minutes per participant (if everyone is prepared)



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- Can be chronological, by phase, by billing period – any logical stream
 - Start with what went well (if anything)
 - What didn't go as planned?
 - What didn't we anticipate? How can we avoid that in the future?
 - What control do we have over the situation? Can we get it?
 - What do we need to change the outcome next time?
 - Skills, personnel, authority, attention, intelligence (military)

The Four Questions



1. Project Budget

Expected vs. Actual – Why?

2. Scope

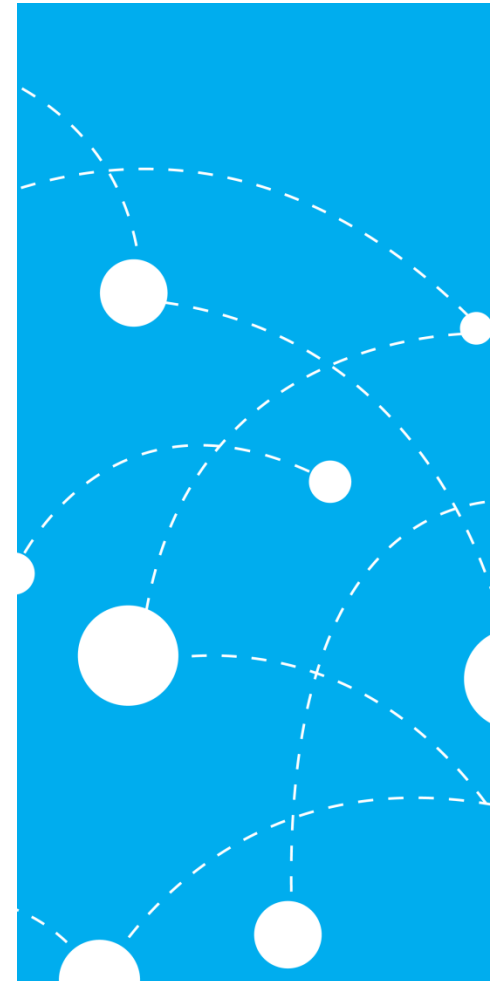
Expected vs. Actual – Why?

3. Schedule

Expected vs. Actual – Why?

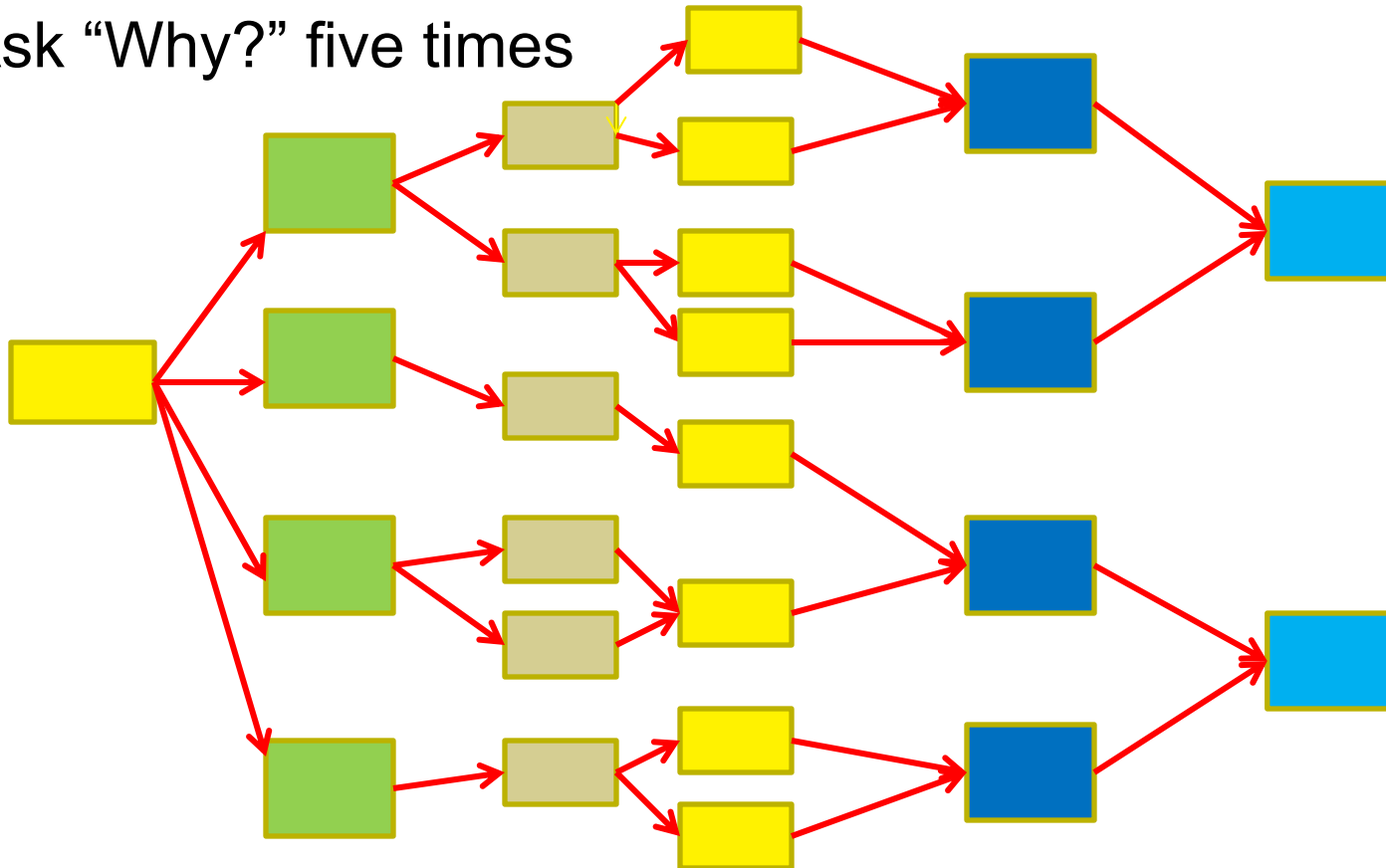
4. Profit Expectations

Plan vs. Actual (after write-offs and calculated cost of capital)



The Five Why's

- From root cause analysis:
 - Ask “Why?” five times



Aggregation & segmentation (Four categories of rework)



- Value-added – new features and benefits
 - Seek change order from owner – a positive event
- External events changing scope
 - Positive if chargeable; negative if unforeseen and uncharged. Can it be anticipated in future?
- E&O
 - positive in that E&O is avoided; negative in that it causes rework. Can it be anticipated in future?
- Risk response
 - Can be positive or negative. Anticipation again

How many of you use checklists?

What happens to them after you use them?



Checklists vs. Checksheets

- Checklists – one-time use to check a procedure for completeness, usually at the end
- Checksheets – continuous use to quantify, check probability, measure variance, data for root cause analysis
- Analysis of variance is the key to improving your processes
- Where does variance occur?



Variance

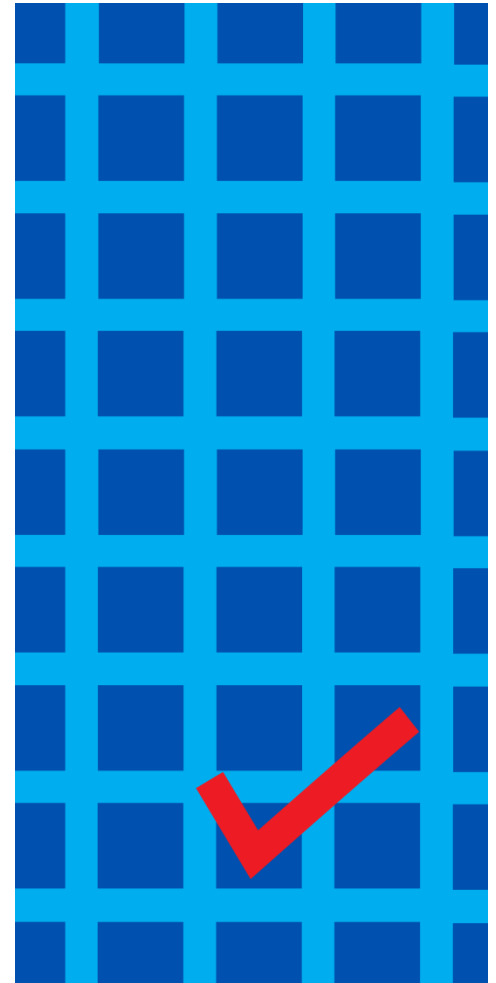


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- Number of hours budgeted vs. hours expended
 - Profit expected vs. profit realized
 - Original scope vs. final scope
 - Original schedule vs. final schedule
 - Measure “normal” for your specific project types

The essence of improvement



- Measure the variance
- Lower the variance
- Lower the mean



What does this do?

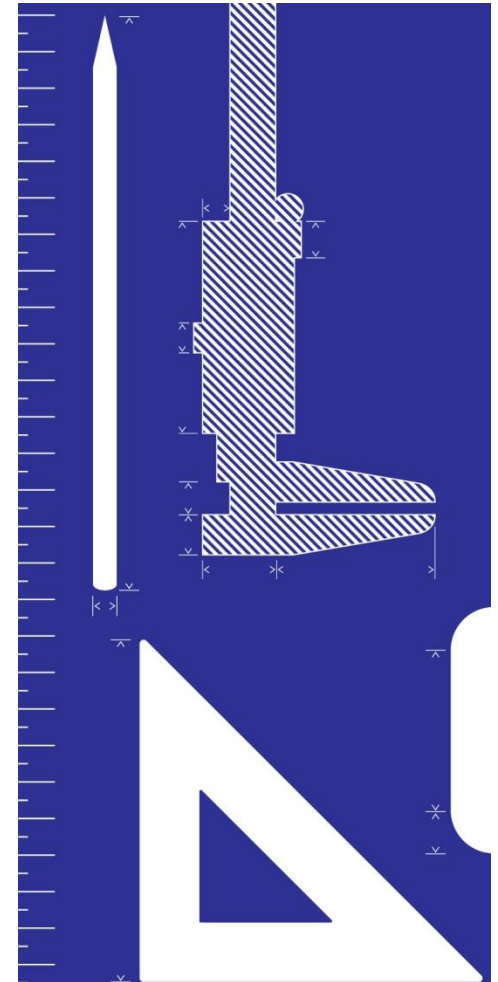


- Measuring variance
 - Gives baseline for pricing
 - Validates your pricing reality
 - Allows targeted improvement
- Lowering variance
 - Improves predictability
 - Improves profitability
 - Allows lump-sum pricing
- Lower the mean
 - Improves efficiency
 - If matched with lump-sum pricing, improves profitability markedly

Example: Measuring rework



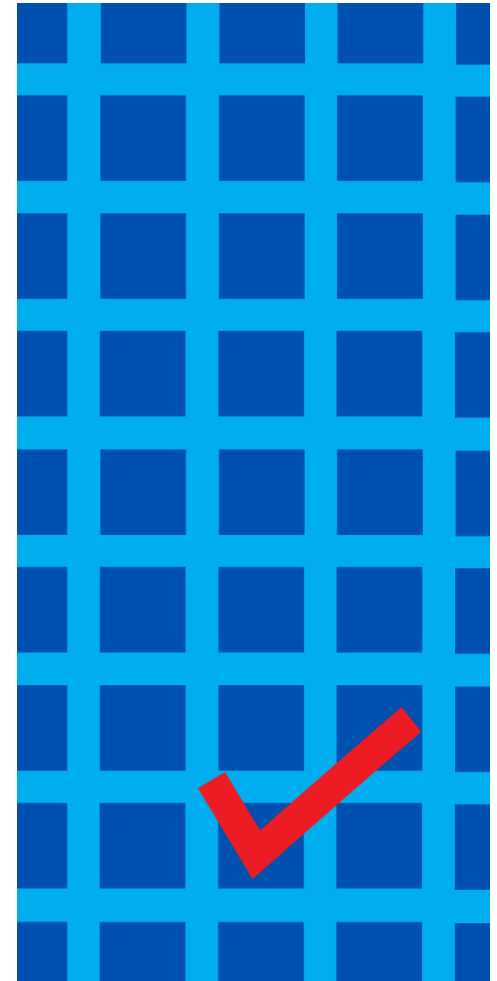
- Cultural problems
 - The billable hour
 - Admitting to problems
 - Lack of training in root cause analysis
- Framing “opportunities for improvement”
- Reward surfacing problems
- Hewlett-Packard saying, “We need to learn how to make mistakes faster.”



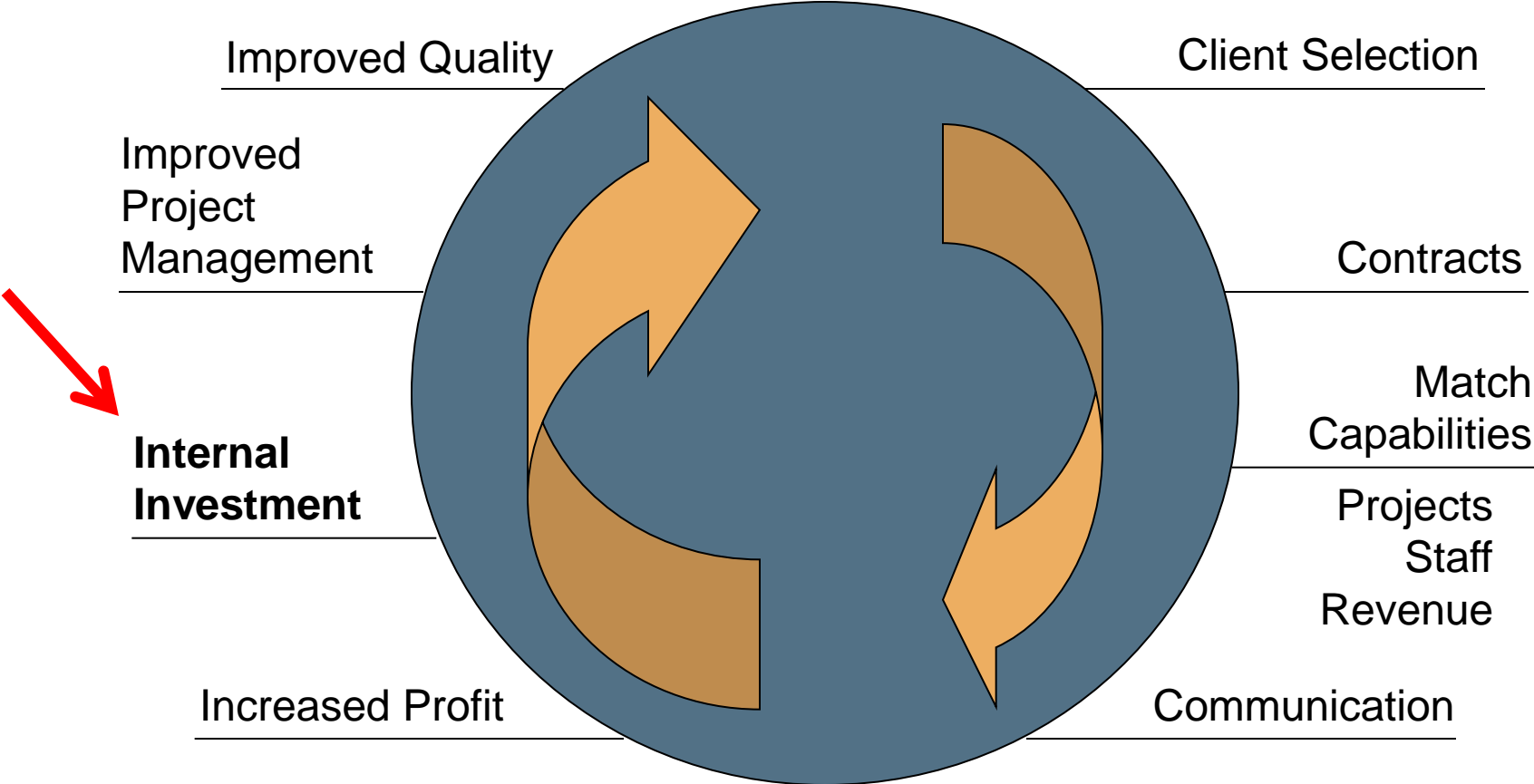
Suggestions



- Assign a job code to rework itself
- Don't punish staff for rework, analyze why it occurs
- Find out whether certain areas generate more rework than others
 - Again, ask, "Why?"
 - Measure, improve, repeat
- Chart success for everyone to see



Risk Management Cycle



The Conundrum



How do I invest when I'm not making any money?



The answers, of course



- It is not an event, but a process
- Small investments on a consistent basis pay off better than large expenditures one time
- As quality and staff performance improve, earnings improve
- Post-Project Reviews are a good place to start
- If you aren't improving your firm, who will?





QUESTIONS ?

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