

Invest in Quality; Keep Money in Your Pocket!

Glenn Cottrell, IBACOS



Quality Spend



Cost of Quality: Defined



ASQ

AMERICAN SOCIETY
FOR QUALITY™

A methodology that allows an organization to determine the extent to which its resources are used for activities that prevent poor quality, that appraise the quality of the organization's products or services, and that result from internal and external failures.

What dollars are spent and why?

Failure Costs?



Insight: *What are you setting aside in reserves?*

New Homes & Building Materials Warranty Report,
Warranty Week

- 2007-2013 trend of new homebuilder accruals at 1.1% of sales (May 8, 2014)

Theresa Weston 

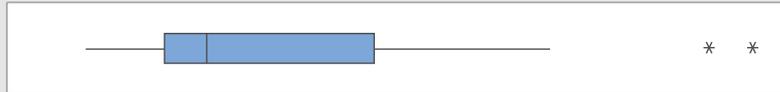
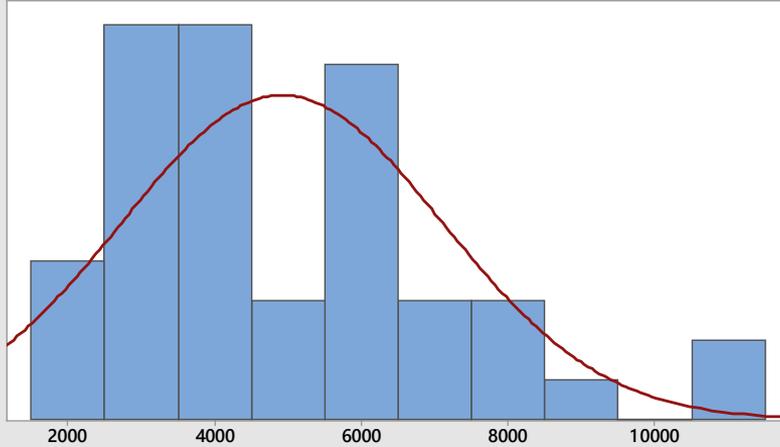
- \$4,900 (mean) warranty accrual per unit across 13 public builders (2012-2016 data)

Warranty Accruals

- Costs are accrued based upon historical experience
- Factors that affect the Company's warranty liability include
 - the number of homes sold,
 - historical and anticipated rates of warranty claims, and
 - cost per claim

NOTE: Warranty costs and General Liability Insurance costs are not the same

Summary Report for Warranty Accruals/Closings



Anderson-Darling Normality Test

A-Squared 1.37
P-Value <0.005

Mean 4919.3
StDev 2187.6
Variance 4785574.1
Skewness 1.08786
Kurtosis 0.94721
N 45

Minimum 2237.5
1st Quartile 3321.5
Median 3883.6
3rd Quartile 6181.9
Maximum 11325.6

95% Confidence Interval for Mean

4262.0 5576.5

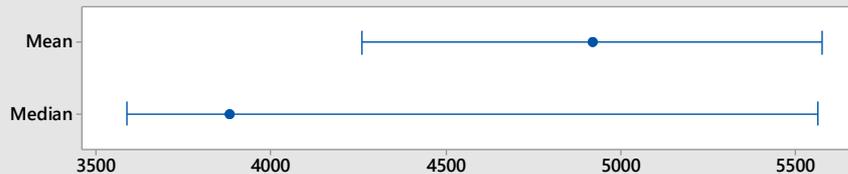
95% Confidence Interval for Median

3588.1 5563.9

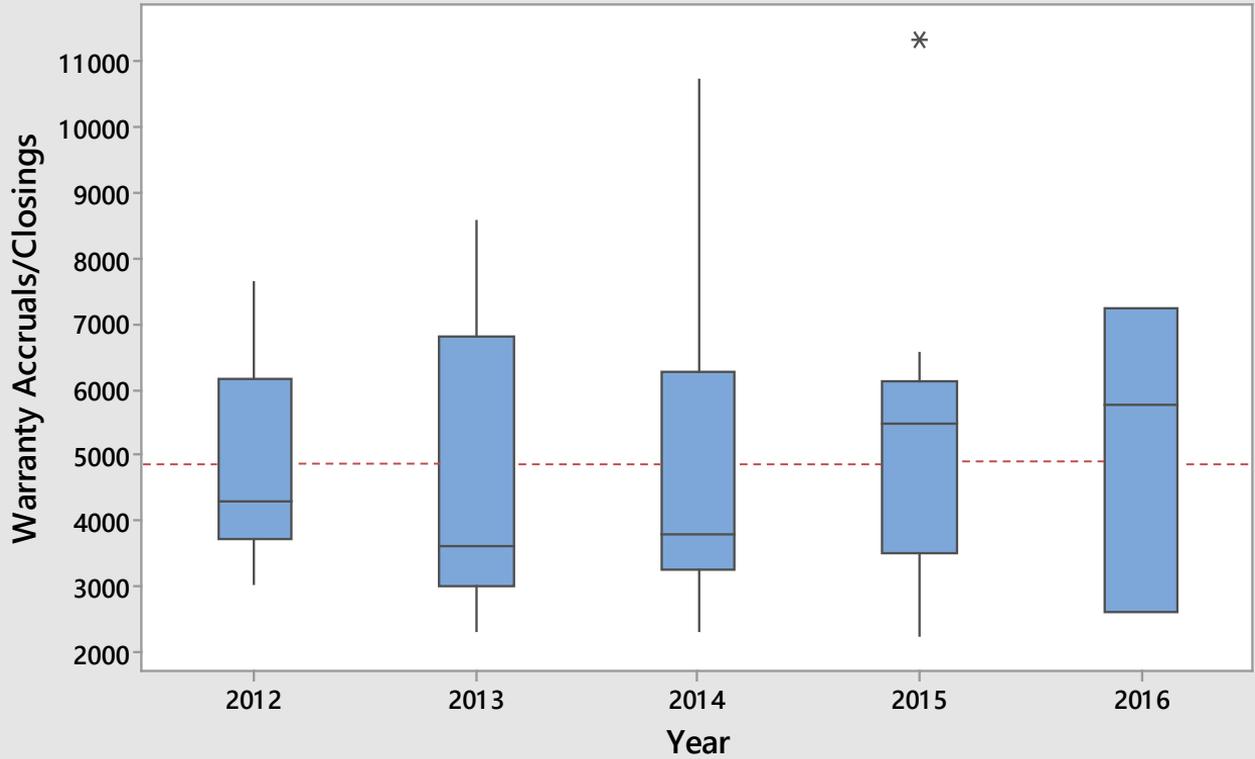
95% Confidence Interval for StDev

1811.0 2763.4

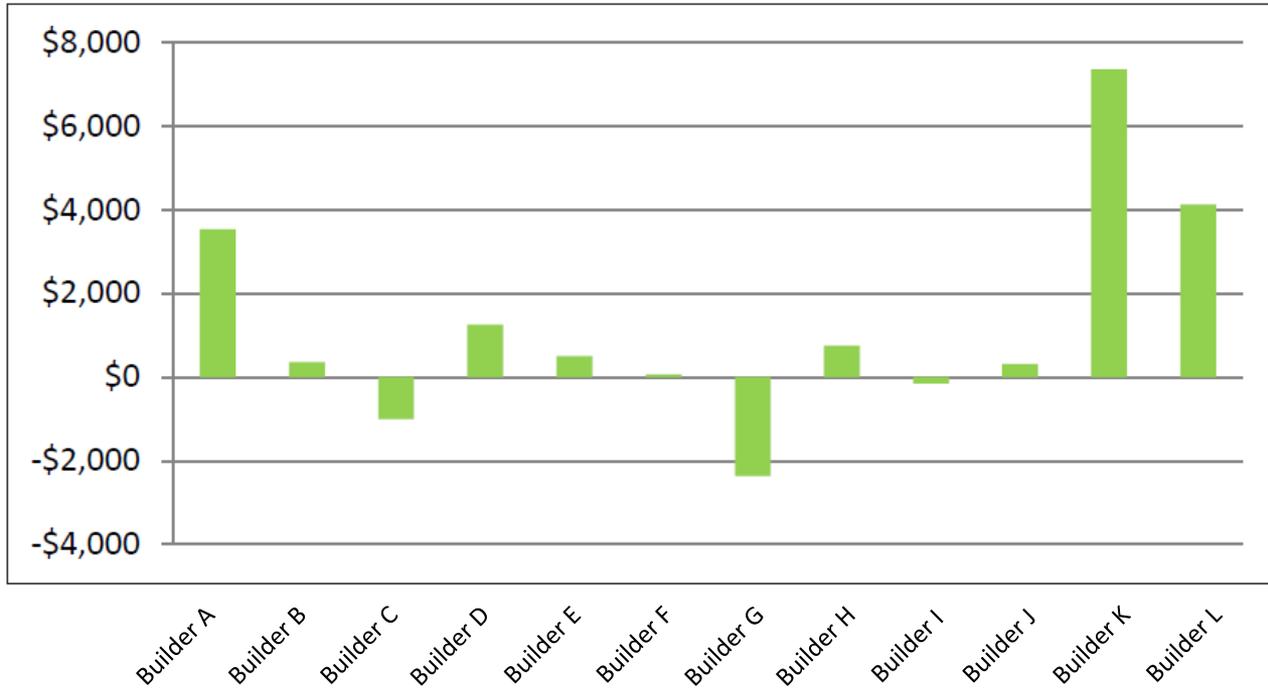
95% Confidence Intervals



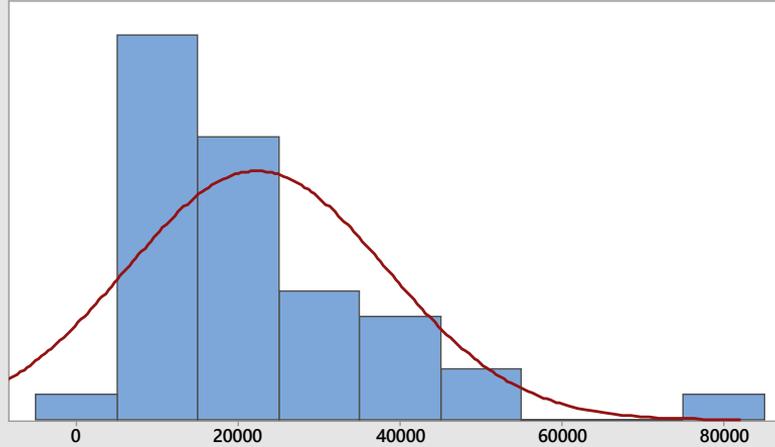
Boxplot of Warranty Accruals/Closings



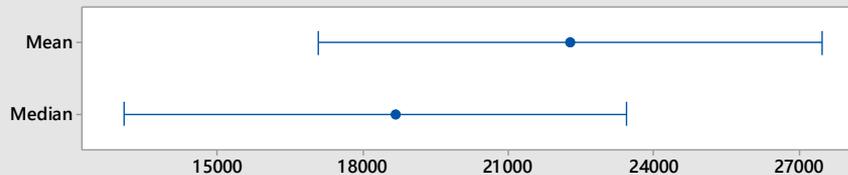
DOLLARS PER DOOR ADJUSTMENT TO WARRANTY ACCRUAL (TRAILING 5 YEARS)



Summary Report for Warranty-Litigation/Closing



95% Confidence Intervals



Anderson-Darling Normality Test

A-Squared 1.19
P-Value <0.005

Mean 22278
StDev 16061
Variance 257965410
Skewness 1.51068
Kurtosis 3.41148
N 39

Minimum 4071
1st Quartile 8042
Median 18684
3rd Quartile 31769
Maximum 81571

95% Confidence Interval for Mean
17071 27484

95% Confidence Interval for Median
13072 23456

95% Confidence Interval for StDev
13126 20699



OMG!

\$22,278



Understanding the Cost of Quality



Cost of Quality: Failure Spends

Cost-overruns

Rework

Delays

Turnover

Dissatisfaction

Warranty

Fines

Waste

Litigation

Cost of Quality: Prevention Spends

Compensation

Recognition

Contracting

Specification

Documentation

Training

Engagement

Value Engineering

Expectations

Cost of Quality: Appraisal Spends



Audits
Commissioning
Inspections
Supervision
Surveying
Testing

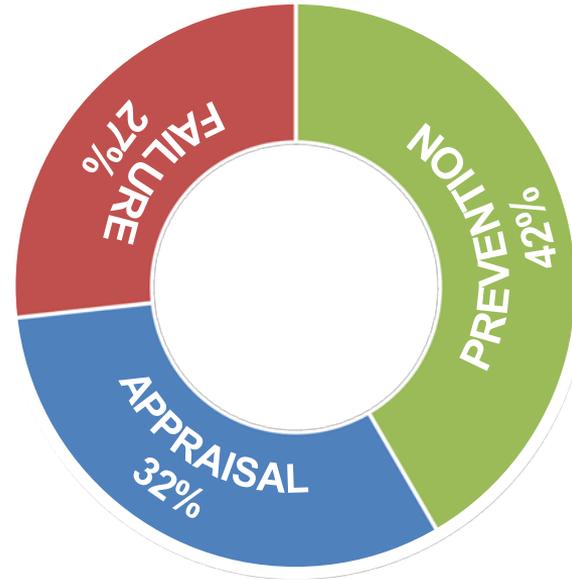


Where do Your Quality \$s go?



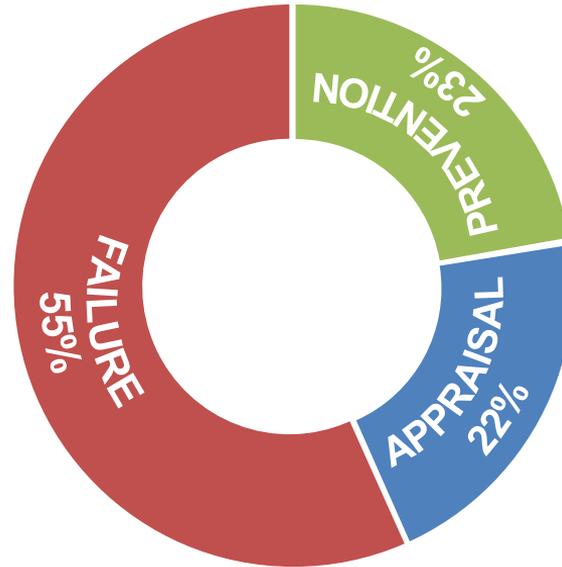
Cost of Quality: IBACOS Survey

**PAF PROFILE:
HOMEBUILDER
PERCEPTION**



Cost of Quality: Pheng & Ke-Wei Study

PAF PROFILE: CONSTRUCTION INDUSTRY

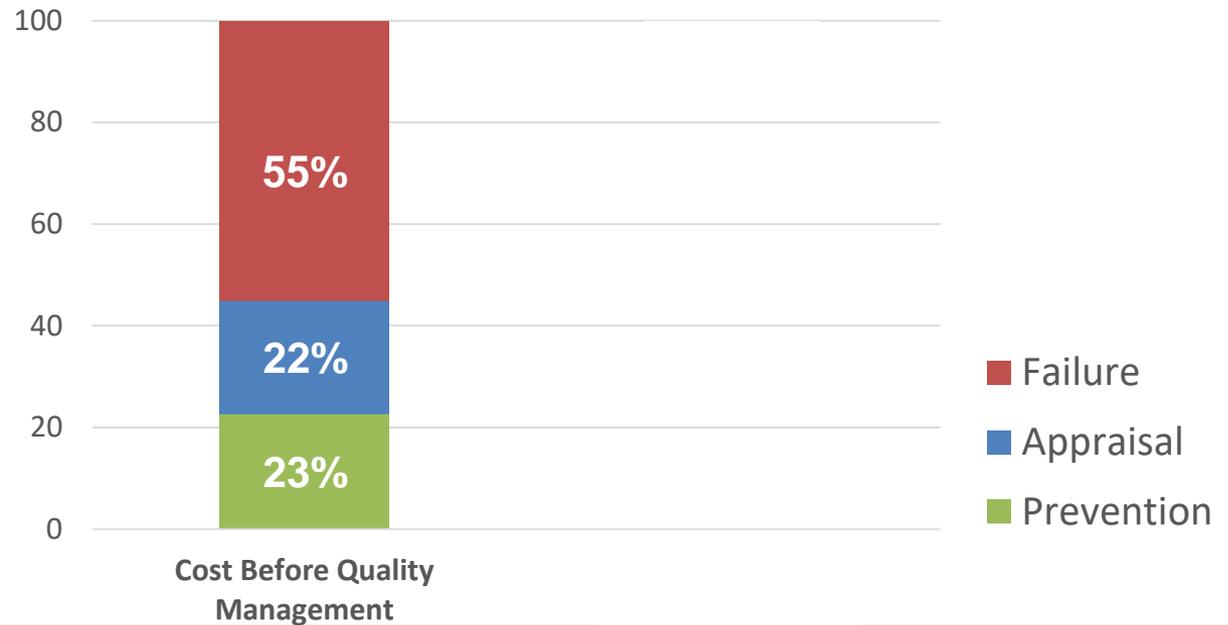


*Pheng, L.S & Ke-Wei, P (1996)
A Framework for Implementing TQM
in Construction, The TQM Magazine,
Vol 8 No 5, pp 39-46*

Cost of Quality: Pheng & Ke-Wei Study

PAF PROFILE: CONSTRUCTION INDUSTRY

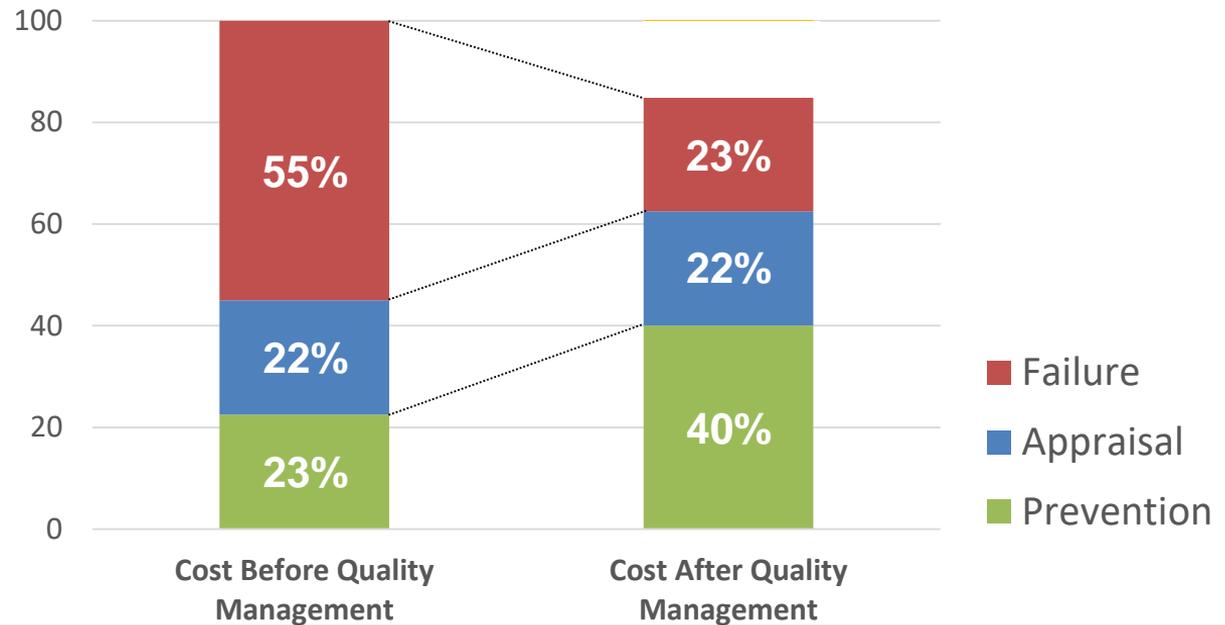
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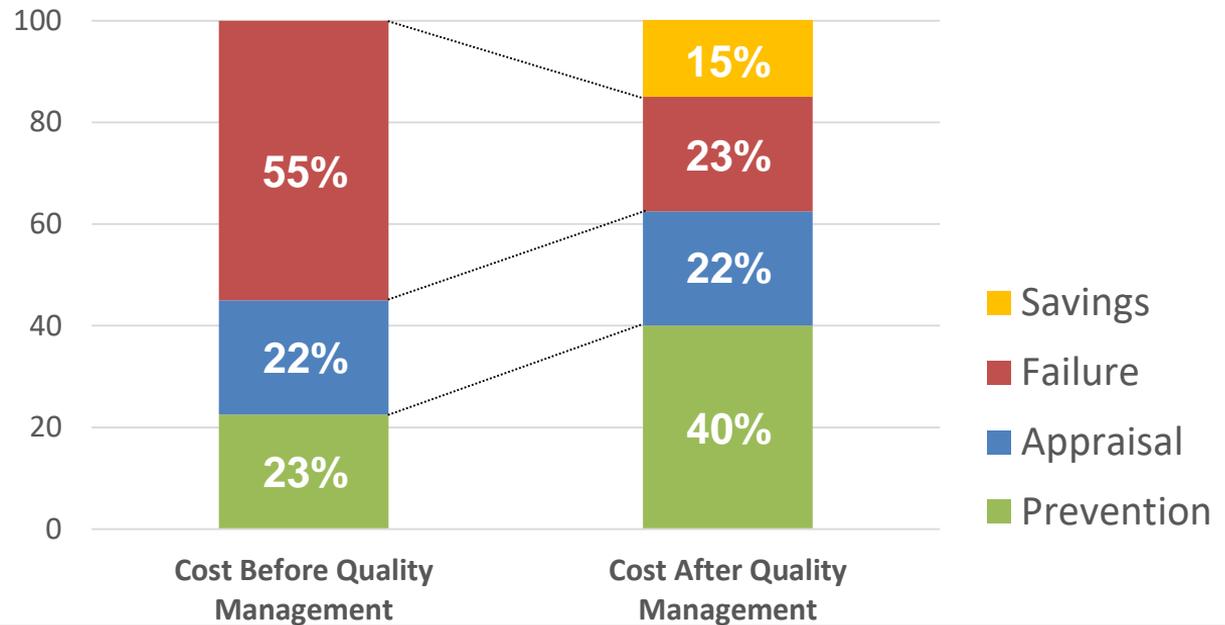
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Money in Your Pocket!



Rol: Benchmark Study

DATA POINTS

- % Revenue on construction
- \$ Superintendent compensation
- # of Homes carried
- % Turnover of construction staff
- # Days in cycle time (target and actual)
- # of Wasted days in cycle
- % Construction cost overruns
- # Dumpsters for construction waste
- \$ Dumpster haul fees
- # Warranty claims
- \$ Spent on warranty

Rol: Benchmark Study

“BENCHMARK” BUILDER

	Low	High	Avg.
• # Homes Carried	5	45	15.1
• Turnover (construction)	<5%	>20%	10.5%
• Target Cycle Time (days)	55	135	89.5
• Actual Cycle Time (days)	55	152	101
• Wasted Days	<1	>5	2.9
• Warranty Items	<2	>10	5.1



Rol: Benchmark Study

METRICS

Cost Variance

Construction Oversight

Customer Delight

Cycle Time

Documentation

Employee Engagement

Execution

Incentives

Jobsite Waste

Training

Value Engineering

Warranty

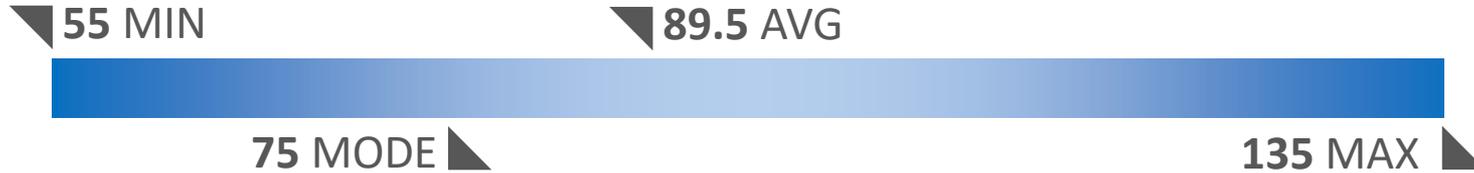
RoI: Cycle Time



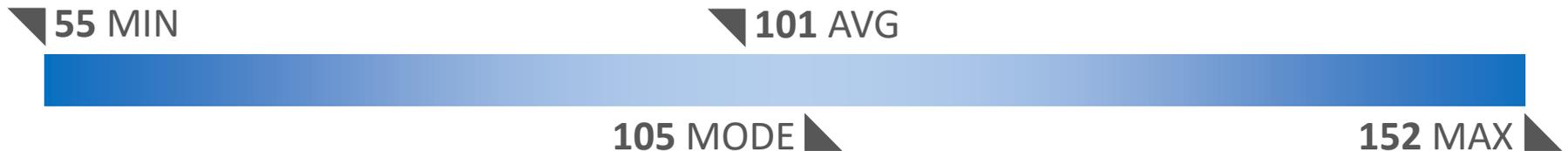
Rol: Cycle Time

SURVEY RESULTS

What is your target cycle time per home in working days?



What is your actual cycle time per home in working days?



Rol: Cycle Time

EXPERT INTERVIEWS +

Eric Timmis, TrueNorth Development

- 1 day saved in construction = \$500+ thru effective use of overhead (resources)

George Casey, Stockbridge Associates

- 5% reduction in build cycle =
 - \$250 savings thru effective use of working capital (less \$ tied up in WIP), OR
 - \$950 added margin thru increased volume using same working capital constraints

Division Purchasing Lead, Top 20 Builder

- Easily several hundred \$ savings from trades efficiency

Rol: Cycle Time

OPPORTUNITY

ASSUMPTIONS

- 101 day build cycle
- 2% cycle time reduction by eliminating dry runs, appropriate crew sizes, etc.

Rol: Cycle Time

OPPORTUNITY = \$1,680 Savings per home

(# of days in actual build cycle) x (fully loaded carry costs / day) x
(% possible reduction) = **\$ Savings per home**

PLUS

(# of additional homes delivered using same working capital) x
(\$s added margin per home) ÷ (total # of homes delivered annually) =
\$ Savings per home



Rol: Cost Variance



Rol: Cost Variance

SURVEY RESULTS

What is the amount spent per home on cost over construction budget?



What is your cost variance as a % of hard construction costs ?



Rol: Cost Variance

EXPERT INTERVIEWS +

Noelle Tarabulski, Builder Consulting Group

- Implementing Variance Purchase Orders (VPOs) can reduce hard construction costs:
 - 1% immediately (just because you're asking why)
 - 3-4% overtime (identifying and addressing waste)

ARC Document Solutions

- 1/3rd of construction cost overruns due to poor documentation / document control (Research study results; published February 11, 2015)

Rol: Cost Variance

OPPORTUNITY

ASSUMPTIONS

- Hard cost overruns per unit = \$1,800
- Reduce overall hard cost by 0.5% through VPOs
- Reduce cost overruns by 20% through improved documentation / document management

Rol: Cost Variance

OPPORTUNITY = \$1,300 Savings per home

(\$s average selling price) x (% spent on hard construction costs) x
(% possible reduction) = **\$ Savings per home**

PLUS

(\$s spent on cost overruns per unit) x (% possible reduction) =
\$ Savings per home



Rol: Jobsite Waste



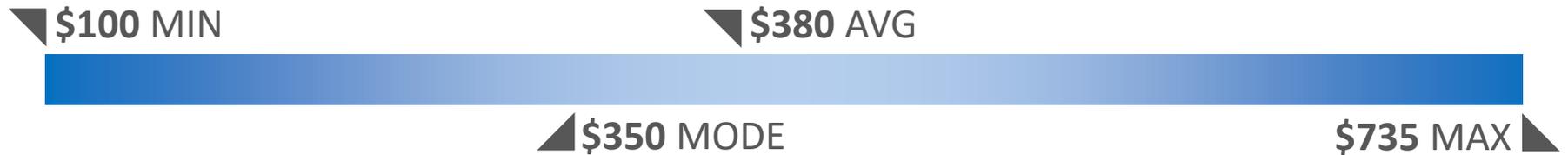
Rol: Jobsite Waste

SURVEY RESULTS

How many dumpsters are used during construction of a single home?



What is the “haul fee” per dumpster?



Rol: Jobsite Waste

EXPERT INTERVIEWS +

NAHB

- Average # of dumpsters = 3+ per unit
- Average waste removal costs = \$1,200 per unit

Scott Sedam, TrueNorth Development

- Job-site waste = \$300-\$500 usable material per dumpster

Rol: Jobsite Waste

OPPORTUNITY

ASSUMPTIONS

- 33% jobsite waste reduction thru:
 - Upfront design
 - Accurate take-offs / Trade partnering

Rol: Jobsite Waste

OPPORTUNITY = \$590 Savings per home

(# of dumpsters per home) x [(\$ haul fee per dumpster) +
(\$s of usable materials thrown away per dumpster)] x
(% possible reduction) = **\$ Savings per home**



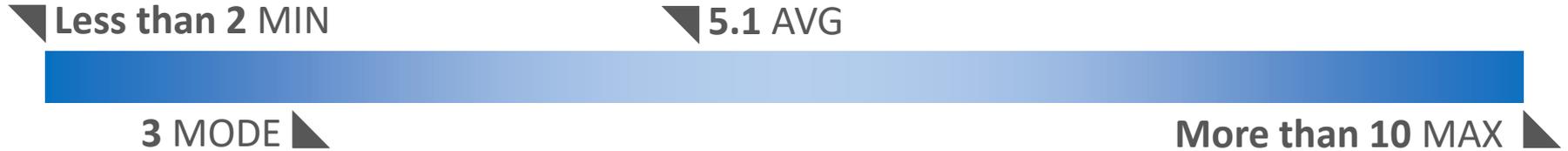
Rol: Customer Delight



Rol: Customer Delight

SURVEY RESULTS

How many legitimate service/ warranty items are reported per home following closing?



Rol: Customer Delight

EXPERT INTERVIEWS +

Paul Cardis, Avid Ratings

- Every 1 (%) point decrease in customer satisfaction results in an average 8% increase in customer service requests the following year
- Average # of service requests per home = 15
- Product Satisfaction is the strongest predictor of customer referrals

President, NHQ Gold Award Winner

- Responding to a single service requests costs \$250

Rol: Customer Delight

EXPERT INTERVIEWS + (cont.)

JD Power and Associates (2006)

- A 1 (%) point increase in customer satisfaction levels can yield 0.17 additional recommendations per homebuyer
- 20% of overall customer satisfaction is driven by the builders' warranty / customer service => Their experience living in their new home

Rol: Customer Delight

OPPORTUNITY

ASSUMPTIONS

- 1 (%) point increase in overall customer satisfaction resulting in:
 - 8% fewer service requests
 - 0.17 extra recommendations per buyer
- 5% conversation of additional recommendations to sales

Rol: Customer Delight

OPPORTUNITY = \$360 Savings per home

(# warranty items per home) x (\$s to respond to each item) x
(% possible reduction) = **\$ Savings per home**

PLUS

(overall customer satisfaction %) x (% possible improvement) x
(# added recommendations per customer) x (# of customers) x
(% conversion rate) = (# added sales)...
(# added sales) x (\$s profit per sale) ÷
(total # of homes delivered annually) = **\$ Savings per home**



\$3,930

Rol: Opportunity?

Cycle Time	\$1,680	Construction Oversight	\$ 635
Cost Variance	\$1,300	Documentation	\$ 600
Warranty	\$1,090	Jobsite Waste	\$ 590
Value Engineering	\$ 940	Execution	\$ 565
Incentives	\$ 760	Employee Engagement	\$ 435
Training	\$ 725	Customer Delight	\$ 360

\$10,000 per home opportunity

The Choice is Yours



Quality » Cost of Doing Business



Quality » Investment in Performance



Additional Information Available

[CONSTRUCTION OPERATIONS]

What is the Cost of Quality?

A 25-year veteran of the housing industry with a focus on building and operations performance makes the case for investing in good quality up front instead of paying for bad quality later

By Glenn Cottrell

Hear and read all the time that you can't quantify quality. It's an ethic, not a number; an abstract goal that doesn't show up on the budget. Quality is in the eye of the beholder.

To be fair, there's no consensus about the definition of the word quality in the housing industry, ranging the gamut from callbacks to the customer experience. As such, there's no standard formula, to place a dollar amount on quality until now.

That number is \$4,919. This is the amount that Theresa Weston, Ph.D., a senior research fellow at DuPont Building Innovation, found to be the average amount set aside per house by 13 publicly traded home builders to cover the cost of warranty work, add construction defect litigation and that per-house reserve balloons to \$27,278. Once I got over the shock of those figures, I decided to do something about it. I wanted to address our industry's penchant for paying out huge sums of money for substandard work, on the front end (the cause) and the back end (the effect). If builders are so willing to throw good money after bad, maybe it's for lack of a different model. Or any model.

I envisioned a road map that enabled builders to objectively measure the key metrics of construction excellence to the point of their respective and collective budget impact ... and then address inefficiencies (read: unnecessary costs) until a moderate investment in good quality wiped away the excessive expense of poor quality. I wanted a way for builders to understand what they spend and why.

We call that road map and formula The Cost of Quality.

AN ATTRACTIVE RETURN

Let's get right to it: What if I said you could save more than \$7,200 per house by investing \$1,200 up front in delivering

better quality? You heard me: a 600 percent return. Maybe a little less, maybe a little more, and likely not all at once, but certainly better than breakeven. Multiply that number by your annual closings and it probably looks pretty attractive, or at least good enough to keep reading.

To get there, we needed to define quality and its costs. My team and I scoured industry sources for data, finding enough pieces from NAHB's annual "The Cost of Doing Business Study," the "New Home & Building Materials Warranty Report" from the Warranty Works website, and customer satisfaction correlations from Avid Ratings, among others, to start filling in the puzzle.

Those references also helped us create a builder profile for benchmarking purposes as we dialed out the formula (see The Benchmark Builder, opposite). We then brainstormed 29 metrics, from rework to customer referrals, and sorted them into eight buckets: Value Engineering, Jobsite Waste, Construction Oversight, Cycle Time, Cost Overruns, Employee Satisfaction, Customer Engagement, and Warranty.

For each of those buckets, we defined the parameters and added a Cost of Quality measure—for example, the bottom-line impact of a 1 percent increase in overall customer satisfaction or a 0.5 percent reduction in hard costs. Then we dug deeper, initially surveying 21 production builders representing nearly 10 percent of all new-home closings in 2014, to establish a baseline for each metric and for others, such as the average new-home sales price, percentage of revenue spent on construction, and budget slippage (see Baselines, on page 44).

At that point, we felt ready to plug in the numbers and do some math, taking a decidedly pragmatic approach bordering on self-doubt and cynicism. When a number came up may we topped off a percentage just to be safe or looked for ways to discredit it. When we made assumptions, we solicited sanity



THE BENCHMARK BUILDER

A real formula requires a real builder—or at least a conglomerate of one that's reliable to most production builders. Based on NAHB's 2013 Housing Economic Study, we composed this guy:

Annual housing starts	500
Average house size (square feet)	2,600 sf
Average sales price	\$400,000
Land (18.6%)	\$75,000
Construction (61.7%)	\$244,000
Hard costs only	\$230,000
Financing (1.4%)	\$5,000
General & Administrative (4.3%)	\$17,000
Sales and marketing (4.7%)	\$19,000
Profit (9.2%)	\$37,000
Employees	120

checks from our production builder clients in the end, we felt confident in the formula and the results.

THE 600 PERCENT COMMITMENT

While the Cost of Quality road map flips the script from back-end reserves to up-front investments in quality with

attractive returns, it's only a guide. Making the assumptions a reality takes work, and likely will disrupt your operations, accounting, and comfort with the status quo.

Those are real risks, but consider the alternative: If you don't have every single aspect of quality defined for your company, someone—including customers and regulators—will set it for

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