Lean Construction Contractor Survey 2021

Lean Construction Institute
Transforming Design and Construction

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DODGE DATA & ANALYTICS

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Objectives

- The 2021 Lean Construction Study was conducted among contractors in the US. The objectives included:
  - Benchmarking project performance metrics across two project types: “Typical” and “Best Performing”.
  - Look at the use of Lean practices, such as organizational factors, commercial factors and process/operational practices on the best and typical projects.
- Specific Areas of Inquiry Include:
  - Firm Profile
  - Selection of Best v. Typical projects
  - Project Outcomes
  - Organizational Factors
  - Commercial Factors
  - Process/Operational Factors

Methodology

Online survey questionnaire completed by 336 respondents:

- Respondents came from the DD&A contractor panel and from The Associated General Contractors of America
- The survey was open from June 15th, 2021, to June 18th, 2021, for Contractor Panel respondents and from June 1st , 2021 to July 2nd, 2021, for AGC respondents
- Average survey length was just over 18 minutes

Survey Criteria:

- Survey was open to contractor firms who work in the United States
- General, specialty, and heavy civil contractors were included
- Firms with over 50% single-family residential or over 50% industrial projects were excluded from the survey

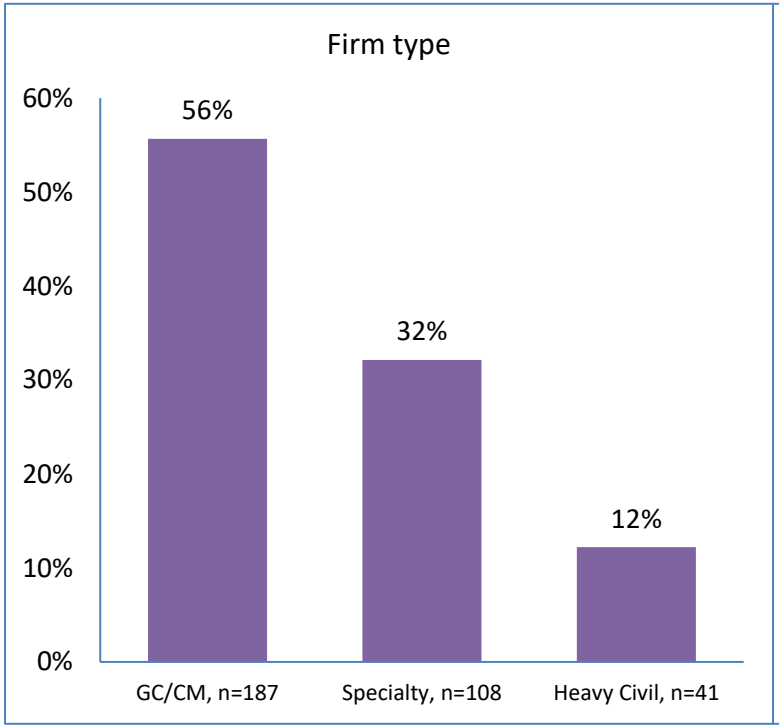
- Technical notes:
  - Unless other wise noted, the sample size for charts is 278
  - 187 respondents were classified as general contractors, 108 as specialty/trade contractors, and 41 as heavy civil contractors
  - An “*” is used to denote where significant differences between groups exist, $p < .05$
  - After the demographics sections, differences by company type are only noted where there is a statistically significant difference.

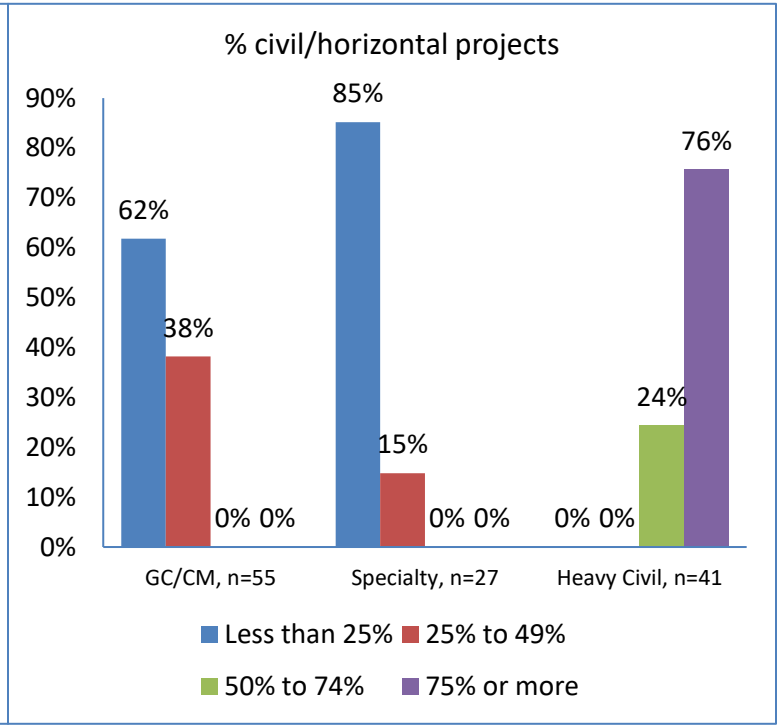
Demographics

- **Unless otherwise noted sample size is:**
- **Total: 336 respondents**
- **GC/CM: 187**
- **Specialty/trade: 108**
- **Heavy civil: 41**

Demographics: Firm Type and Job Role

- A good representation of general, specialty, and heavy civil contractors were included
- To be considered a heavy civil contractor more than 50% of that firm's projects were civil/horizontal

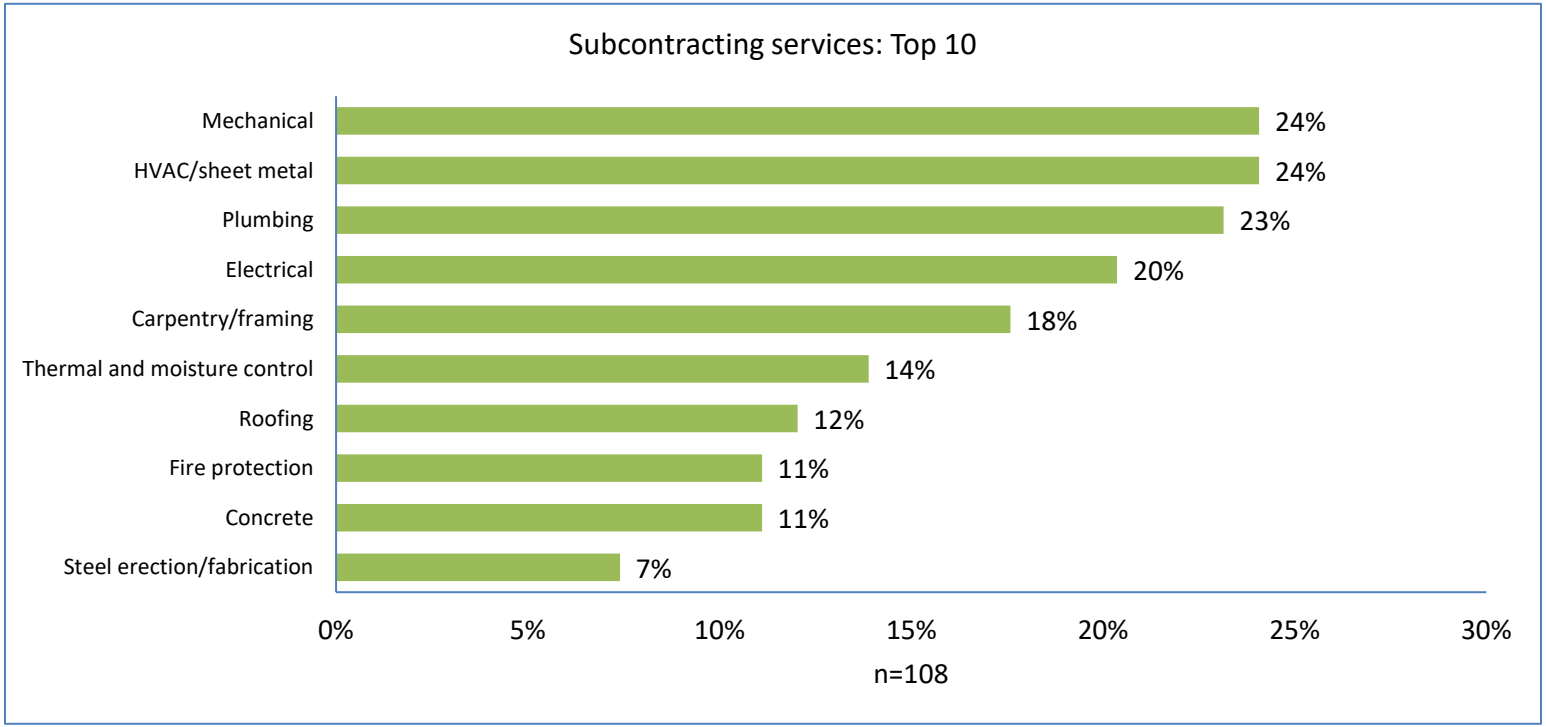




qa1. Which of the following best describes your company?
qa3b: What percentage of your firm's projects are civil/horizontal projects?

Demographics: Subcontractor Services

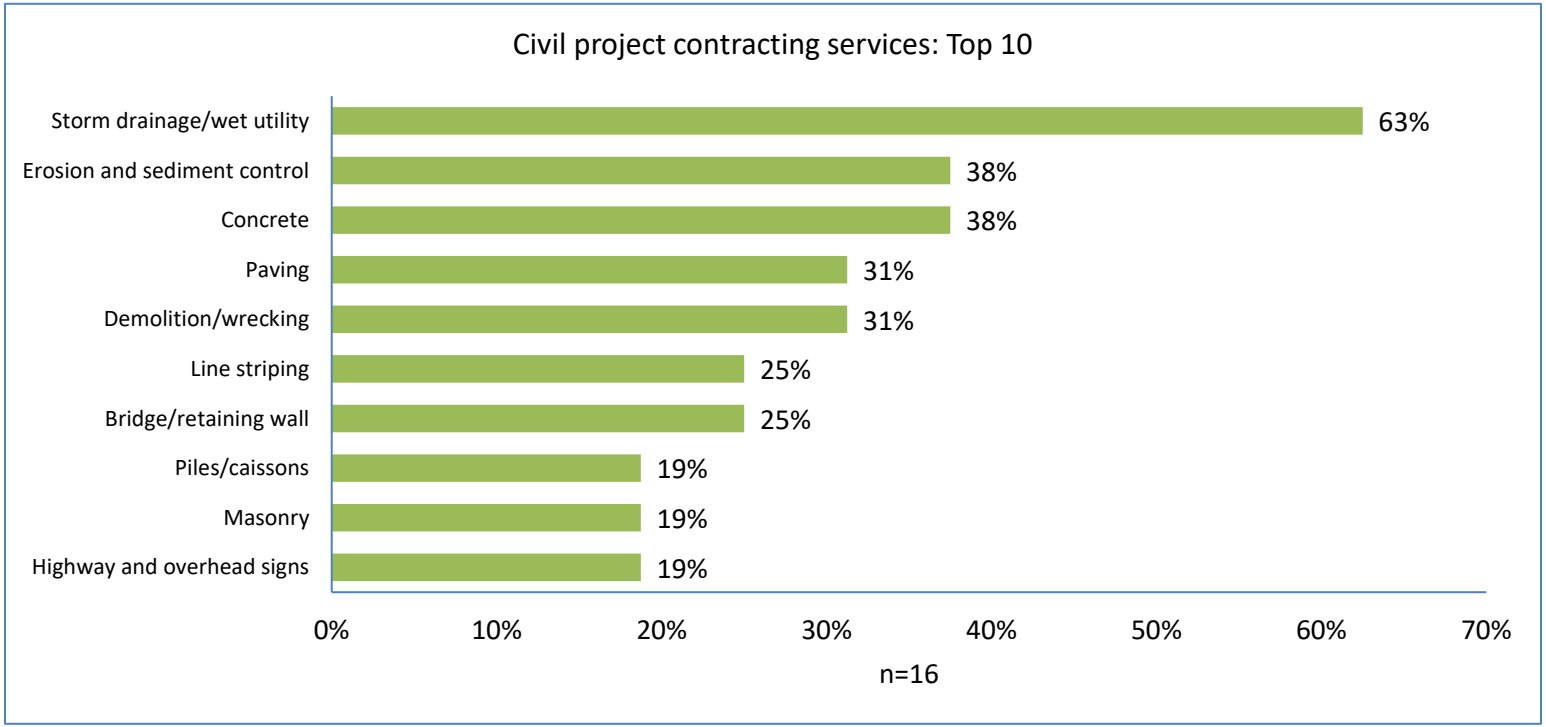
- A broad array of specialty contractor types were included
- Mechanical, HVAC, plumbing and electrical were most common



qa4b. What type of subcontracting services does your firm primarily offer for your projects?

Demographics: Heavy Civil Specialty Services

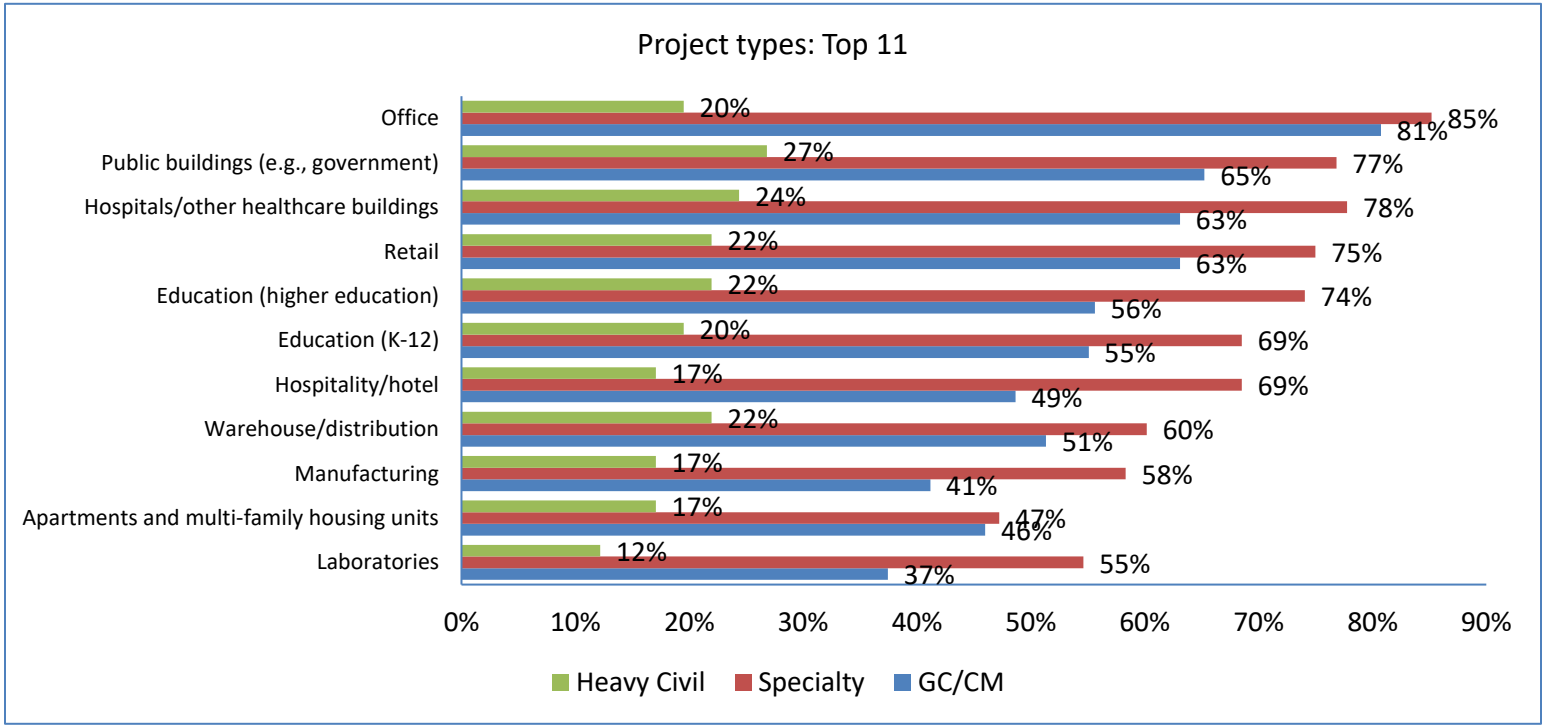
- 16 specialty firms were considered heavy civil, based on their project types
- Many civil project services were included, primarily storm drainage, erosion/sediment control, and concrete



qa4a. What type of subcontracting services does your firm primarily offer for your civil projects?

Demographics: Project Types

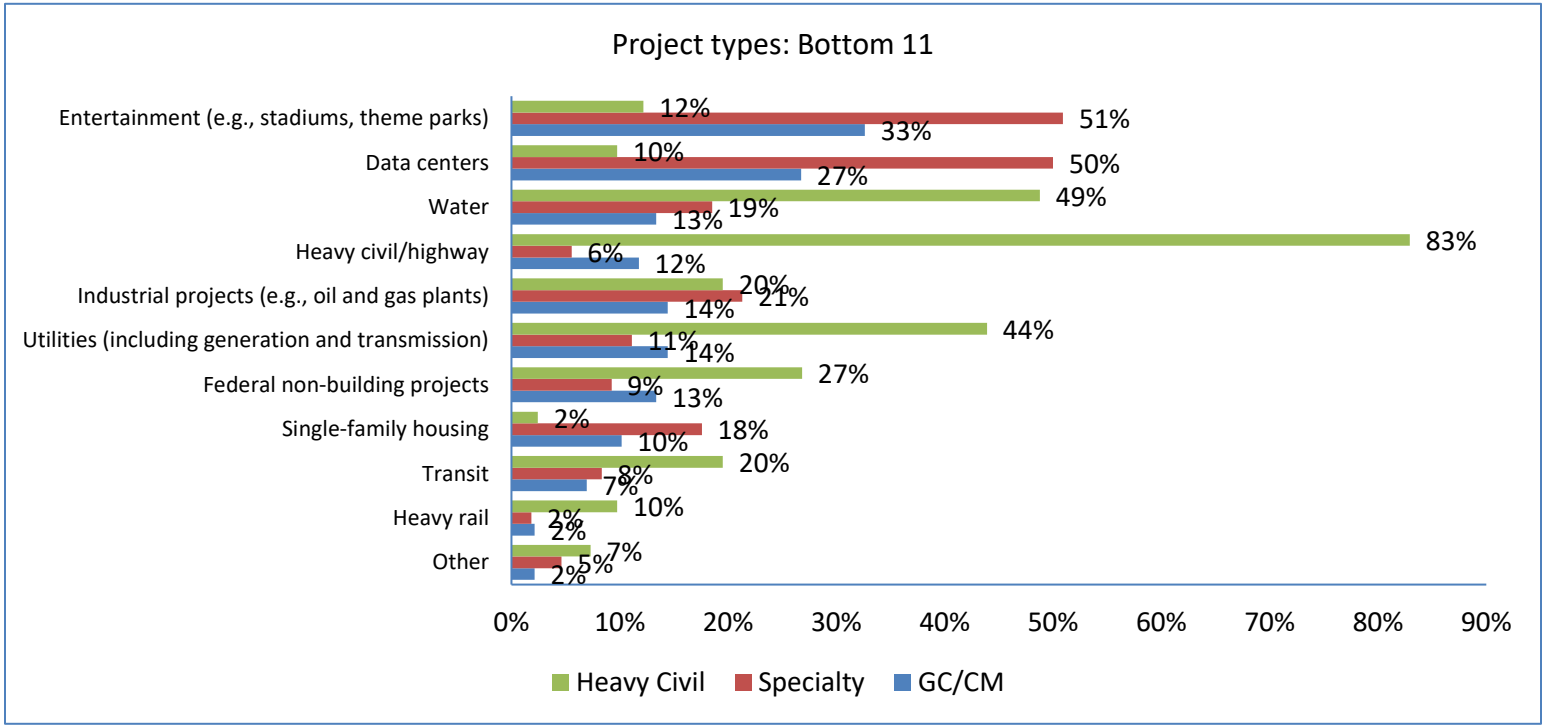
- Over 20 different project types were included, the top 11 are listed below
- Specialty and GC firms worked mostly on building projects



qa2. What types of projects are in your company's contracting portfolio?

Demographics: Project Types

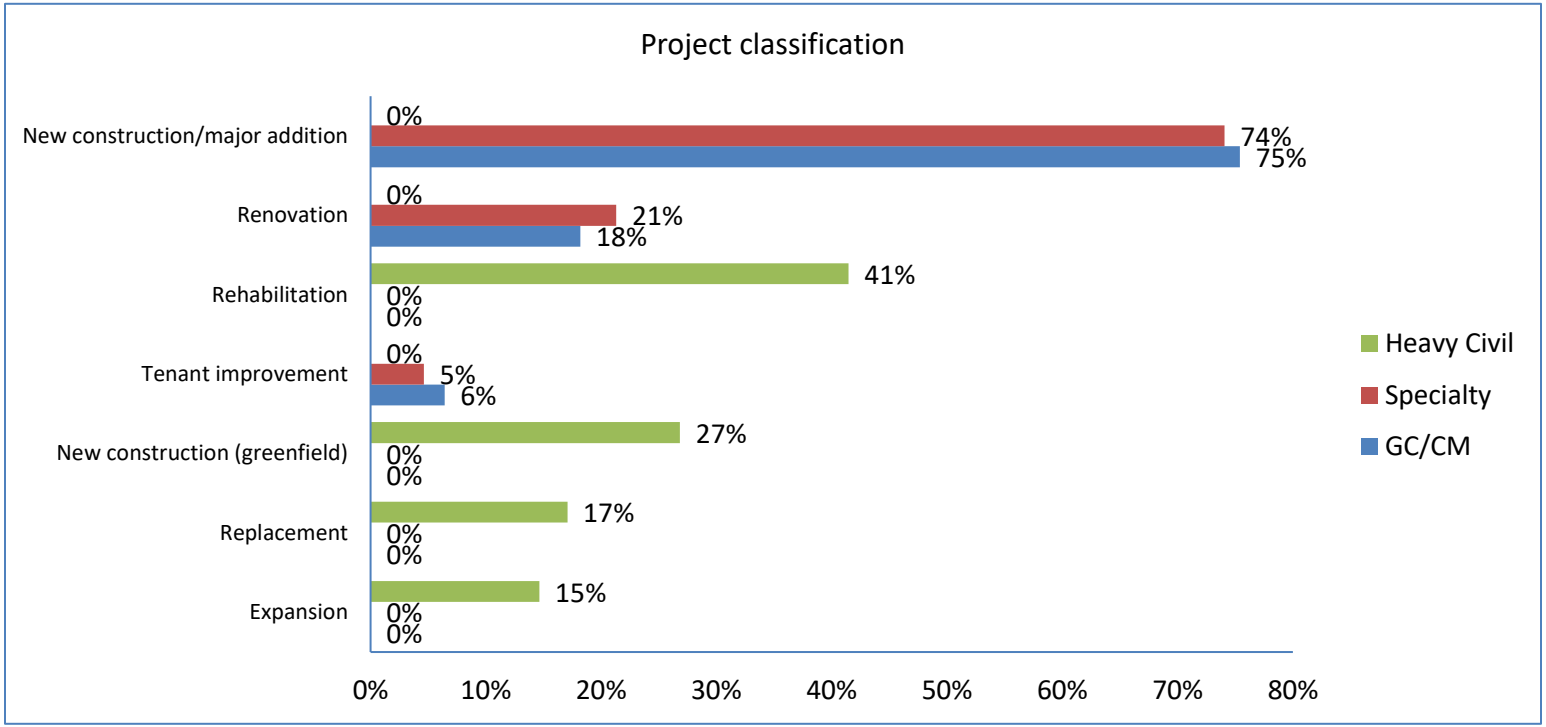
- The heavy civil firms worked mostly on civil or horizontal projects
- These projects were less frequently cited as there were fewer heavy civil contractors than GC or specialty firms



qa2. What types of projects are in your company's contracting portfolio?

Demographics: Project Classification

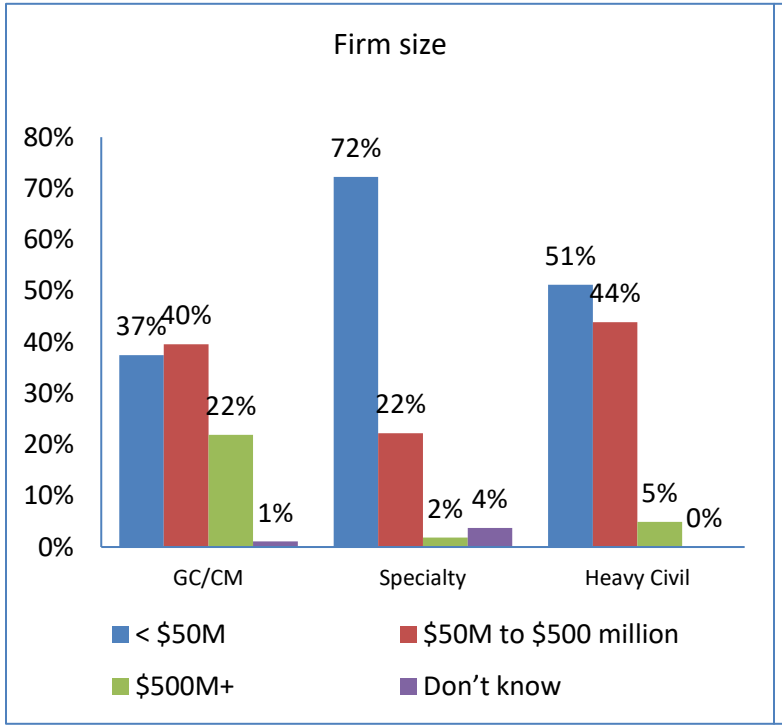
- GC and specialty firms worked mostly on new construction
- Most heavy civil projects were rehabilitation

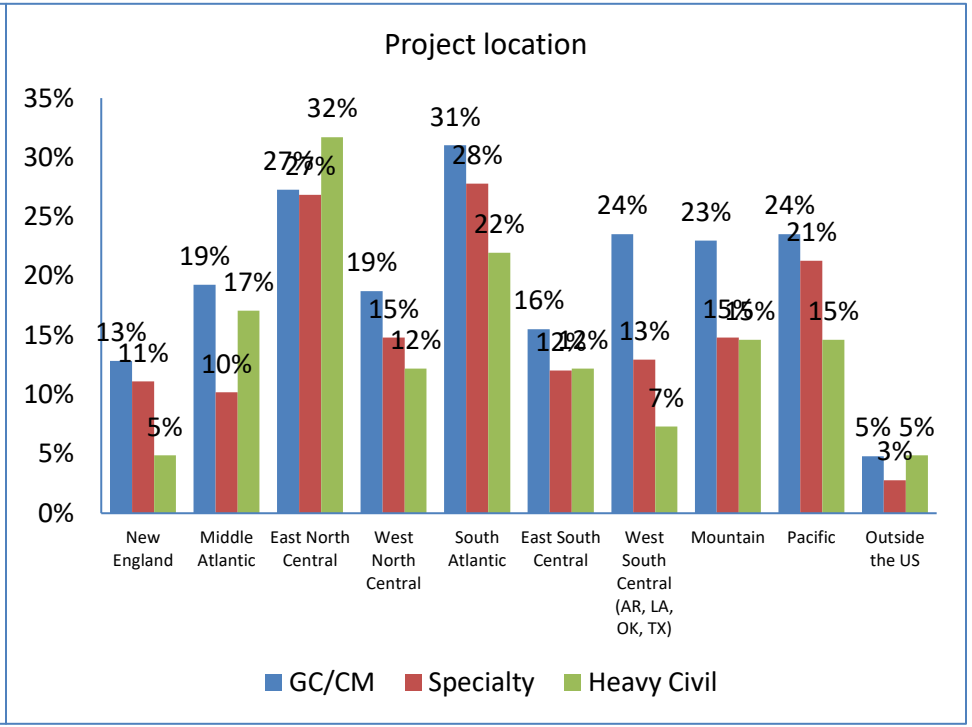


qa5: With which types of projects have you personally had most experience in the last five years?

Demographics: Firm Size and Project Location

- Firms of all sizes were included in the study
- Firms conducted projects across the US

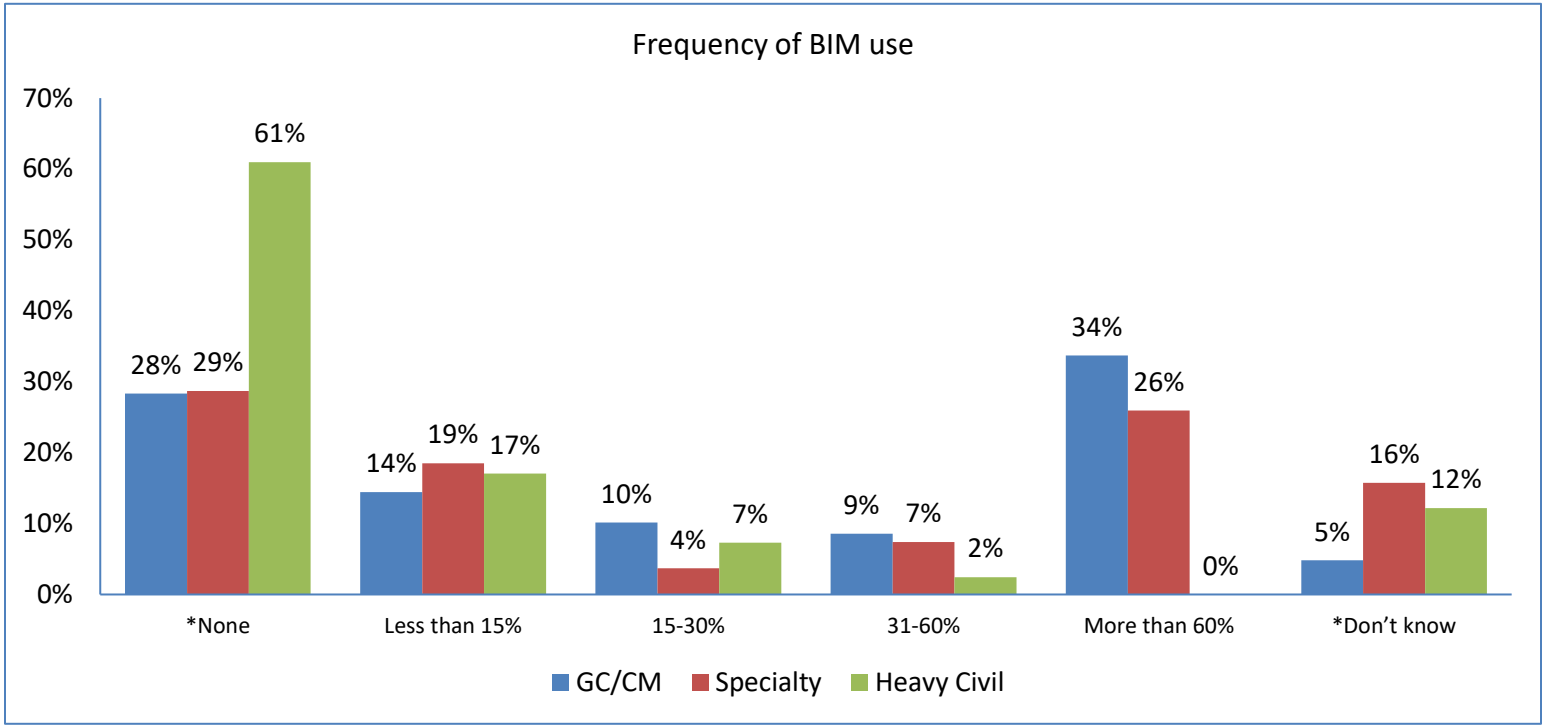




qa4: What was the value of your company's revenue in 2020?
qa6. Please select the regions in which your completed construction projects in the past 3 years are located.

Demographics: BIM Use

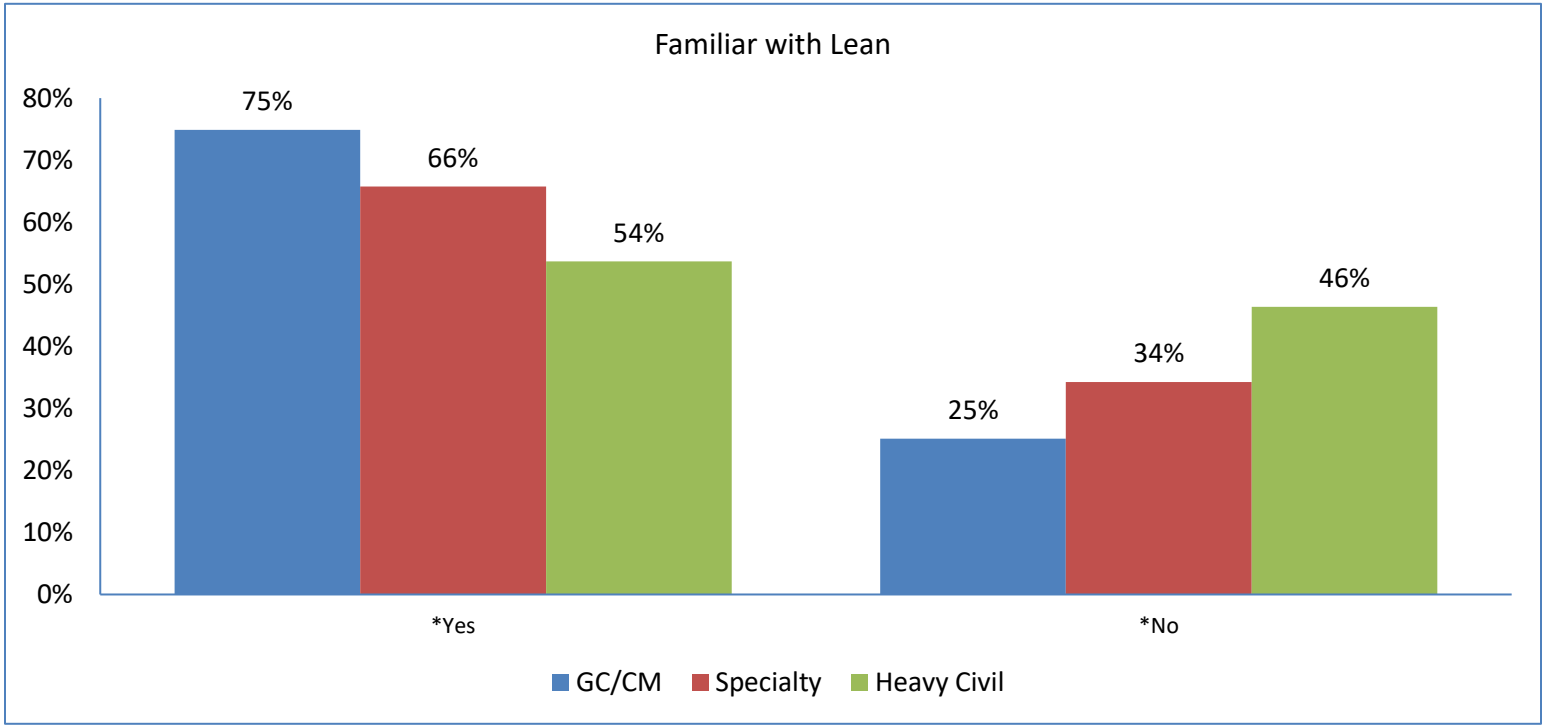
- Most specialty and GC firms reported some level of BIM use
- Heavy civil contractors were less likely to be BIM users



qg1: On what percentage of your organization's projects valued over $10 million is BIM being used?

Demographics: Lean Construction Familiarity

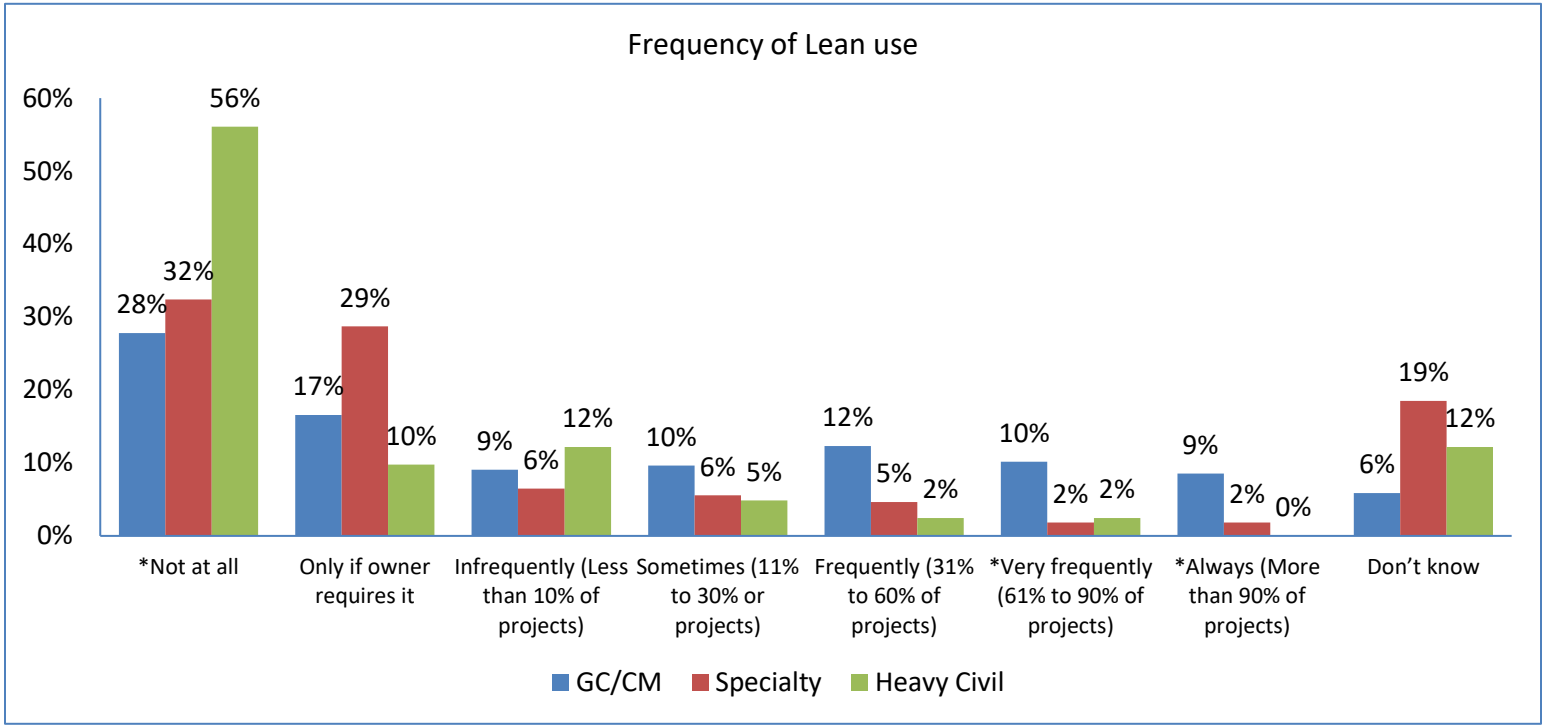
- Most firms were familiar with Lean in design and construction
- Heavy civil firms were less familiar with Lean than GC firms



qg2: Are you familiar with Lean in design and construction?

Demographics: Frequency of Lean Construction Use

- 70% of GC and specialty firms report some level of Lean construction use on projects valued over $10M
  - Mostly if requested by owner
- Most heavy civil contractors reported not using Lean construction at all on projects valued over $10M



qg3: To what degree does your company use Lean on your projects that are valued at over $10 million in construction cost?

Findings

- **Selection of Best v. Typical projects**
- **Project Outcomes**
- **Organizational Factors**
- **Commercial Factors**
- **Process/Operational Factors**

- **Unless otherwise noted sample size is:**
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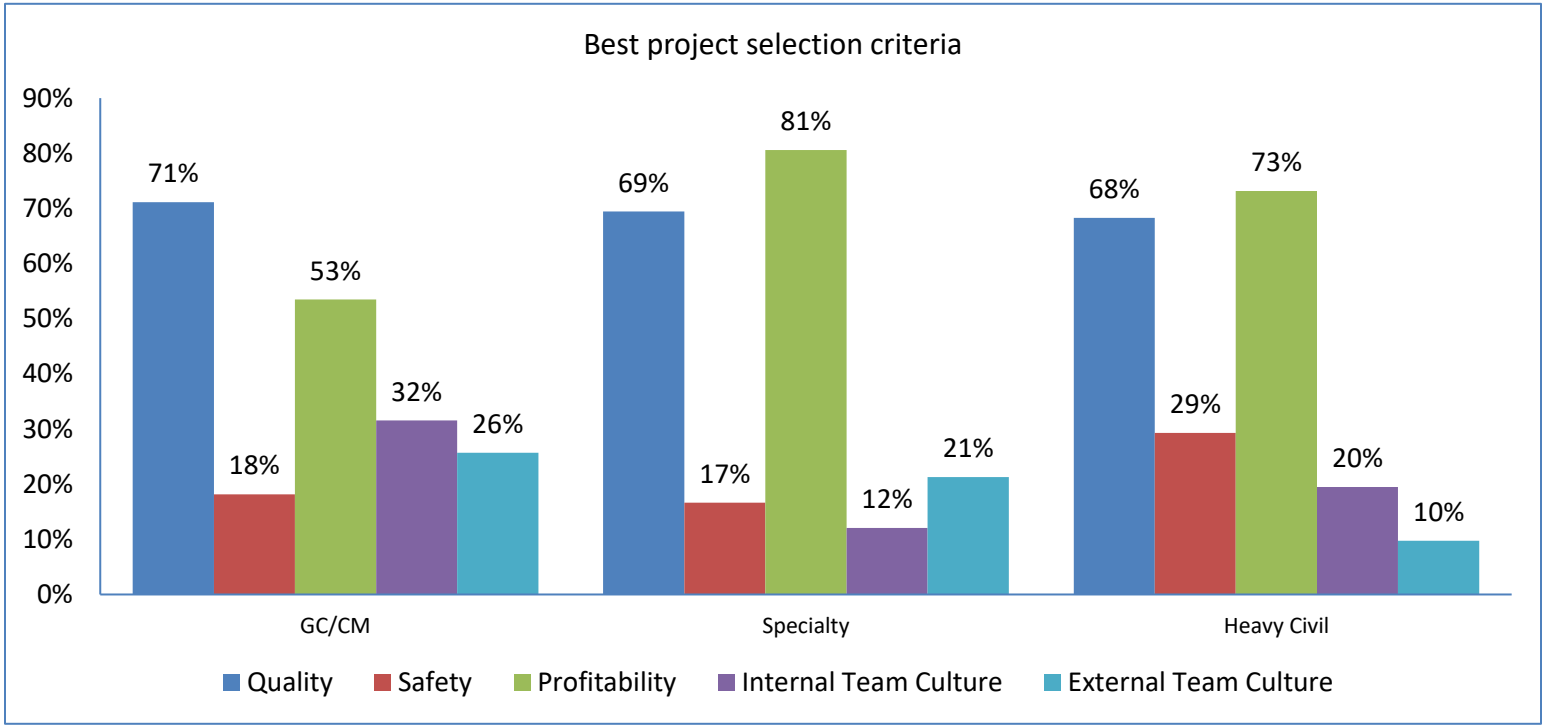
Best Project Selection

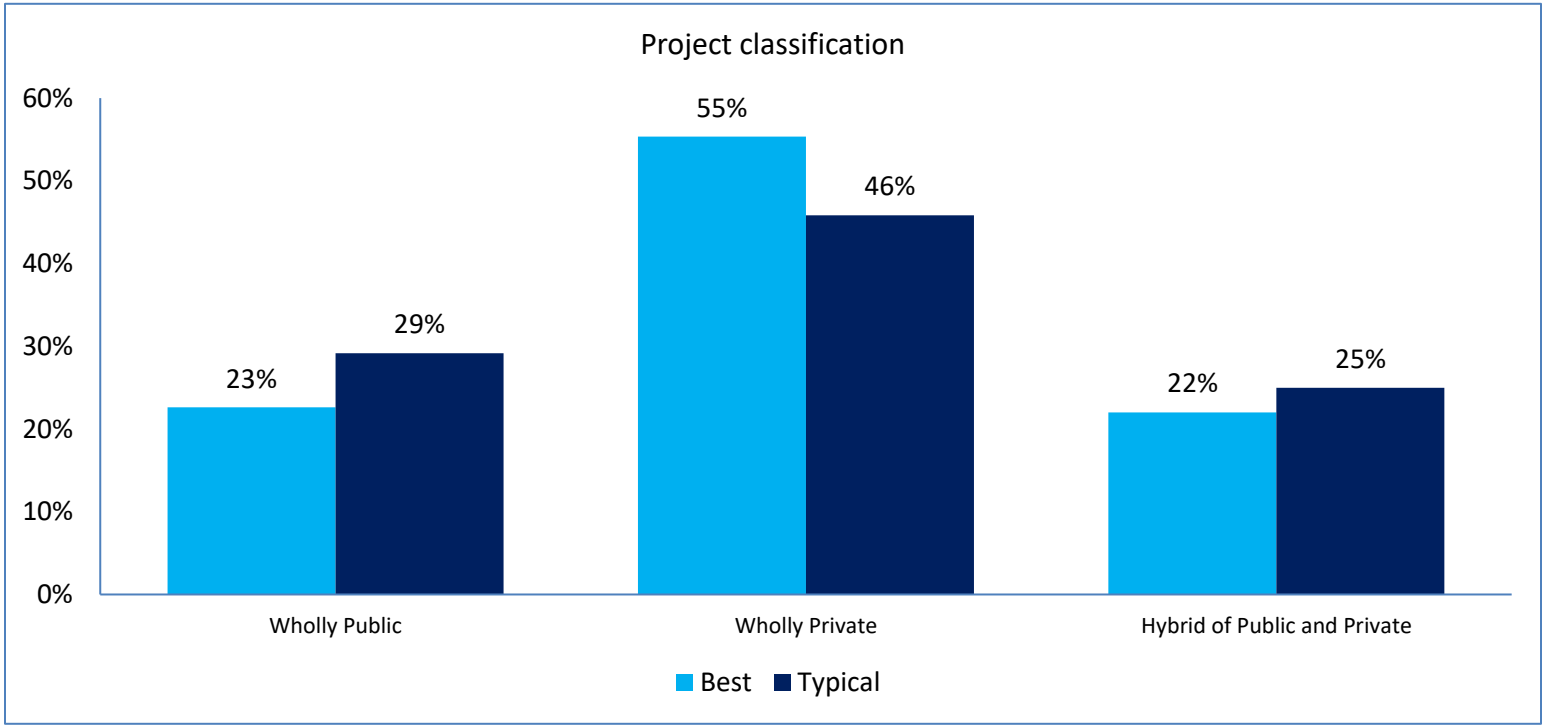
- Respondent firms typically relied on quality and profitability as determinants of “best” projects



qb1. Among the categories below, select the two that were most influential in your choice of a best project:

Best and Typical Project Classification

- Best projects were most likely wholly private



qb2. How would you classify the best and typical projects you select?

Best and Typical Project Classification

- Civil contractors had a much higher share of wholly public projects than do the other types of contractors
- Trades report a much higher share of hybrid projects among their typical projects and a higher share of wholly private projects their best projects.
- GC/CMs report a higher share of wholly public projects in their best projects than their typical with the difference largely split between wholly private and hybrid projects for the share of typical projects that are higher than their best ones..

Best Projects	GC/CM	Trades	Civil
Wholly Public	20%	15%	56%**
Wholly Private	59%	59%	29%**
Hybrid of Public and Private	21%	26%	15%

Typical Projects	GC/CM	Trades	Civil
Wholly Public	29%**	15%**	66%**
Wholly Private	55%	45%	7%**
Hybrid of Public and Private	16%*	40%*	27%

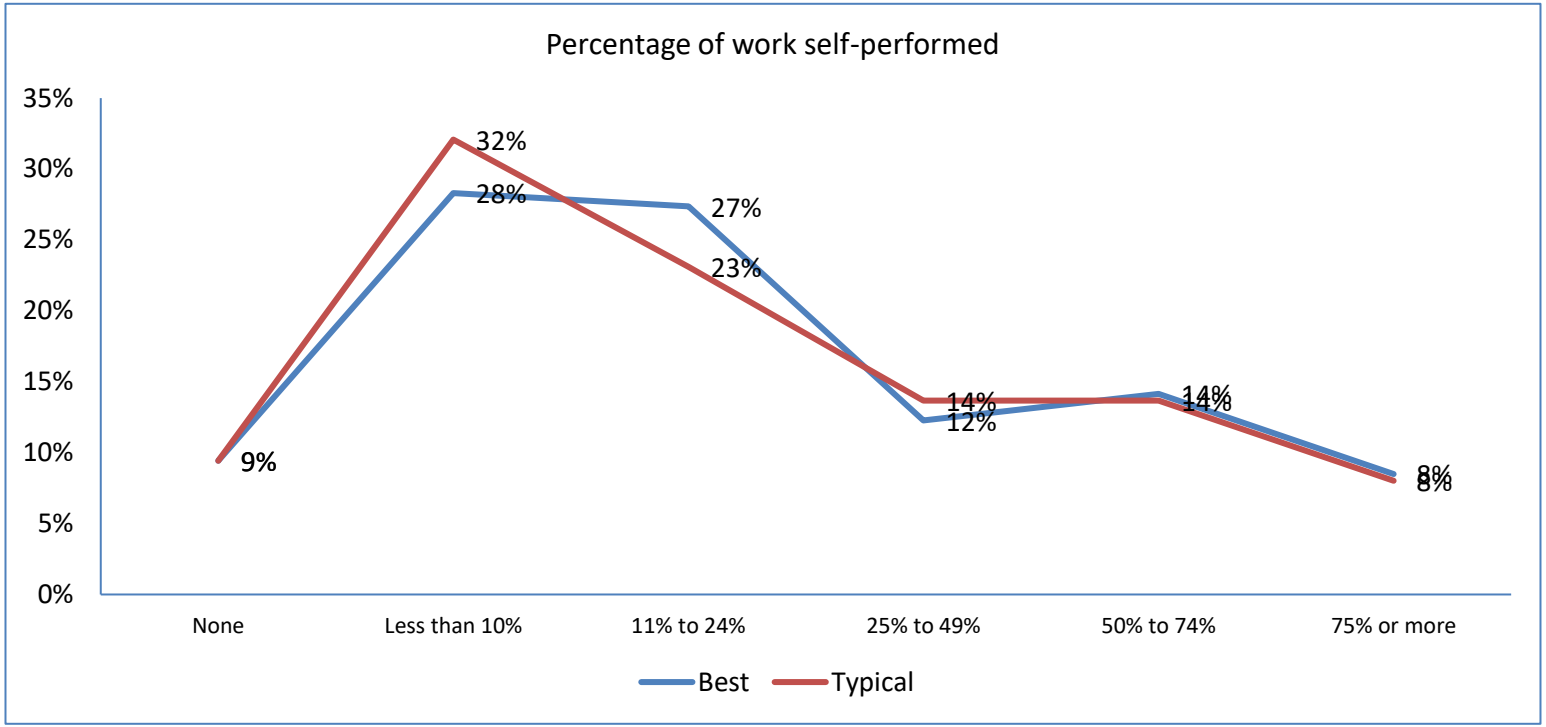
* denote statistical difference with one factor

** denotes statistical difference with more than one factor

qb2. How would you classify the best and typical projects you select?

Percentage of Work Self-Performed

- The amount of work self-performed did not vary between best and typical projects



qb1. Among the categories below, select the two that were most influential in your choice of a best project:

Findings

- Selection of Best v. Typical projects
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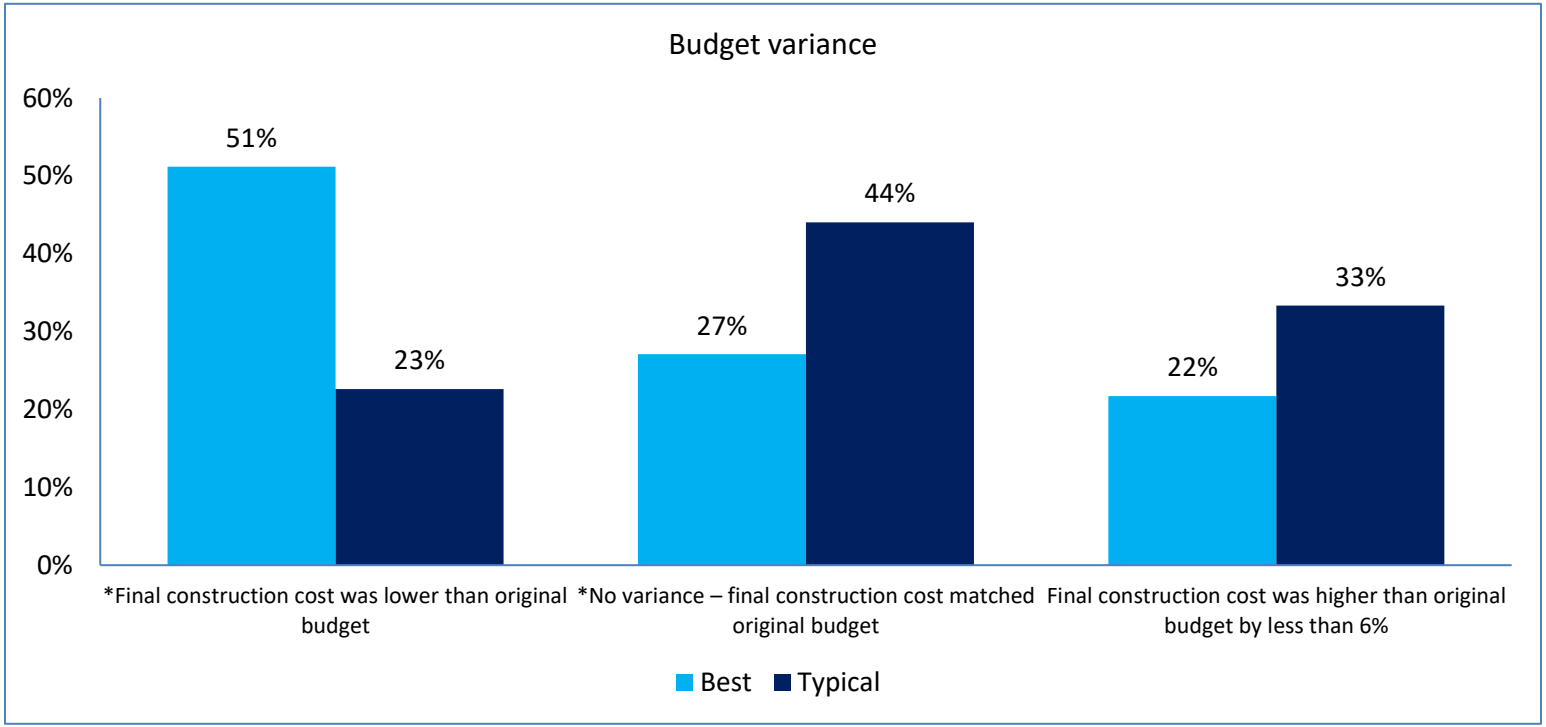
Project Outcomes: Budget Variance

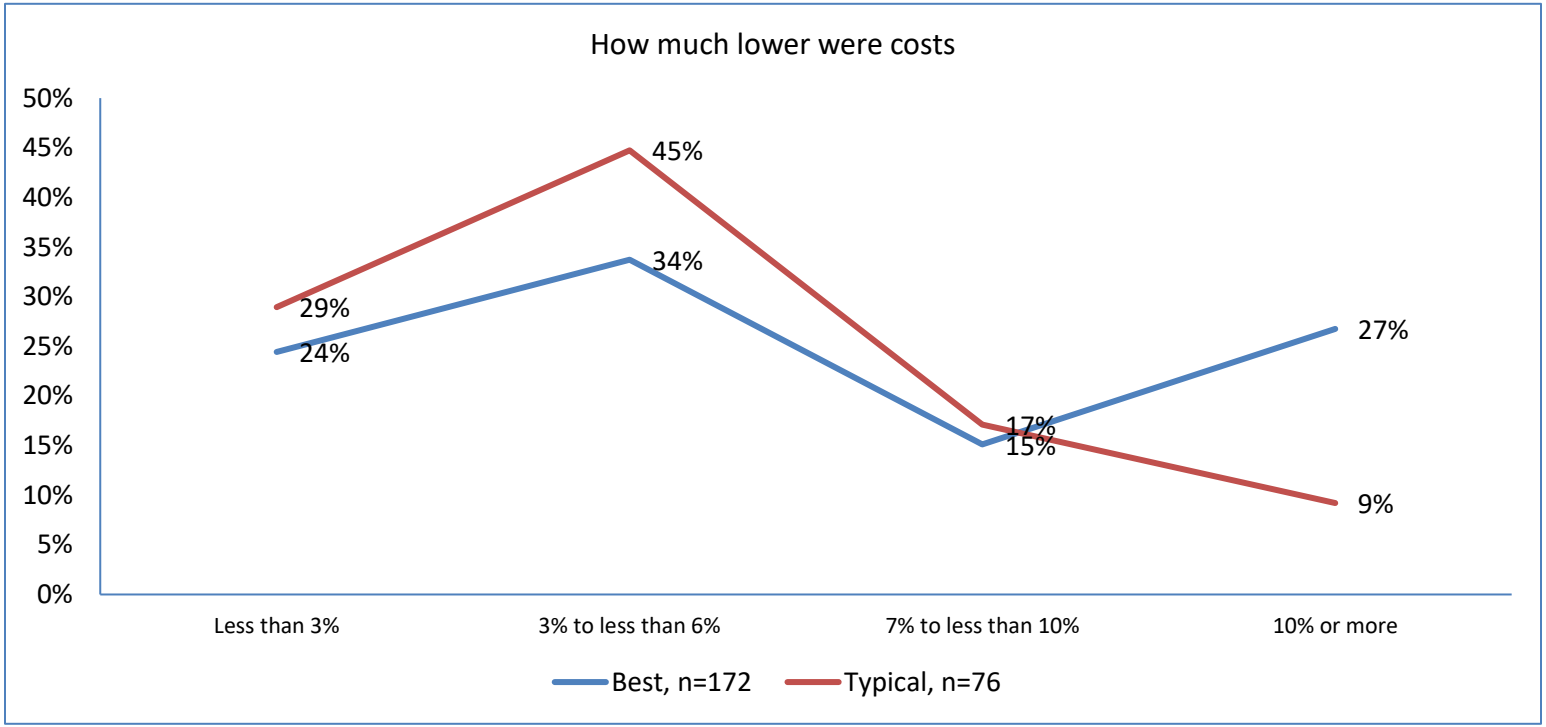
- Best projects were more likely to have a final cost lower than the original budget
- Typical projects were more likely to have no variance from original budget



qc1. Considering the specific projects that you selected as your best and typical projects, how would you best describe the variance between the final cost of construction and the original budget expected at the time that you became involved?

Project Outcomes: Budget Variance

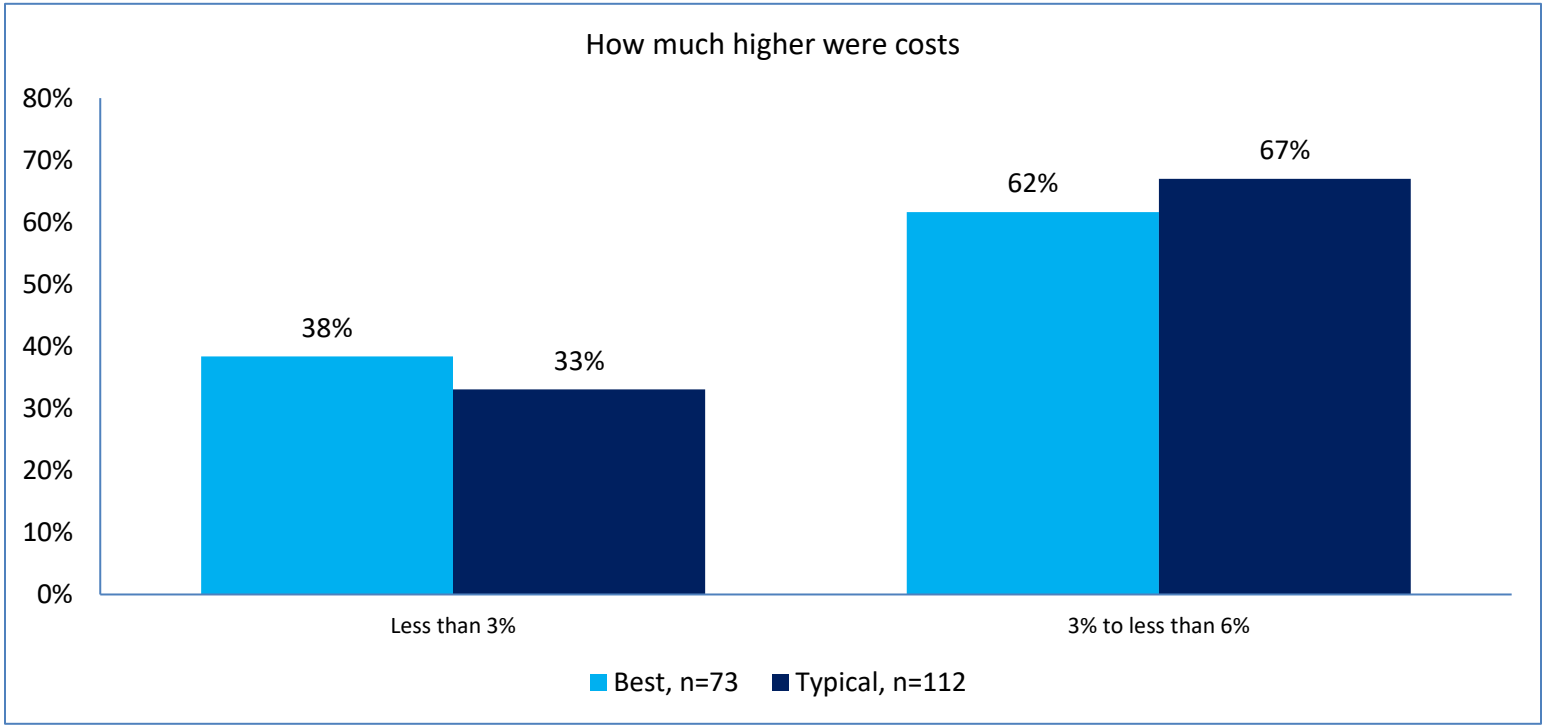
- For projects with lower costs, there was no significant difference between best and typical projects on how much lower costs were



qc1a. How much lower were the final projects costs from the original budget?

Project Outcomes: Budget Variance

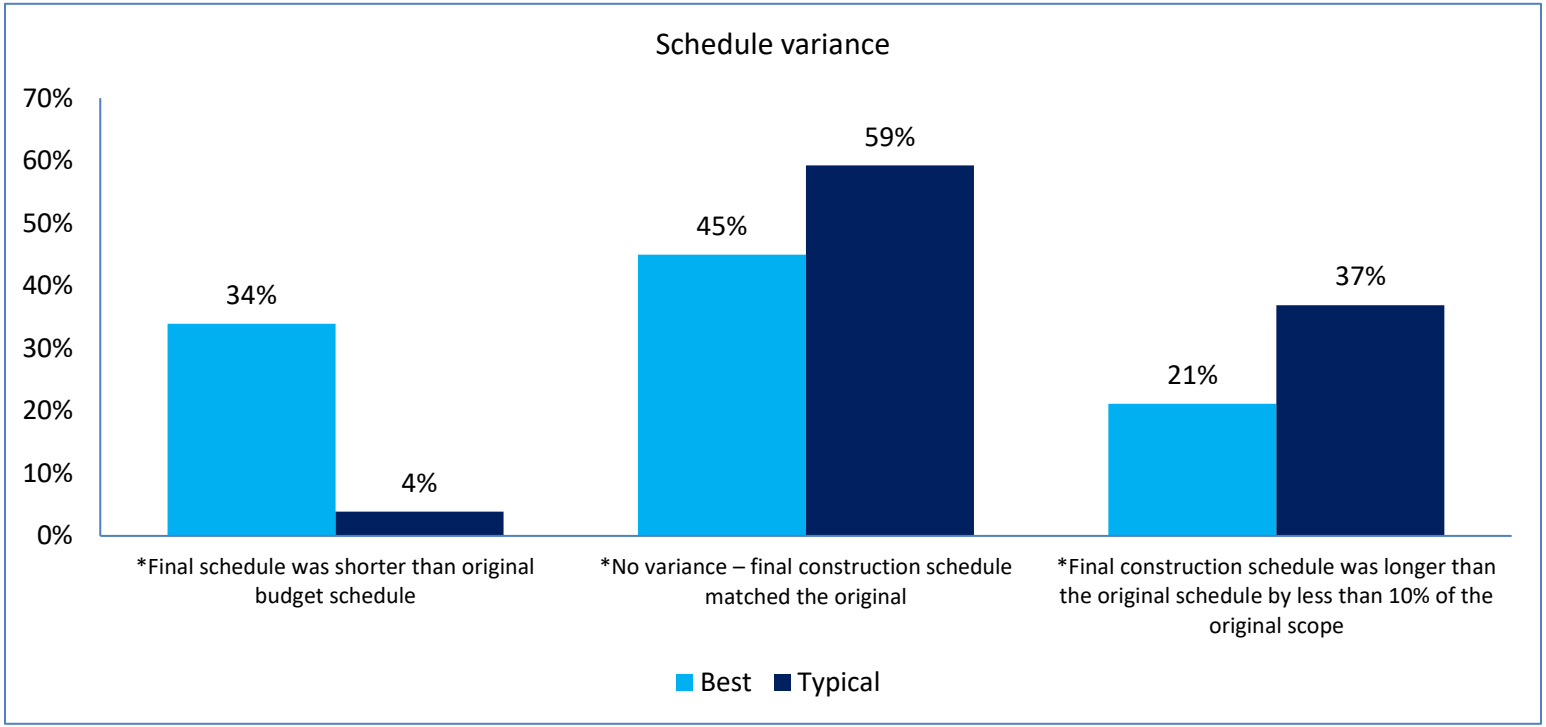
- For projects with higher costs, there was no significant difference between best and typical projects on how much higher costs were
- N.B., projects were restricted as to how much over budget they were to be included in the study, a 6% cap



qc1b. How much higher were the final projects costs from the original budget?

Project Outcomes: Schedule Variance

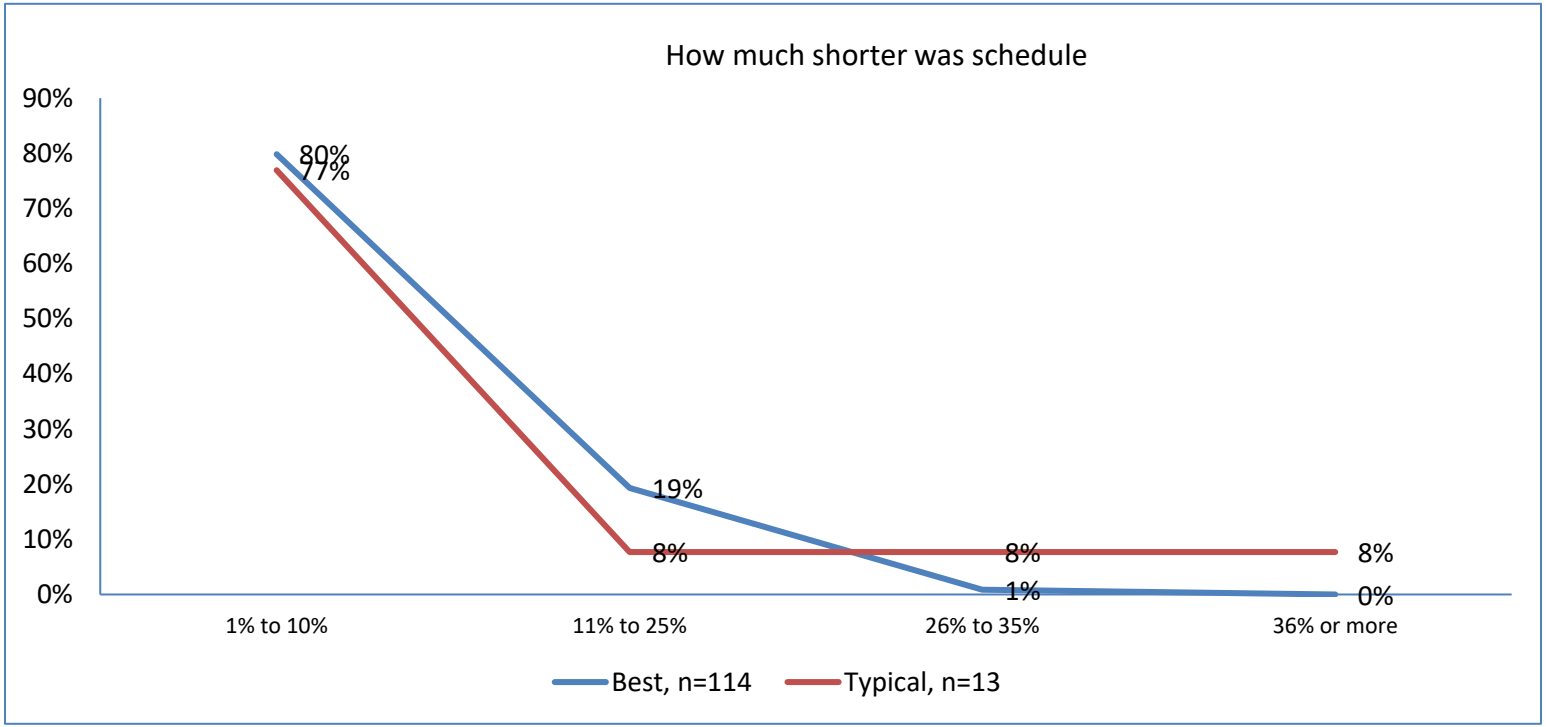
- Schedule variance differed across the board for best and typical projects
- Best projects were more likely to be under schedule, typical projects were more likely to be either on schedule or over schedule



qc2. Considering these same best and typical projects, how did the final schedule compare to the original schedule expected at the time that you became involved in the project?

Project Outcomes: Schedule Variance

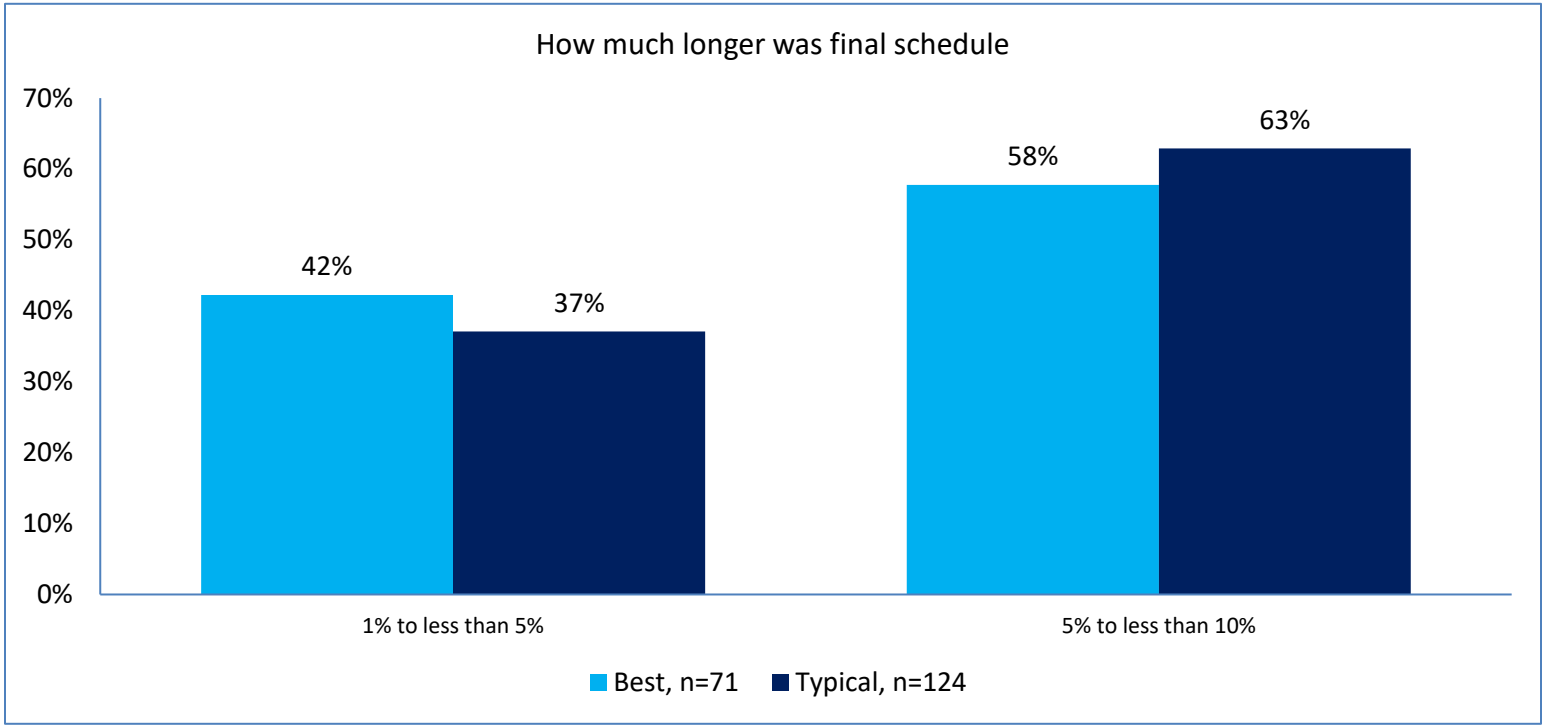
- For projects with a shorter schedule, there were no differences in length between best and typical projects



qc2a. How much shorter was the final schedule from the original schedule?

Project Outcomes: Schedule Variance

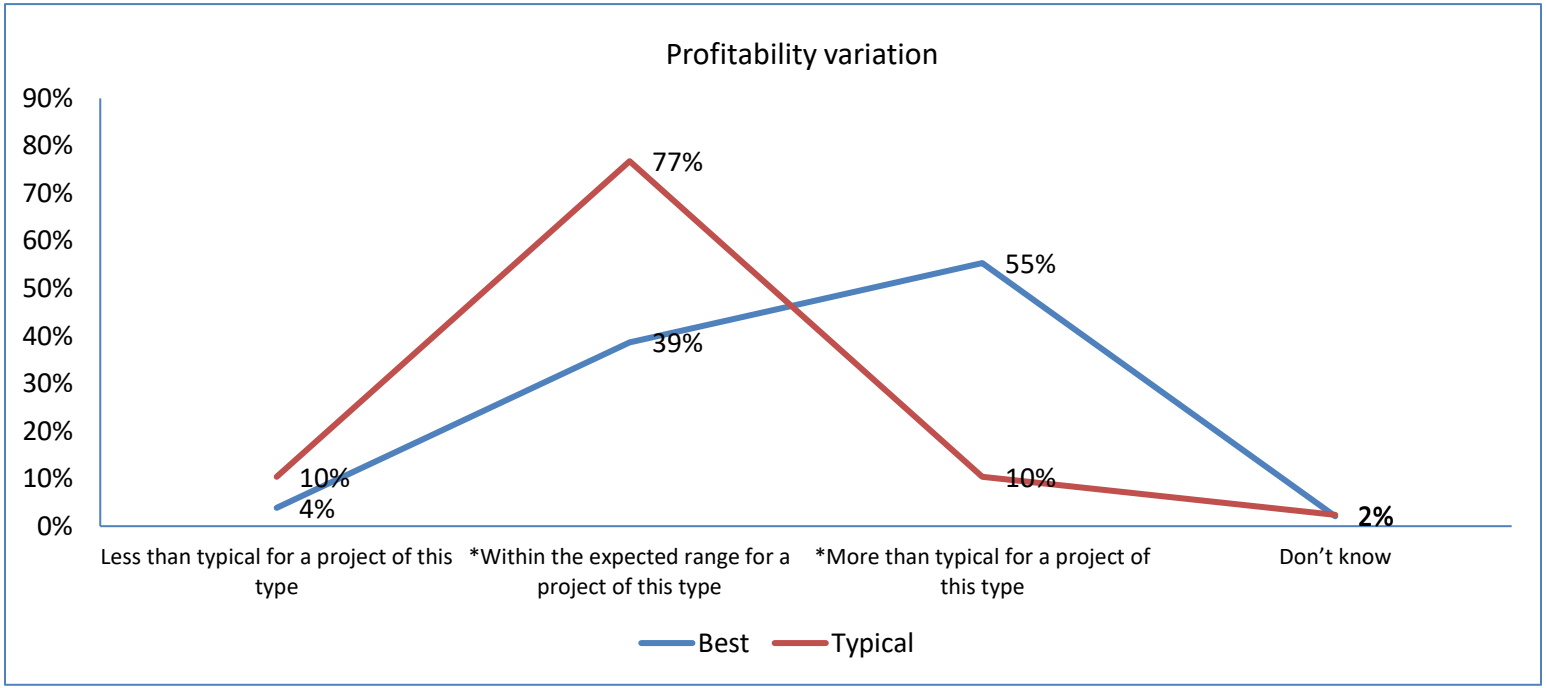
- For projects with a longer schedule, there were also no differences in length between best and typical projects



qc2b. How much longer was the final schedule from the original schedule?

Project Outcomes: Profitability Variance

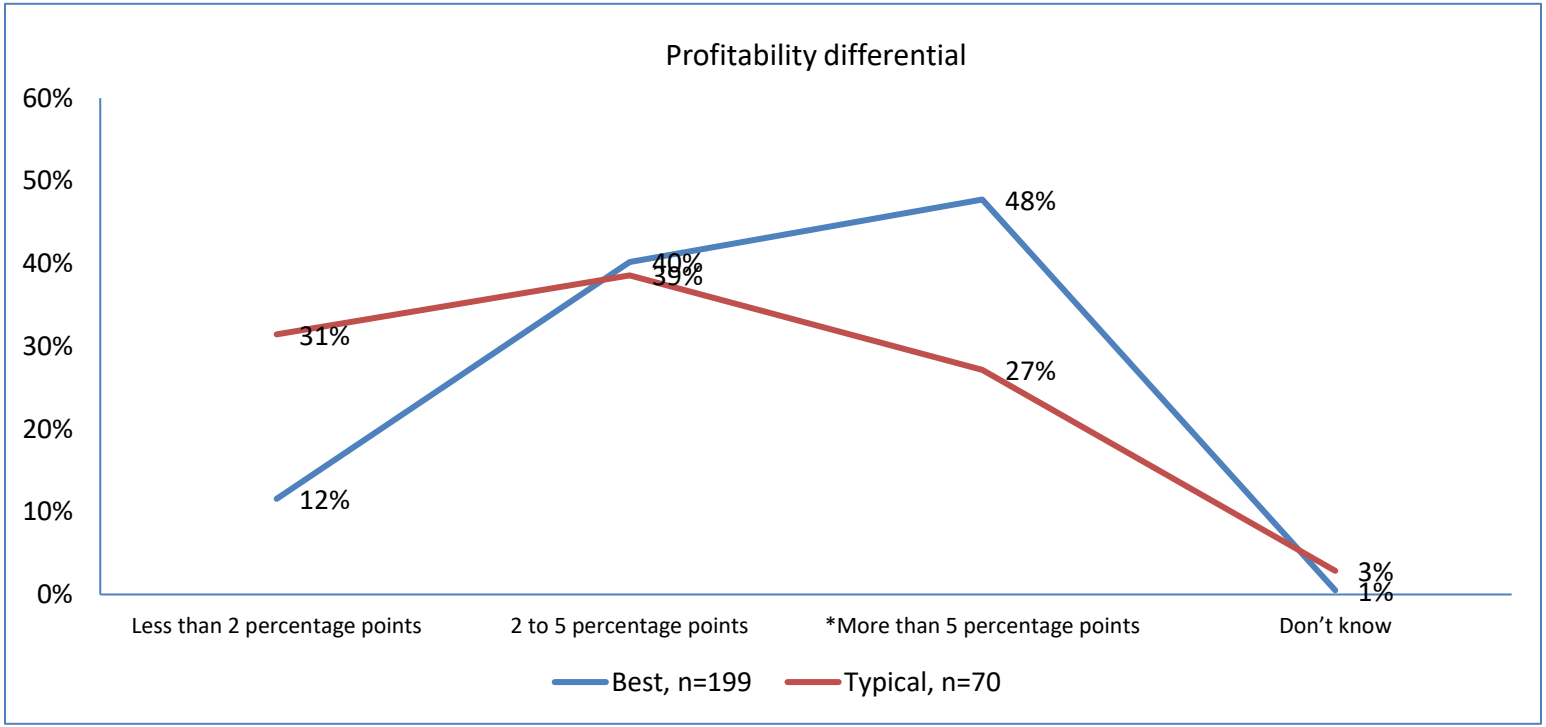
- There were significant differences between best and typical projects on profitability, one of the key items for choosing a best project
- Typical projects were more likely to be within the expected profit range
- Best projects were more likely to have a higher profit than typical projects, with trade contractors most frequently reporting the highest profit levels.



qc3. How did the profitability of each project compare with your expected profitability at the project onset?

Project Outcomes: Profitability Variance

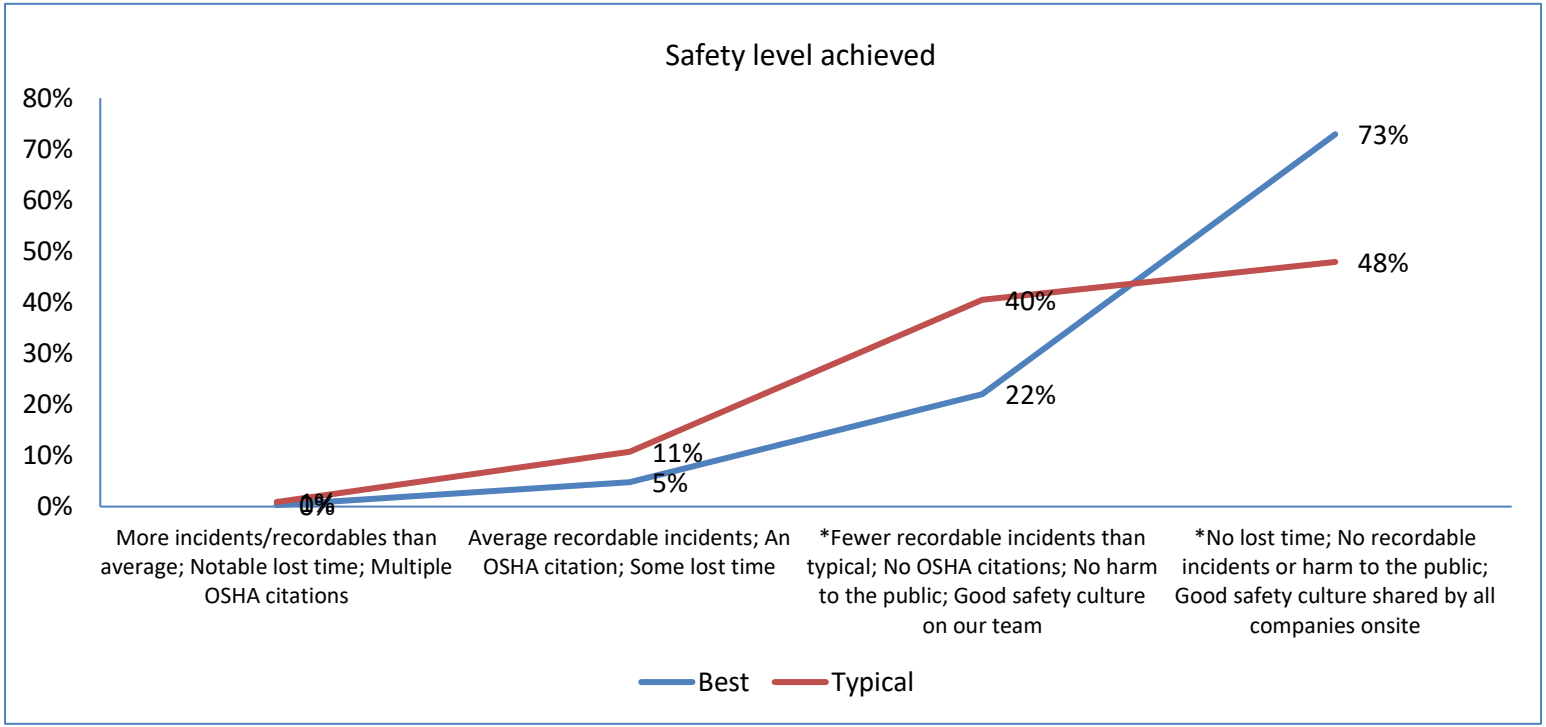
- For projects with a profit variance, best projects were more likely to have a more than 5 percentage point deviation



qc3a. What was the difference in profit (lower or higher) you experienced?

Project Outcomes: Safety Level

- Both typical and best projects achieved good safety outcomes
- Typical projects were more likely to have a higher rate of fewer recordable incidents than best projects
- Best projects were more likely to achieve the highest level of safety noted, with no recordable incidents or lost time



qc4. Which of the following best describes the level of safety achieved on each project?

Project Outcomes: Safety Level

- For Best projects, significantly more GC/CMs than trade contractors place themselves in the “Good” category, and significantly more trade contractors place themselves in the “Excellent” category than other types of contractors.
- There were no significant differences in safety evaluations on typical projects.

Best Projects	GC/CM	Trades	Civil
Fewer recordable incidents than typical; No OSHA citations; No harm to the public; Good safety culture on our team	28%*	12%*	22%
No lost time; No recordable incidents or harm to the public; Good safety culture shared by all companies onsite	69%	84%**	63%

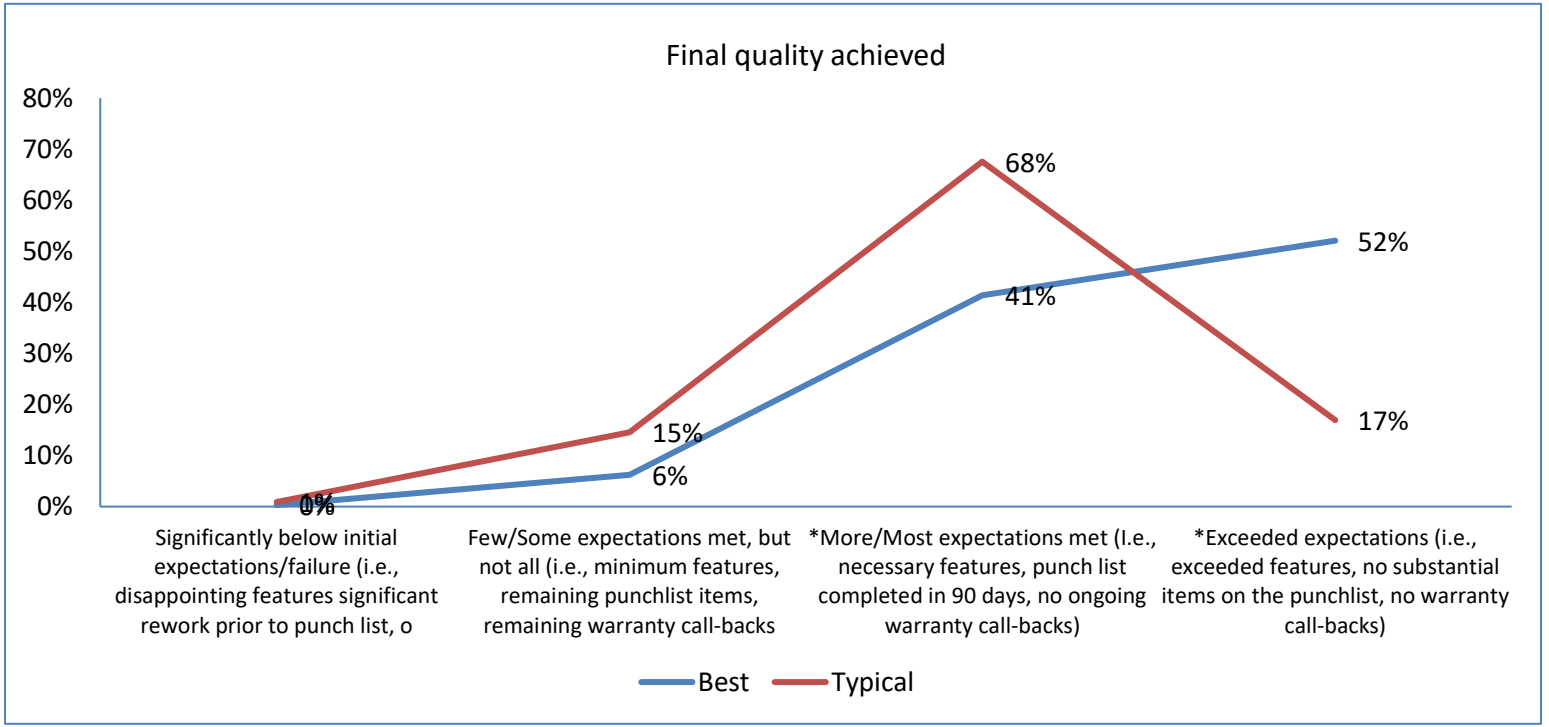
* denote statistical difference with one factor

** denotes statistical difference with more than one factor

qc4. Which of the following best describes the level of safety achieved on each project?

Project Outcomes: Final Quality

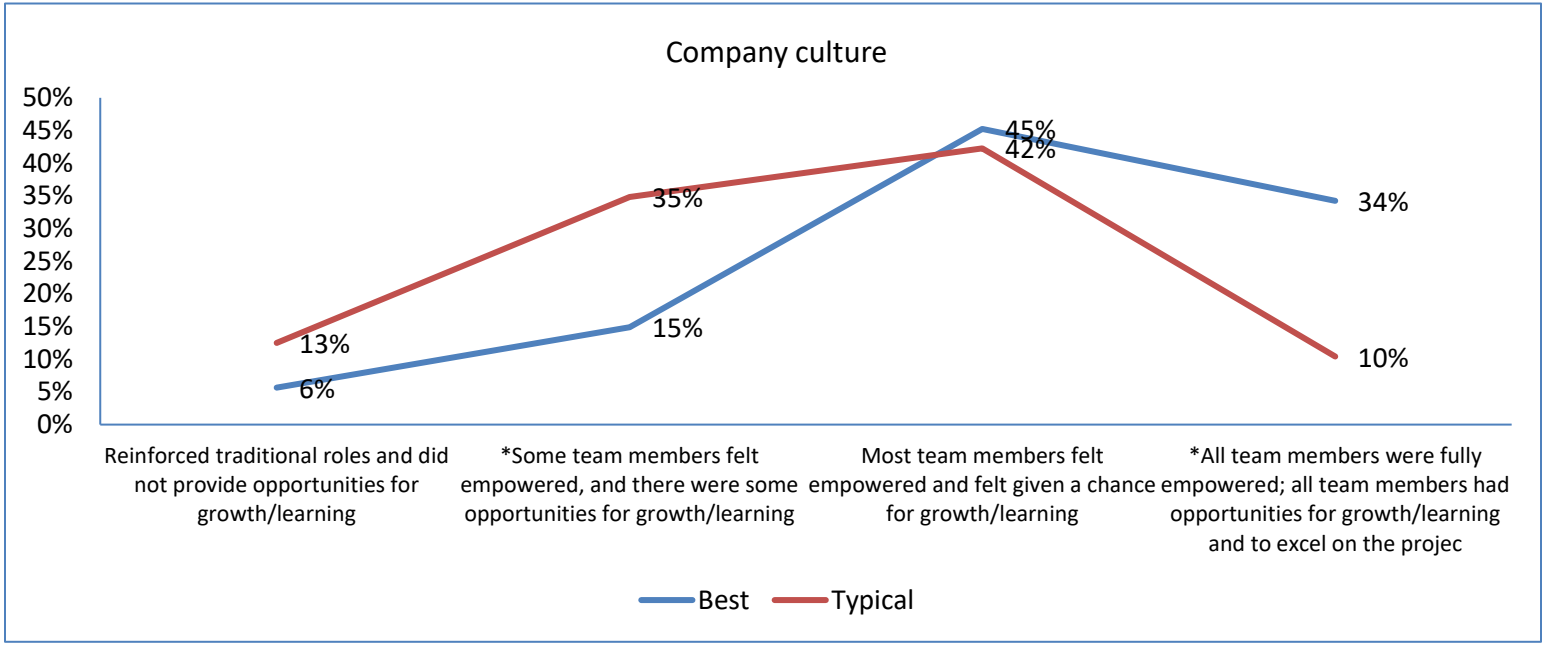
- Both types of projects also achieved good quality outcomes, the other main item for choosing a best project
- Typical projects were more likely to meet more or most necessary features
- Best projects were more likely to exceed project expectations with no substantial items on the punchlist



qc5. What was the quality of the final building compared with overall expectations?

Project Outcomes: Company Culture

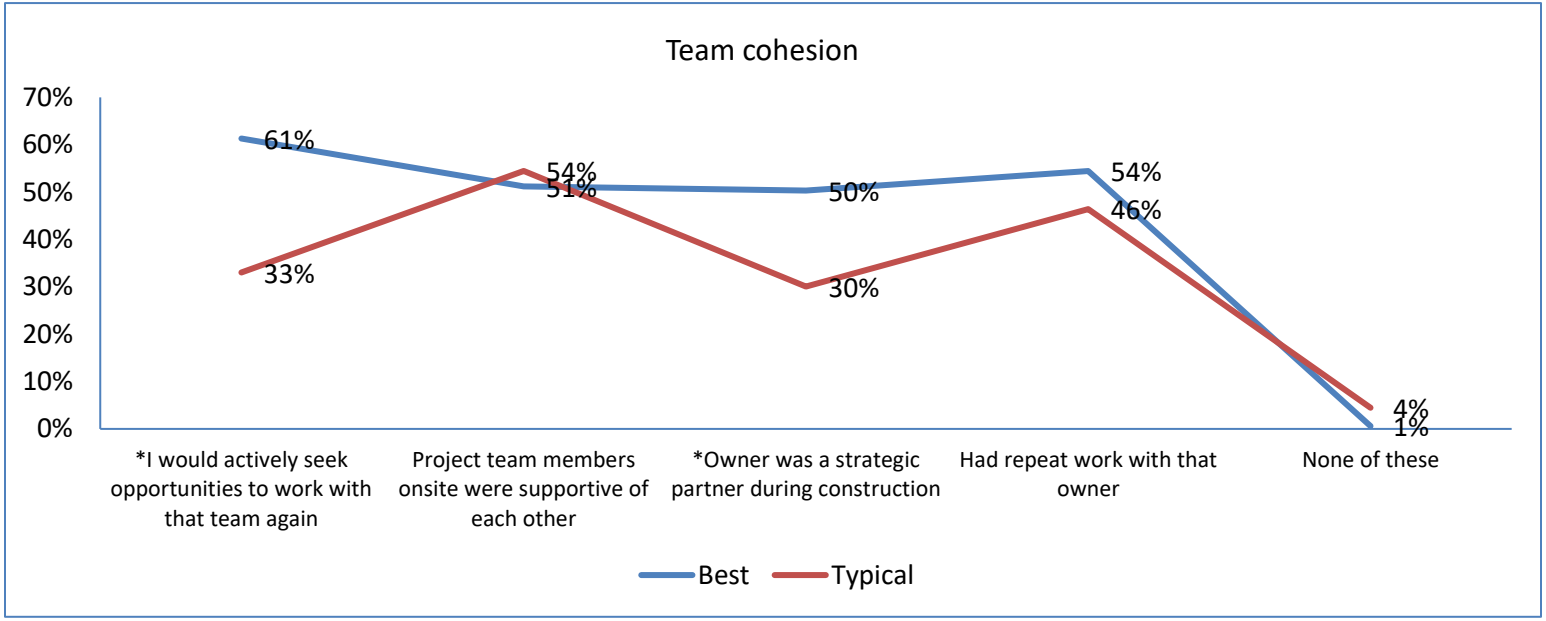
- Typical projects were more likely to report that some team members felt empowered
- Best projects were significantly better at making all team members feeling full empowered and they had an opportunity for growth or learning
- Significantly more trade contractors (19%) than GC/CMs (9%)find that they reinforced traditional roles on typical projects.



qc6. Where along the spectrum below did each project fall in terms of its impact on the firm culture within your company?

Project Outcomes: Team Cohesion

- On best projects respondents significantly more frequently noted wanting to actively seek opportunities to work with that team again and that the owner was a strategic partner
- Significantly more GC/CMs (59%) than trades (36%) report that the owner was a strategic partner during construction on best projects, and GC/CMs (40%) are significantly higher for typical projects in this category than both trades (14%) and civil contractors (27%).
- Significanltly more trade contractors (9%) report that none of these apply to their typical projects than do GC/CMs (3%) or civil contractors (0%)



qc7. Which of the following is true about each project, related to how the external team worked together?

Findings

- Selection of Best v. Typical projects
- Project Outcomes
- **Organizational Factors**
- Commercial Factors
- Process/Operational Factors

- **Unless otherwise noted sample size is:**
- **Total: 336 respondents**
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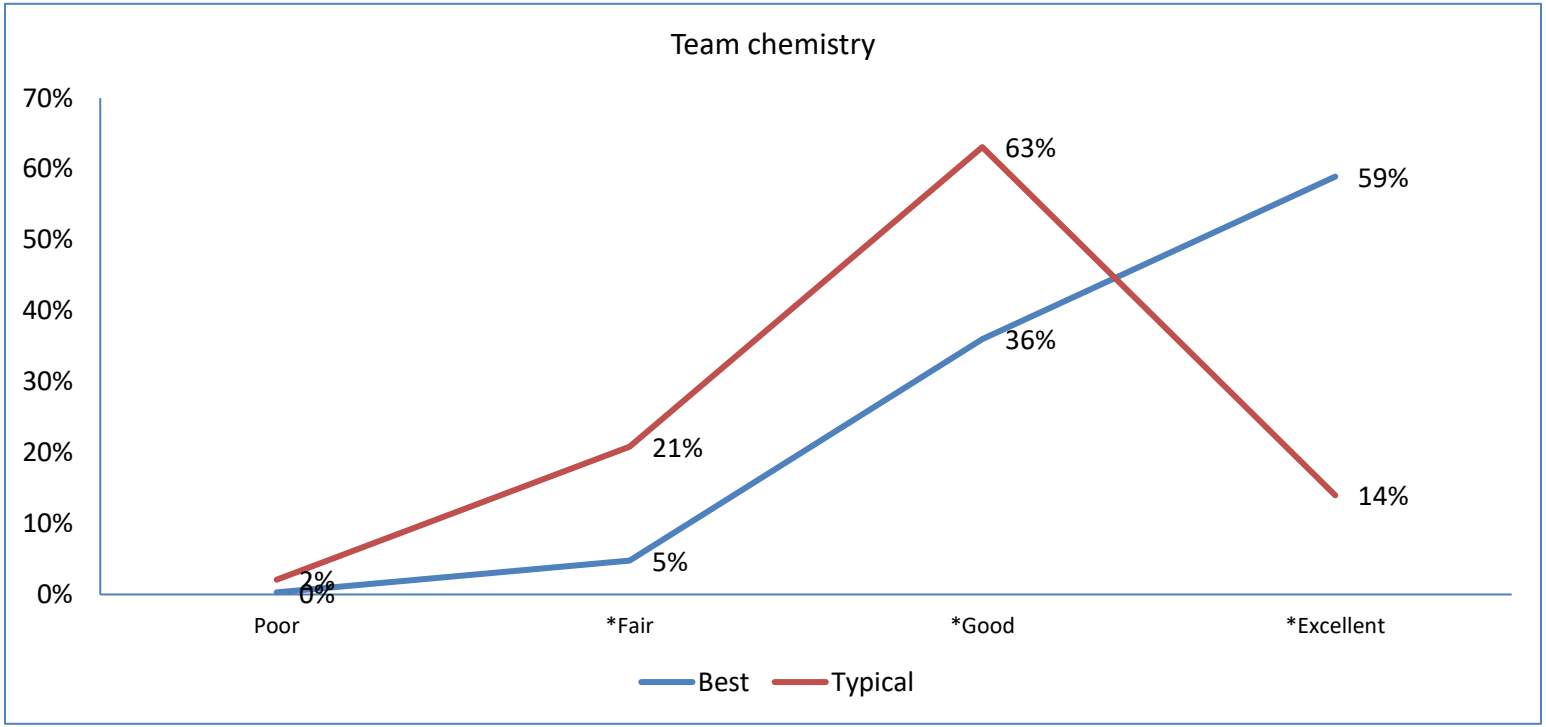
Organizational Factors: Team Chemistry

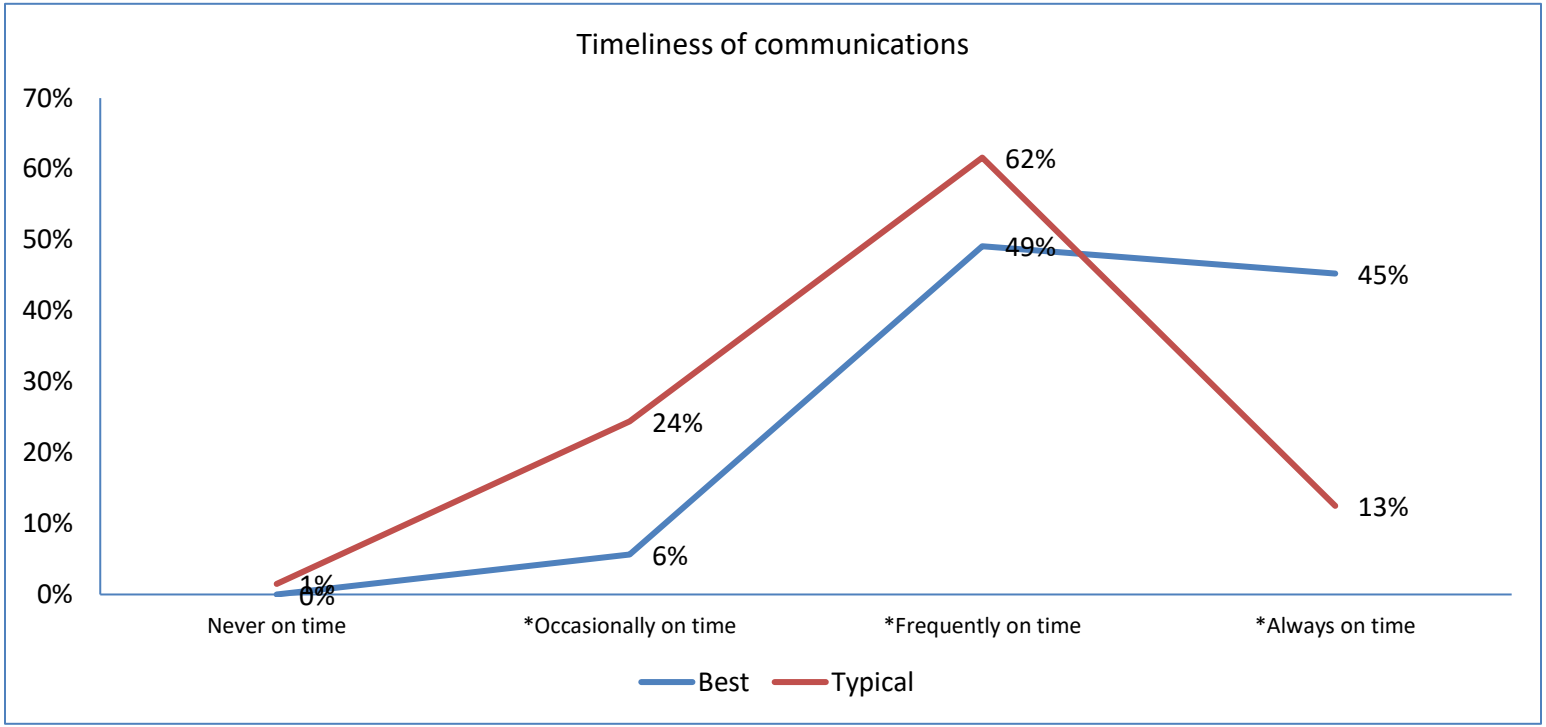
- Typical projects were more likely to report a fair or good team chemistry
- Best projects were more likely to report an excellent team chemistry
- GC/CMs report fair team chemistry (14%) significantly less frequently than do trades (28%) or civil contractors (32%)



qd1. On a scale of 1 to 4, how would the majority of key stakeholders rate the team chemistry on these specific projects?

Organizational Factors: Timeliness of Communication

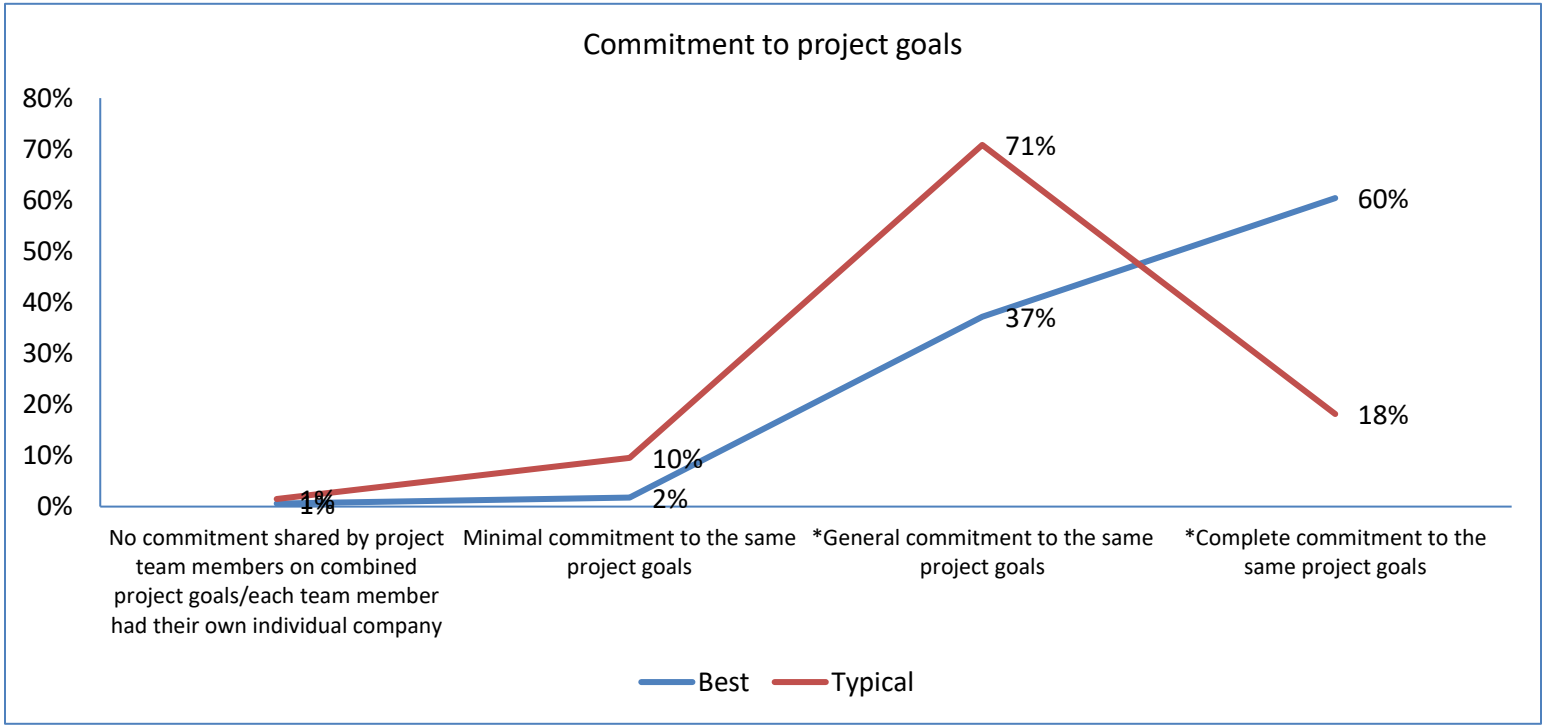
- Typical projects were more likely to note that communication was occasionally or frequently on time
- Best projects were more likely to note always on time communication



qd2. On a scale of 1 to 4, how would the majority of key stakeholders rate the timeliness of communication on these specific projects?

Organizational Factors: Commitment to Project Goals

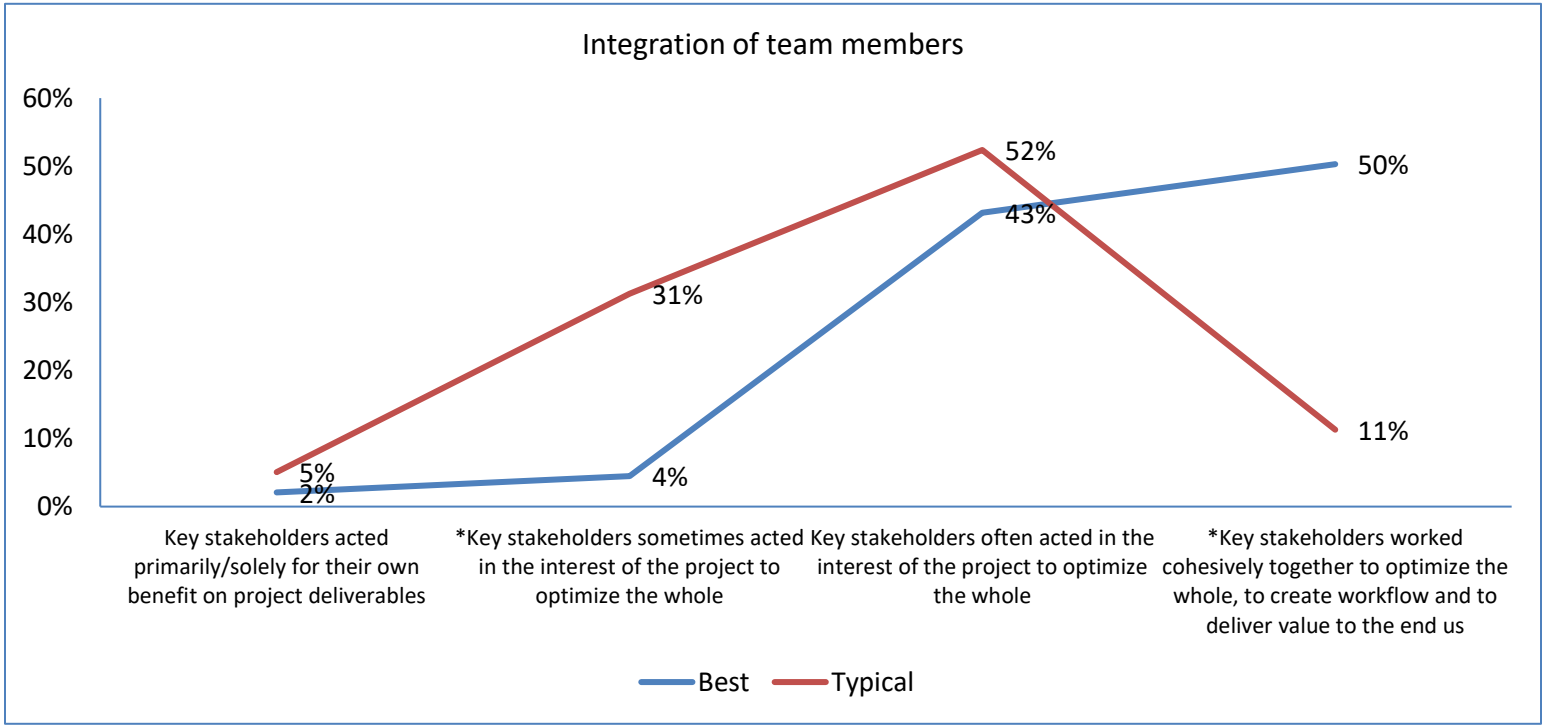
- Respondents for typical projects were more likely to state a general commitment to projects
- On best projects respondents stated a complete commitment to project goals more frequently
- Trades (10%) significantly less frequently report complete commitment to the same project goals on typical projects than do GC/CMs (22%)



qd3. On a scale of 1 to 4, how would the majority of key stakeholders rate how committed all project team members were to the same project goals on these specific projects?

Organizational Factors: Integration of Team Members

- On typical projects key stakeholders were more frequently viewed as sometimes acting in the interest of optimizing the whole projects
- For best projects the stakeholders were more frequently seen to be working cohesively together to optimize the whole and to create workflow to deliver value



qd4. On a scale of 1 to 4, how would the majority of key stakeholders describe the integration of project team members on these specific projects?

Organizational Factors: Integration of Team Members

- There are no statistically significant differences for integration of team members on best projects.
- However, on typical projects, trades significantly more frequently report that key stakeholders act primarily for their own benefit than do GCs/CMs, and civil contractors significantly more frequently report that key stakeholders sometimes act in the interest of the project to optimize the whole than do GCs/CMs.

Typical Projects	GC/CM	Trades	Civil
Key stakeholders acted primarily/solely for their own benefit on project deliverables	2%*	11%*	2%
Key stakeholders sometimes acted in the interest of the project to optimize the whole	28%*	30%	49%*

* denote statistical difference with one factor
** denotes statistical difference with more than one factor

qd4. On a scale of 1 to 4, how would the majority of key stakeholders describe the integration of project team members on these specific projects?

Findings

- Selection of Best v. Typical projects
- Project Outcomes
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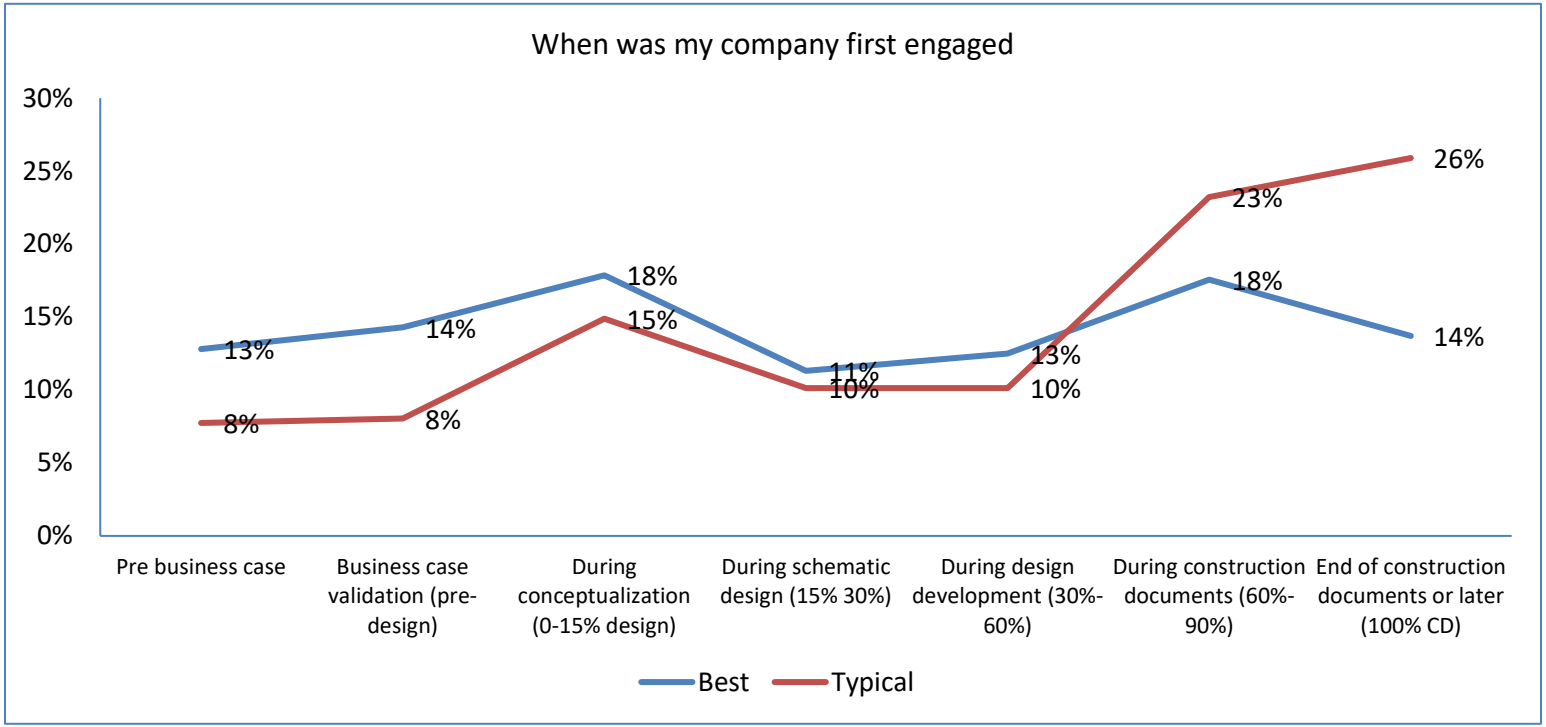
Commercial Factors: Initial Engagement of My Company

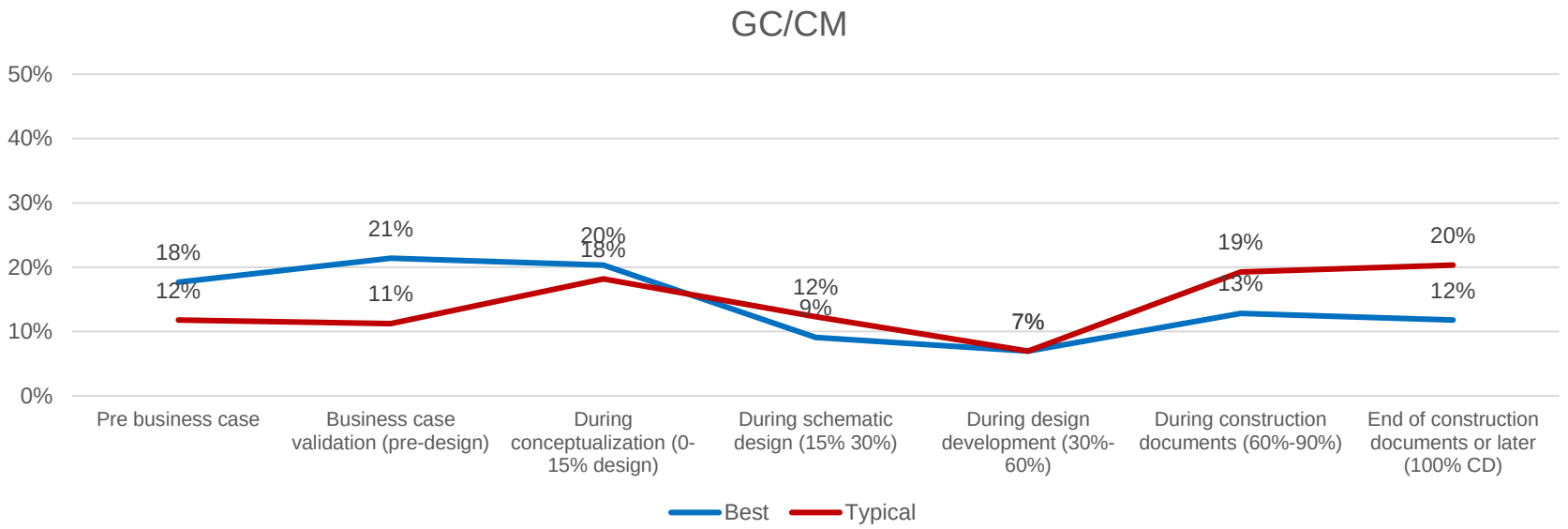
- Typical and best projects did not significantly differ as to stage of the project for when a respondent noted their company's first engagement



qe1. Thinking of the best/typical project, when was my company first engaged and contracted on this specific project?

Commercial Factors: Initial Engagement of My Company

- GC/CMs are more frequently selected pre-business case or during business case validation on best projects and during construction documents or later on typical ones.



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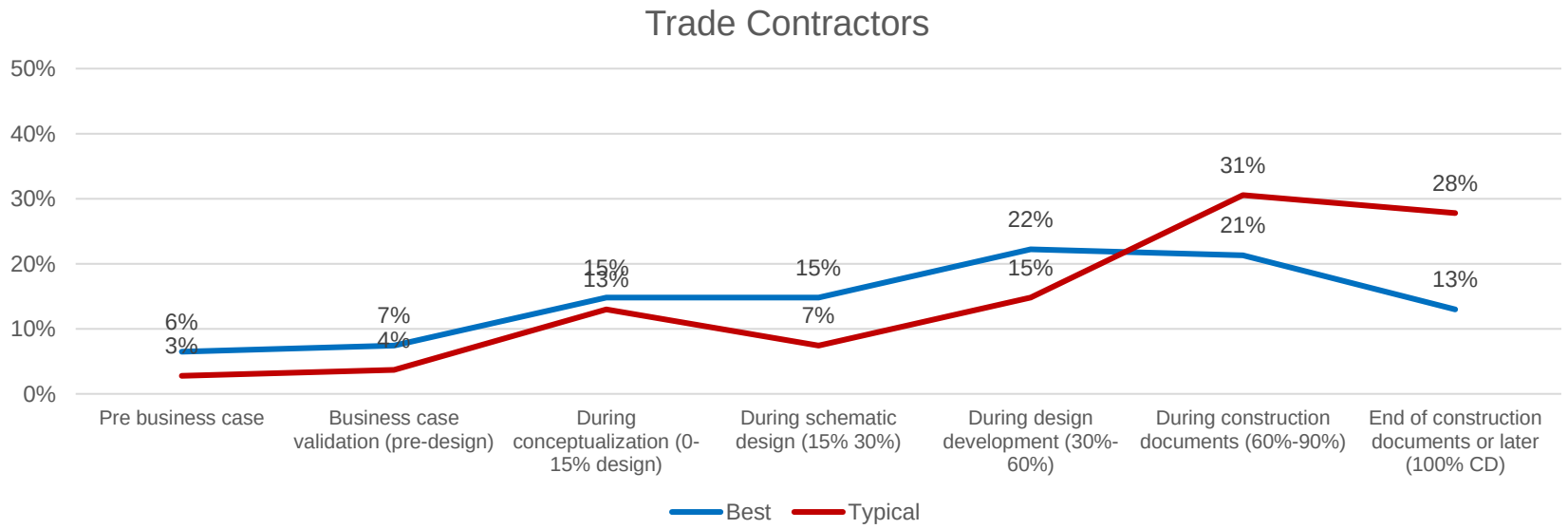
Commercial Factors: Initial Engagement of My Company

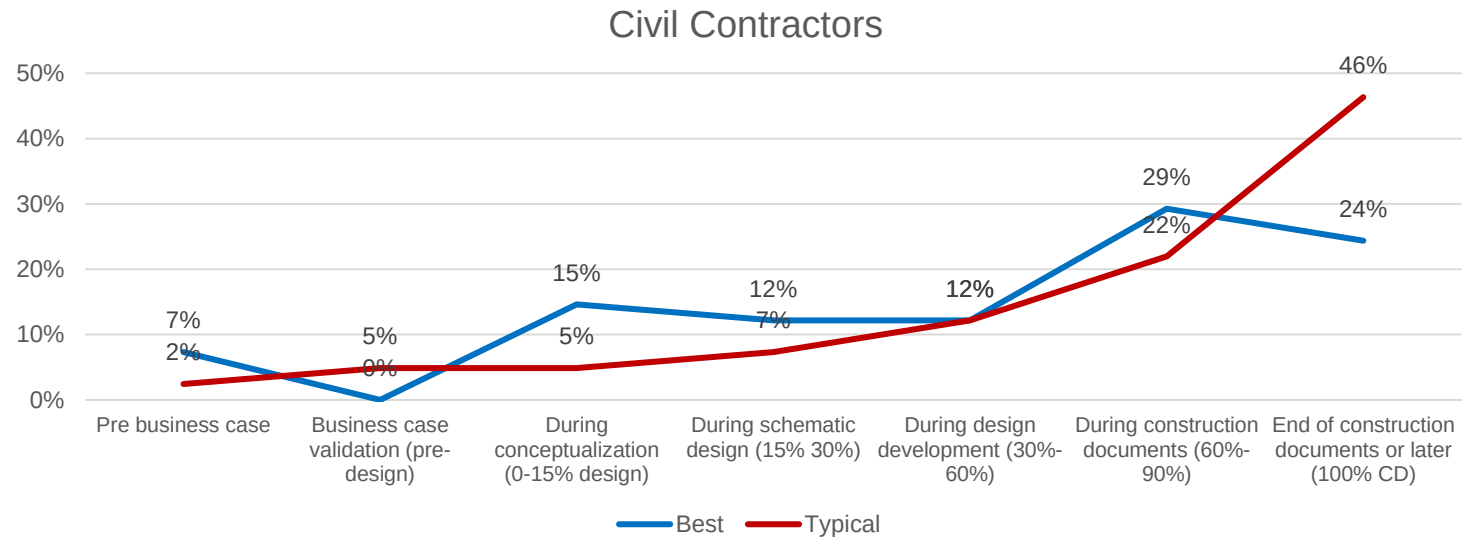
- The real gap between best and typical projects opens up for trade contractors in the during construction documents phase or later, when they are more frequently brought on for typical than for best projects.



qe1. Thinking of the best/typical project, when was my company first engaged and contracted on this specific project?

Commercial Factors: Initial Engagement of My Company

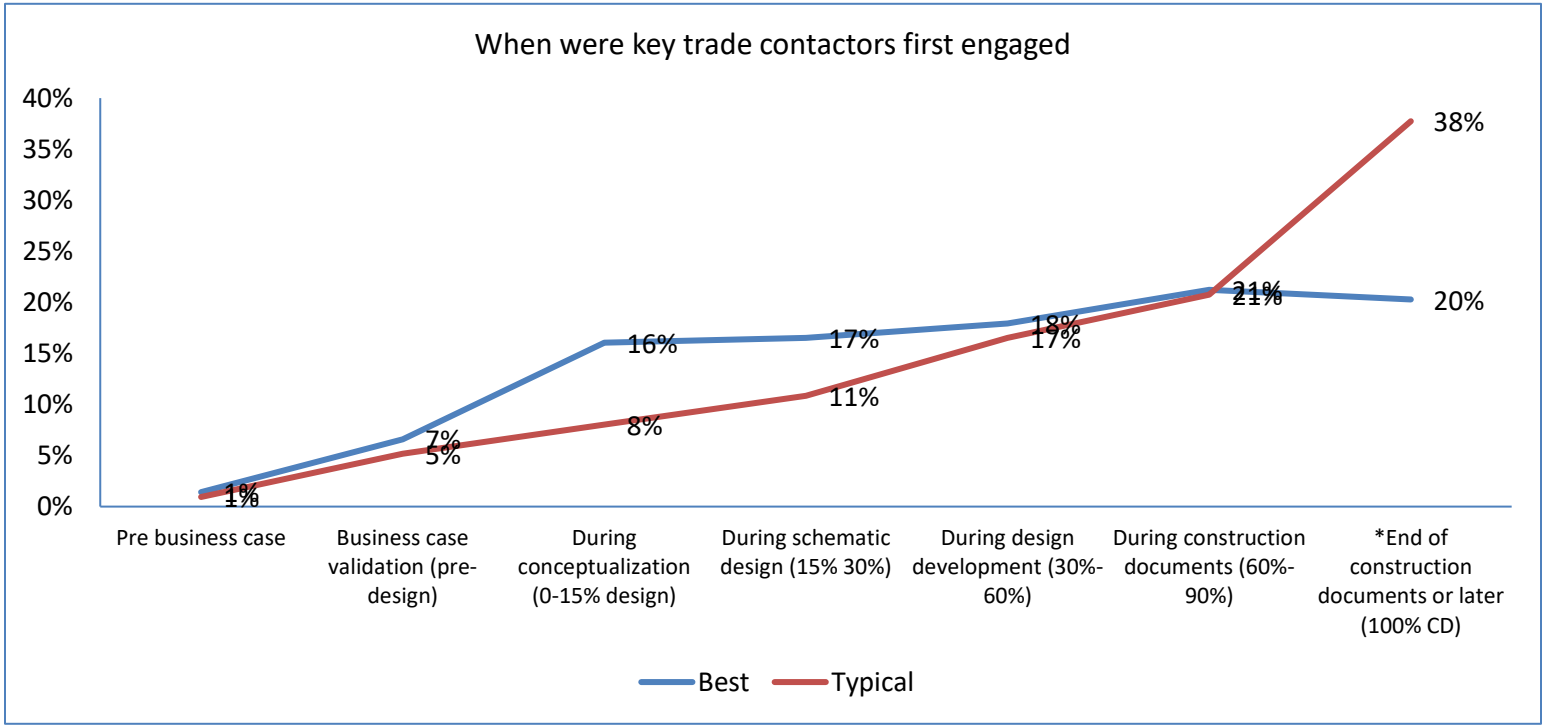
- The largest difference between best and typical projects for civil contractors is that nearly half (45%) of typical projects involve bringing the contractor in at the end of CDs or later, compared to just about one quarter (24%) of best projects



qe1. Thinking of the best/typical project, when was my company first engaged and contracted on this specific project?

Commercial Factors: Initial Engagement of Key Trade Contractors

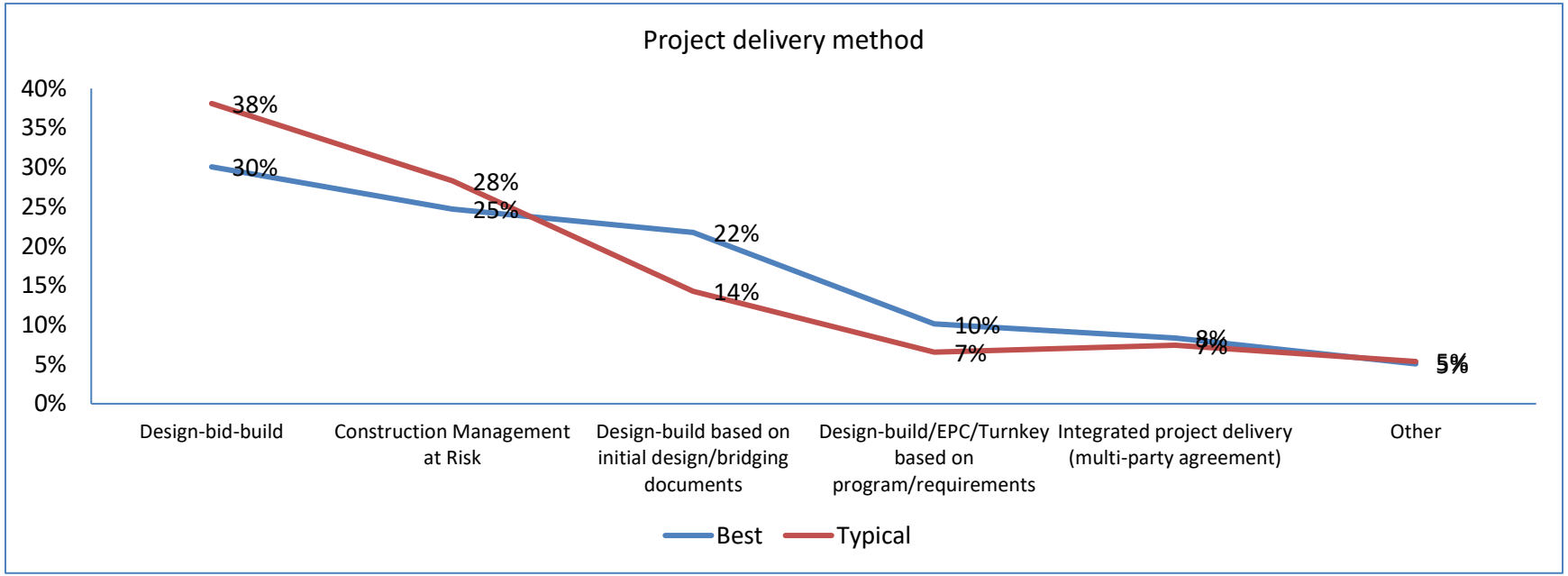
- On typical projects key trade contractors were more frequently reported being first engaged and the end of construction documents or later
- A much larger share of civil contractors report that key trade contractors were first engaged at the end of CDs for both best (44%) and typical (56%) projects than do GC/CMs (17% and 35%, respectively).



qe2. Thinking of the best/typical project, when were the key trade contractors first engaged and contracted on this specific project?

Commercial Factors: Project Delivery Method

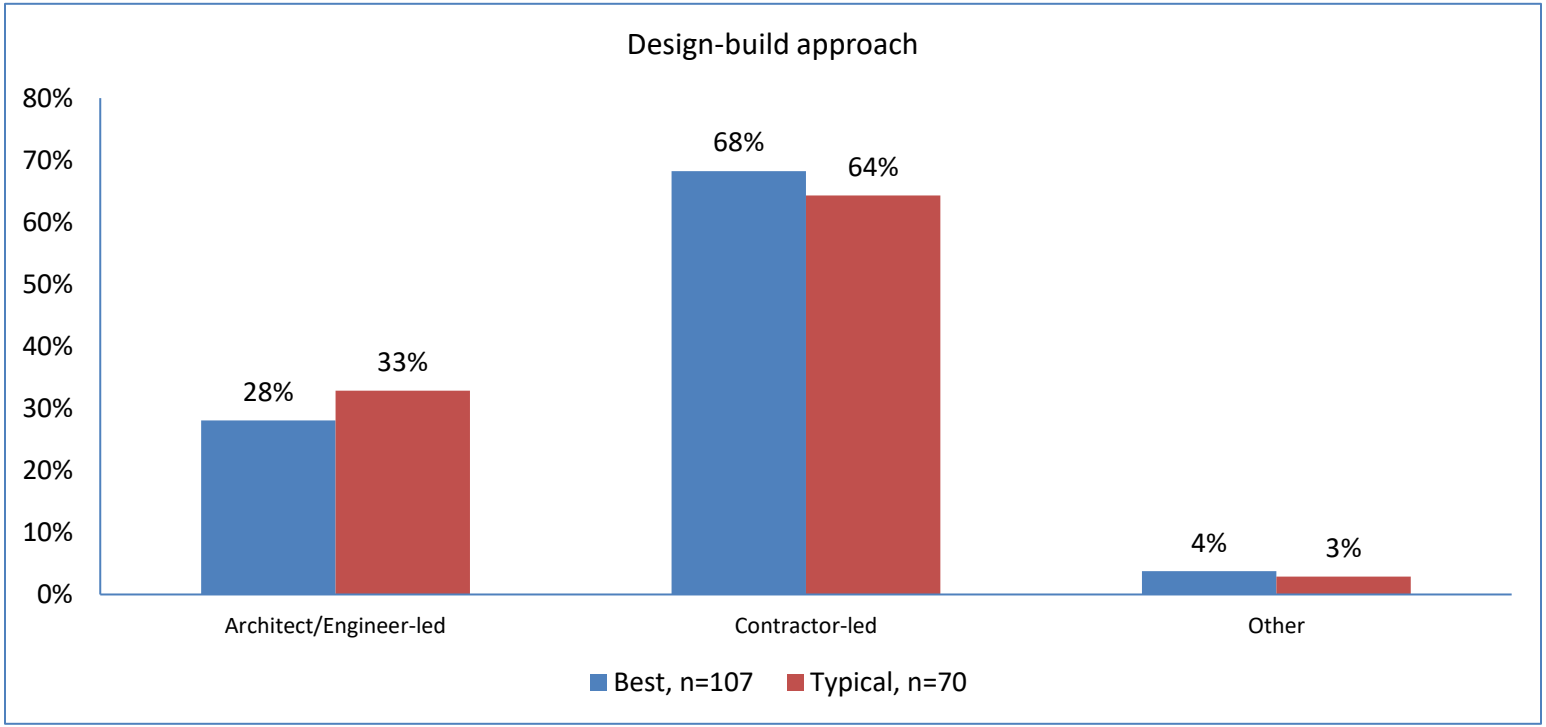
- There were no significant differences in project delivery method between best and typical projects
- Design-bid-build was most frequent followed by CM at risk and IPD was least frequently used
- GC/CMs are involved in CM-at-Risk projects more frequently for both best (34%) and typical (39%) projects than are trades (16%/20%) and civil contractors (5%/0%).
- For typical projects only, a significantly higher percentage of civil contractors (63%) are involved in design-bid-build projects, and more trade contractors (22%) are involved in design-build based on initial design/bridging documents



qe3/5. Thinking of the best project, what was the delivery method for this specific project?

Commercial Factors: Design-Build Approach

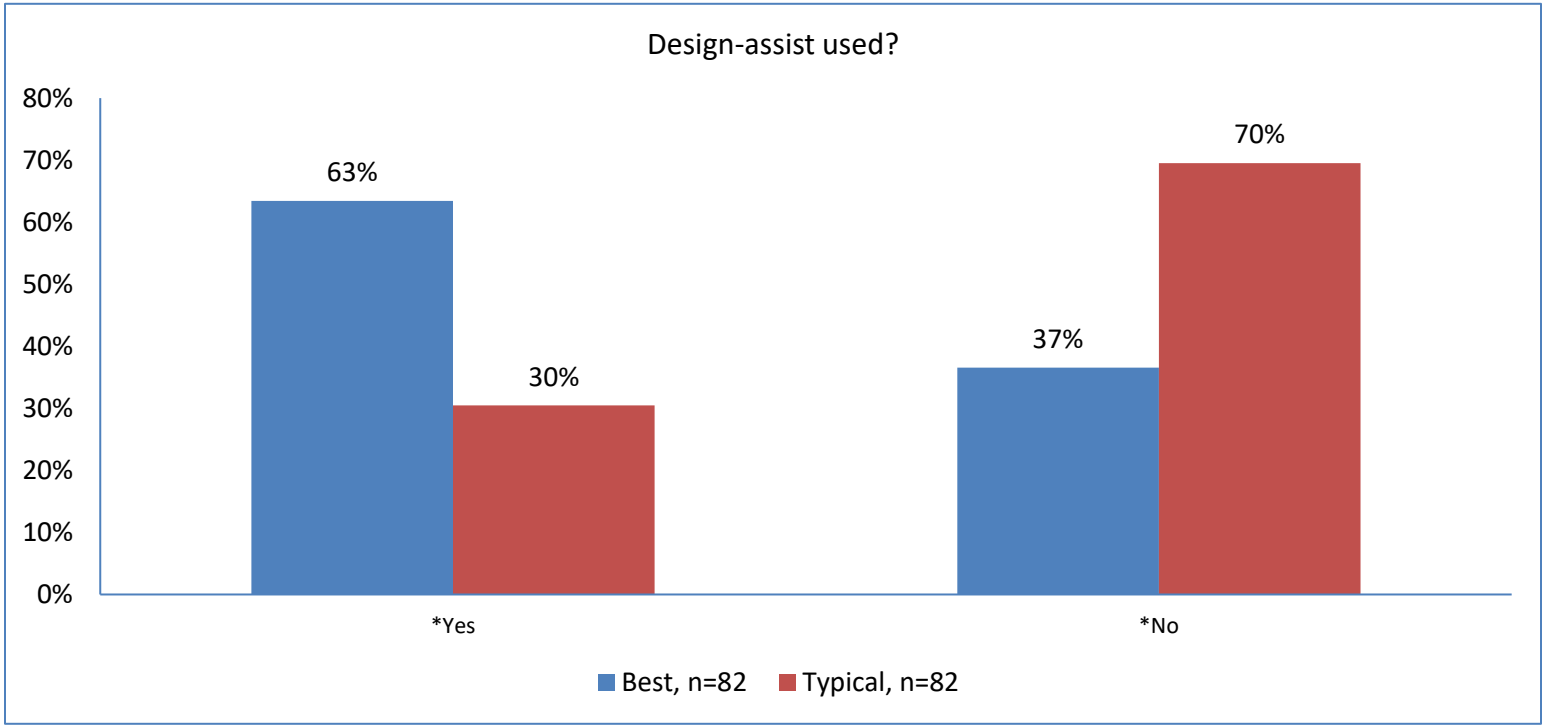
- On projects that design-build was used the approach did not differ between best and typical projects
- Contractor-led was most frequently used



qe4/6. Which of the following best describes the approach to design/build on your best project?

Commercial Factors: Design-Assist Use

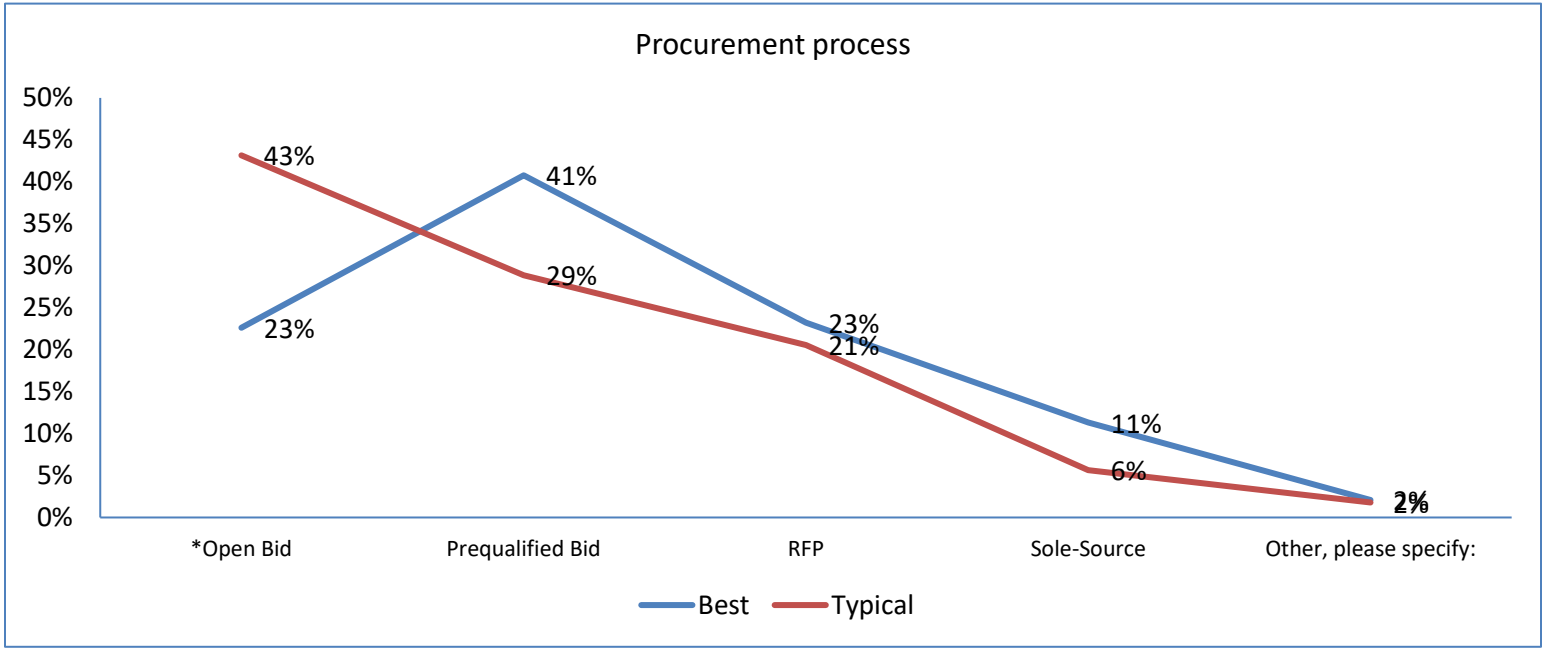
- Design-assist was used significantly more frequently on best projects



qe7. Was Design-Assist part of your typical and/or best project?

Commercial Factors: Procurement Process

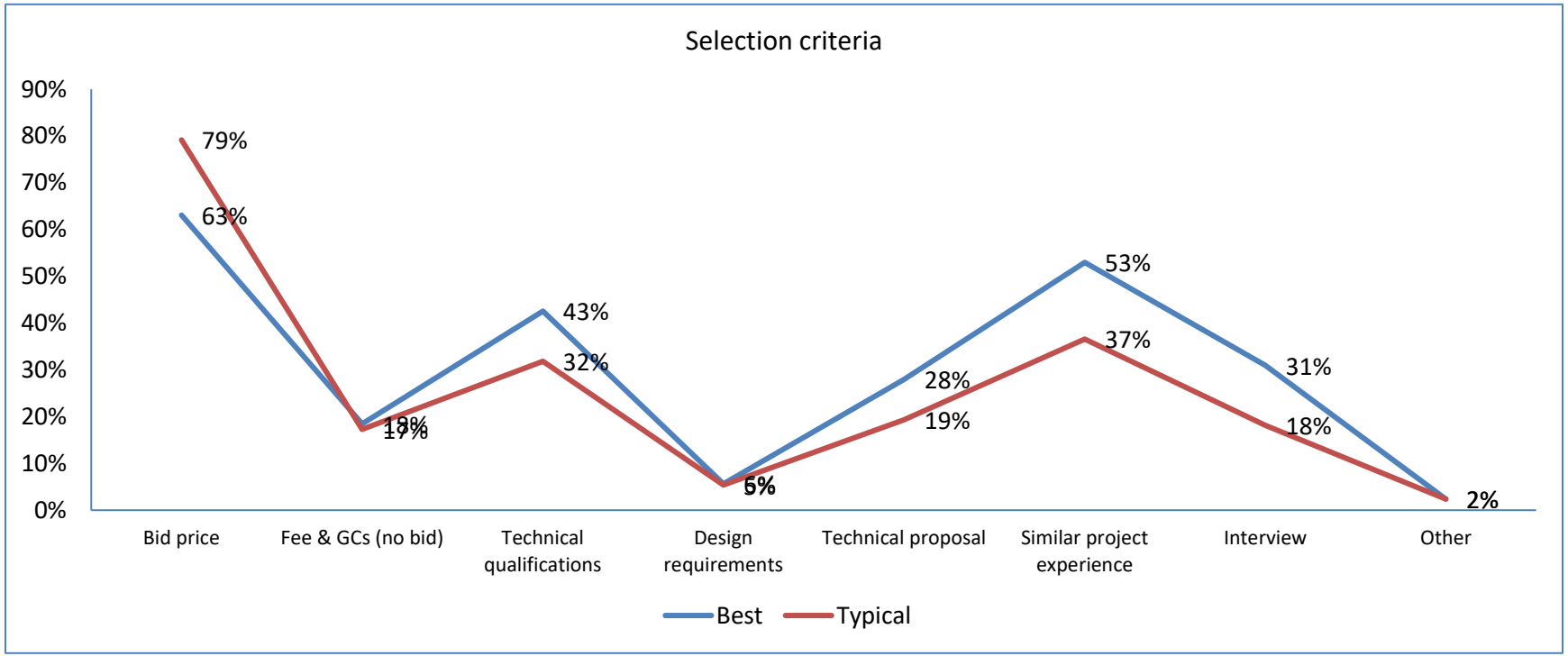
- Typical projects were more likely to use an open bid process
- While there were no significant differences in procurement processes for best projects between the different types of contractors, for typical projects, open bid was used significantly less frequently on GC/CM projects (34%) than for trades (52%) and civil contractors (61%), and prequalified bids were used significantly more frequently for GC/CM projects (35%) than for trades (21%),



qe8/9. Thinking of the best/typical project, what process was used for procurement?

Commercial Factors: Selection Criteria

- There were no significant differences for types of procurement processes used between best and typical projects
- Bid price is more common among civil contractors than GC/CMs and Fee & GCs more commonly by GC/CMs than by trade or civil contractors for both best and typical projects. However, the basic pattern below still holds for each.



qe10/11. Thinking of the best/typical project, what selection criteria was used for procurement?

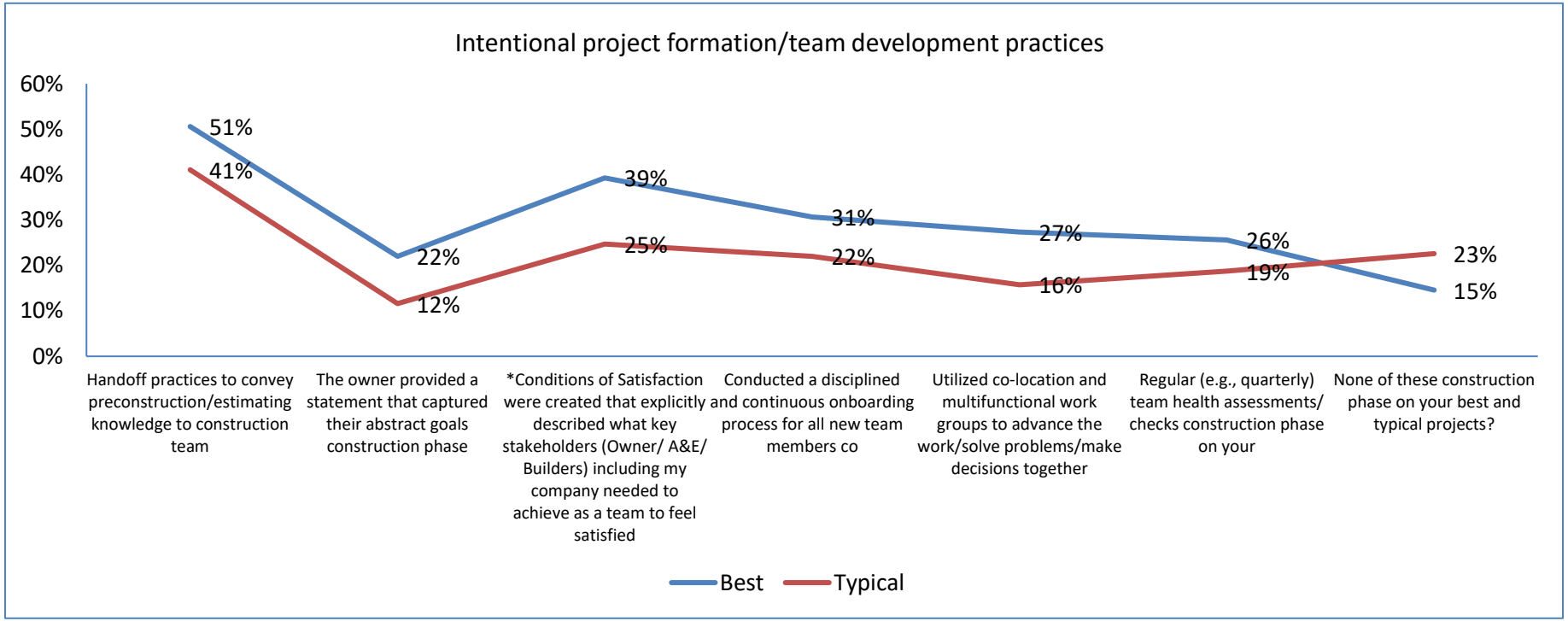
Findings

- Selection of Best v. Typical projects
- Project Outcomes
- Organizational Factors
- Commercial Factors
- **Process/Operational Factors**

- **Unless otherwise noted sample size is:**
- **Total: 336 respondents**
- **GC/CM: 187**
- **Specialty: 108**
- **Heavy civil: 41**

Process Factors: Intentional Project Formation

- Best projects were more likely to establish conditions of satisfaction key stakeholders needed to achieve as a team to feel satisfied



qf1. Which of the following Intentional Project Formation/Team Development Practices (not used as a recovery method) occurred during the pre-construction or construction phase on your best and typical projects?

Process Factors: Intentional Project Formation

- GC/CMs more frequently do regular team health assessments than trade contractors, but all three types more frequently do them on their best projects than their typical ones.
- GC/CMs are the most frequent users of at least one of these activities.

Regular (e.g., quarterly) team health assessments/ checks	GC/CM	Trades	Civil
Best	33%*	16%*	20%
Typical	27%*	7%*	12%

None of these	GC/CM	Trades	Civil
Best	11%	17%	24%
Typical	15%*	31%	37%

* denote statistical difference with one factor

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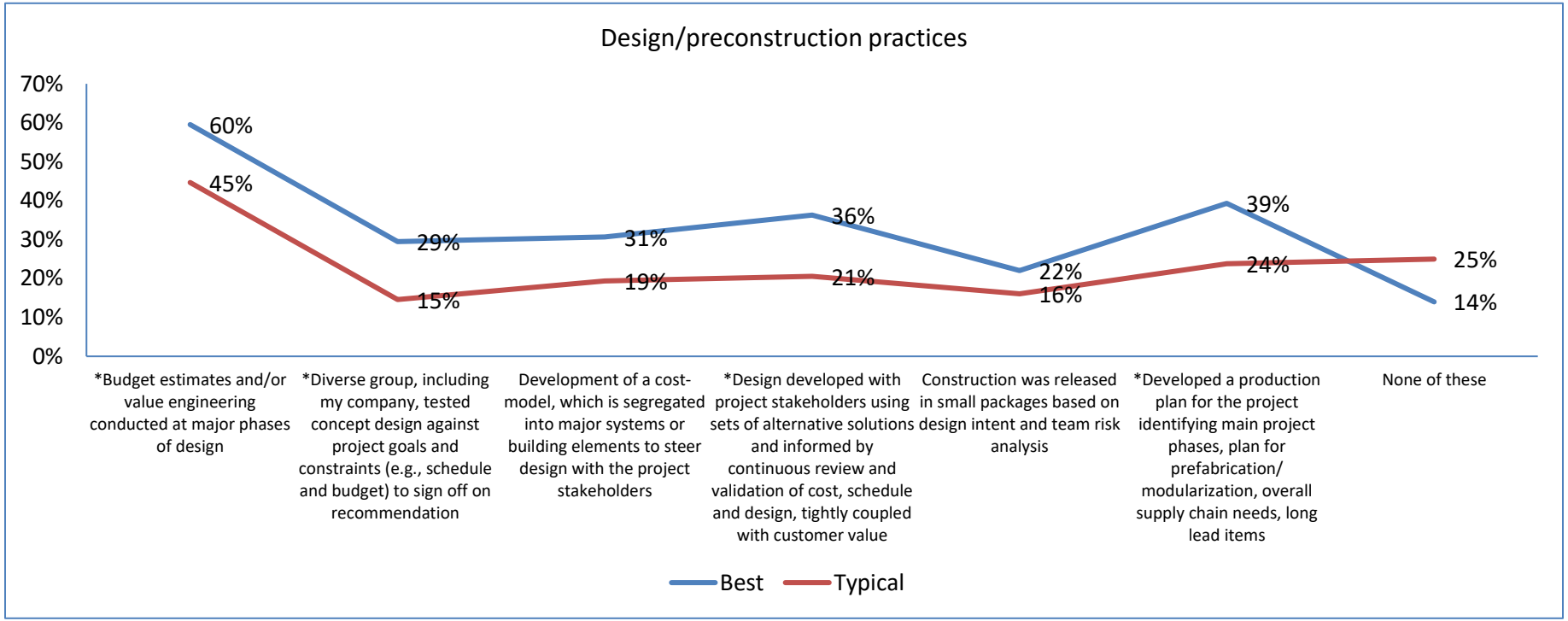
qf1. Which of the following Intentional Project Formation/Team Development Practices (not used as a recovery method) occurred during the pre-construction or construction phase on your best and typical projects?

Process Factors: Design/Preconstruction Practices

- Best projects significantly conducted more design practices including; budget estimates at major phases of design, tested concept design against project goals, an iterative design process informed by continuous review and validated against outcomes, and developed a production plan identifying main project phases



qf2. Which of the following Design/Preconstruction Practices occurred during the pre-construction phase on your best and typical projects?

Process Factors: Design/Preconstruction Practices

- There are many differences by type of contractor in the frequency of use of design/preconstruction practices for both best and typical projects

Budget estimates and/or value engineering conducted at major phases of design	GC/CM	Trades	Civil
Best	65%	54%	49%
Typical	52%**	38%	27%

Development of a cost-model, which is segregated into major systems or building elements to steer design with the project stakeholders	GC/CM	Trades	Civil
Best	40%**	20%	15%
Typical	25%*	15%	5%*

Diverse group, including my company, tested concept design against project goals and constraints (e.g., schedule and budget) to sign off on recommendation	GC/CM	Trades	Civil
Best	36%*	23%	15%*
Typical	20%	9%	5%

Design developed with project stakeholders using sets of alternative solutions and informed by continuous review and validation of cost, schedule and design, tightly coupled with customer value	GC/CM	Trades	Civil
Best	46%**	25%	24%
Typical	27%*	11%*	15%

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qf2. Which of the following Design/Preconstruction Practices occurred during the pre-construction phase on your best and typical projects?

Process Factors: Design/Preconstruction Practices

- There are many differences by type of contractor in the frequency of use of design/preconstruction practices for both best and typical projects
- GC/CMs are most frequently using at least one of these practices, especially on typical projects.

Construction was released in small packages based on design intent and team risk analysis	GC/CM	Trades	Civil
Best	29%*	13%*	15%
Typical	20%	13%	7%

None of these	GC/CM	Trades	Civil
Best	10%*	16%	27%*
Typical	18%**	30%	44%

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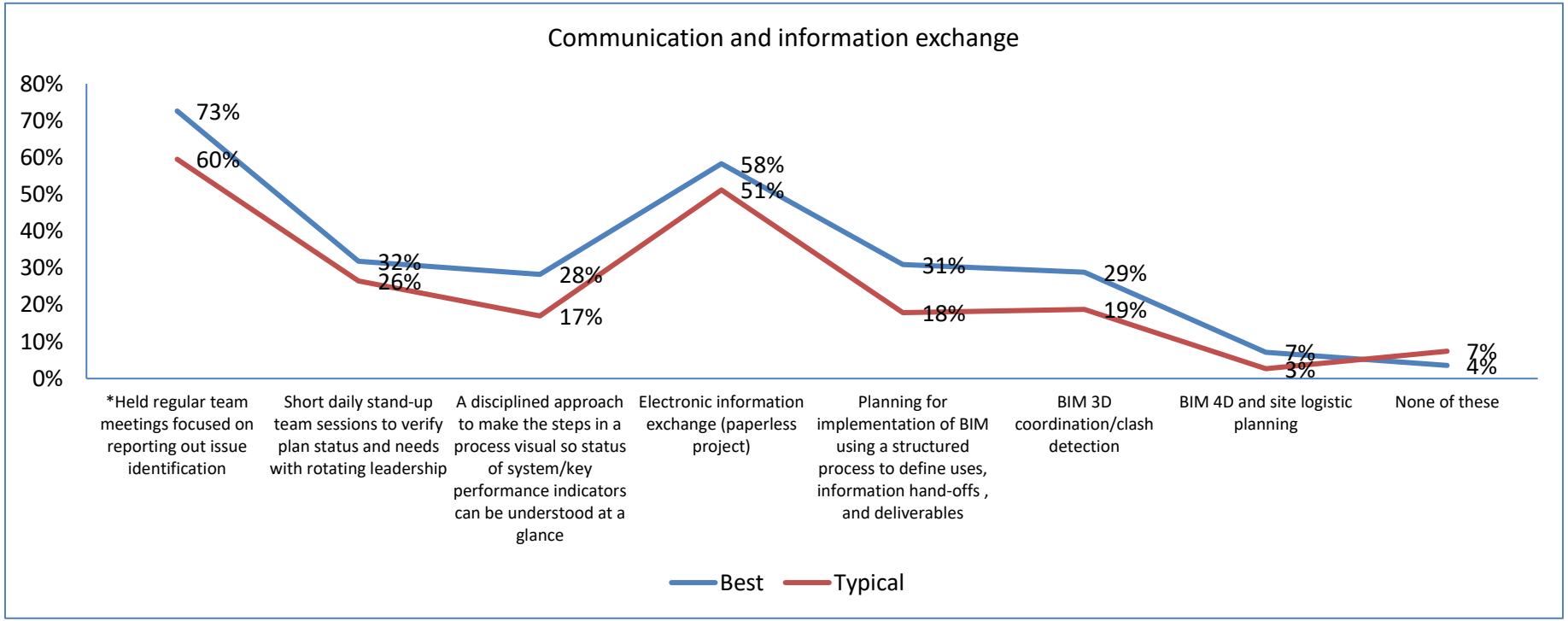
qf2. Which of the following Design/Preconstruction Practices occurred during the pre-construction phase on your best and typical projects?

Process Factors: Communication and Information Exchange

- Best projects held regular team meetings focused on reporting out issue identification more frequently than typical projects



qf3. Which of the following best describes how the team communicated and how information was exchanged during the construction phase on your best and typical projects?

Process Factors: Communication and Information Exchange

- Many significant differences exist for best and typical by contractor type for communication and information exchange, they are noted in the following tables

Held regular Owner-Architect/Engineer-Contractor meetings focused on reporting out issue identification	GC/CM	Trades	Civil
Best	79%	61%*	73%
Typical	74%	34%*	58%

BIM 3D coordination/clash detection	GC/CM	Trades	Civil
Best	12%	2%*	0%
Typical	5%	8%	17%*

Planning for implementation of building information modeling (BIM) using a structured process to define uses, information hand-offs , and deliverables	GC/CM	Trades	Civil
Best	37%	28%	10%*
Typical	23%	15%	2%*

A disciplined approach to make the steps in a process visual so status of system/key performance indicators can be understood at a glance	GC/CM	Trades	Civil
Best	32%	22%	26%
Typical	23%	8%*	10%

* denote statistical difference with one factor

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qf3. Which of the following best describes how the team communicated and how information was exchanged during the construction phase on your best and typical projects?

Process Factors: Communication and Information Exchange

- More differences for communication and information exchange

Electronic information exchange (paperless project)	GC/CM	Trades	Civil
Best	52%	56%	49%
Typical	57%	49%	31%*

None of these	GC/CM	Trades	Civil
Best	3%	3%	7%
Typical	5%	8%	17%*

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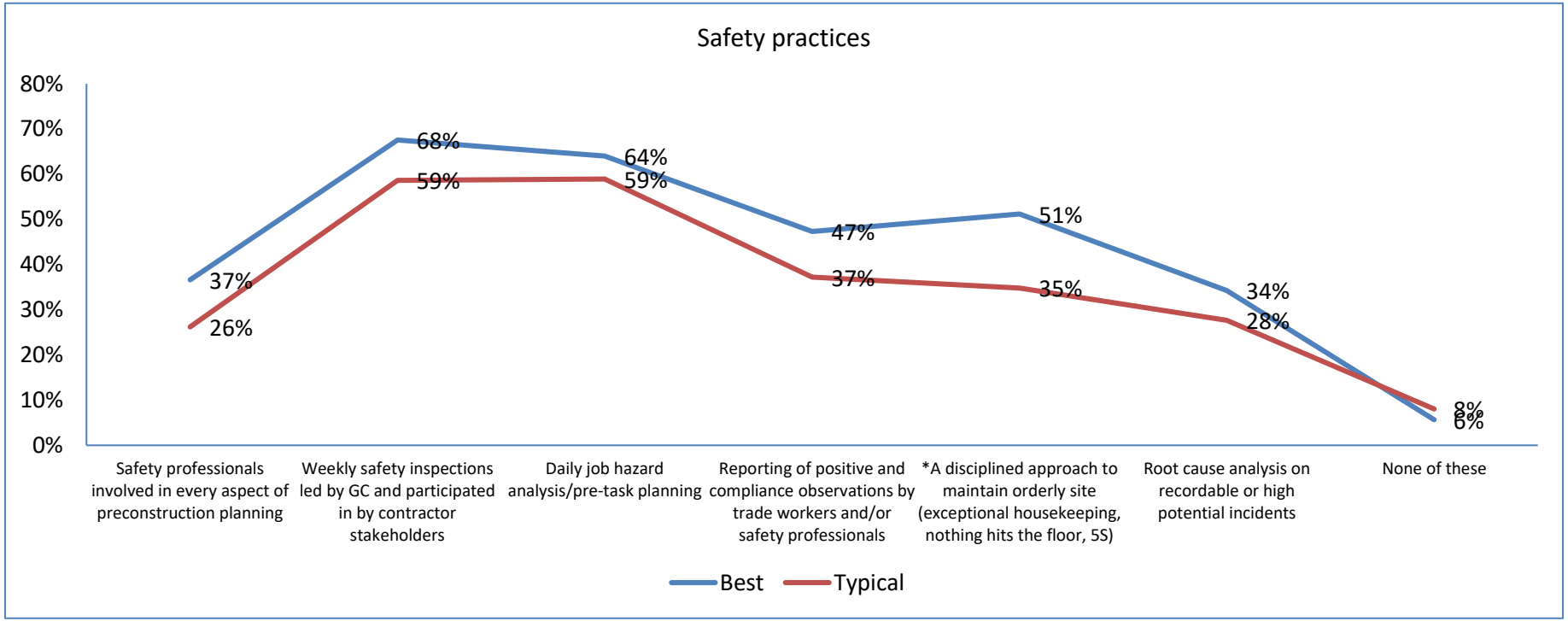
qf3. Which of the following best describes how the team communicated and how information was exchanged during the construction phase on your best and typical projects?

Process Factors: Safety Practices

- Best projects were more likely to use a disciplined approach to maintain orderly site than were typical projects



qf4. Which of the following Safety Practices occurred during the construction phase on your best and typical projects?

Process Factors: Safety Practices

- For safety practice there were many significant differences among contractor types noted in the tables below

Reporting of positive and compliance observations by trade workers and/or safety professionals	GC/CM	Trades	Civil
Best	54%	37%*	47%
Typical	44%	27%*	34%

Root cause analysis on recordable or high potential incidents	GC/CM	Trades	Civil
Best	40%	24%*	37%
Typical	33%	18%*	29%

Safety professionals involved in every aspect of preconstruction planning	GC/CM	Trades	Civil
Best	40%	28%	44%
Typical	31%	16%*	32%

Weekly safety inspections led by GC and participated in by contractor stakeholders	GC/CM	Trades	Civil
Best	72%	66%	54%
Typical	69%	44%*	49%

A disciplined approach to maintain orderly site (exceptional housekeeping, nothing hits the floor, 5S)	GC/CM	Trades	Civil
Best	54%	46%	49%
Typical	42%	27%*	24%

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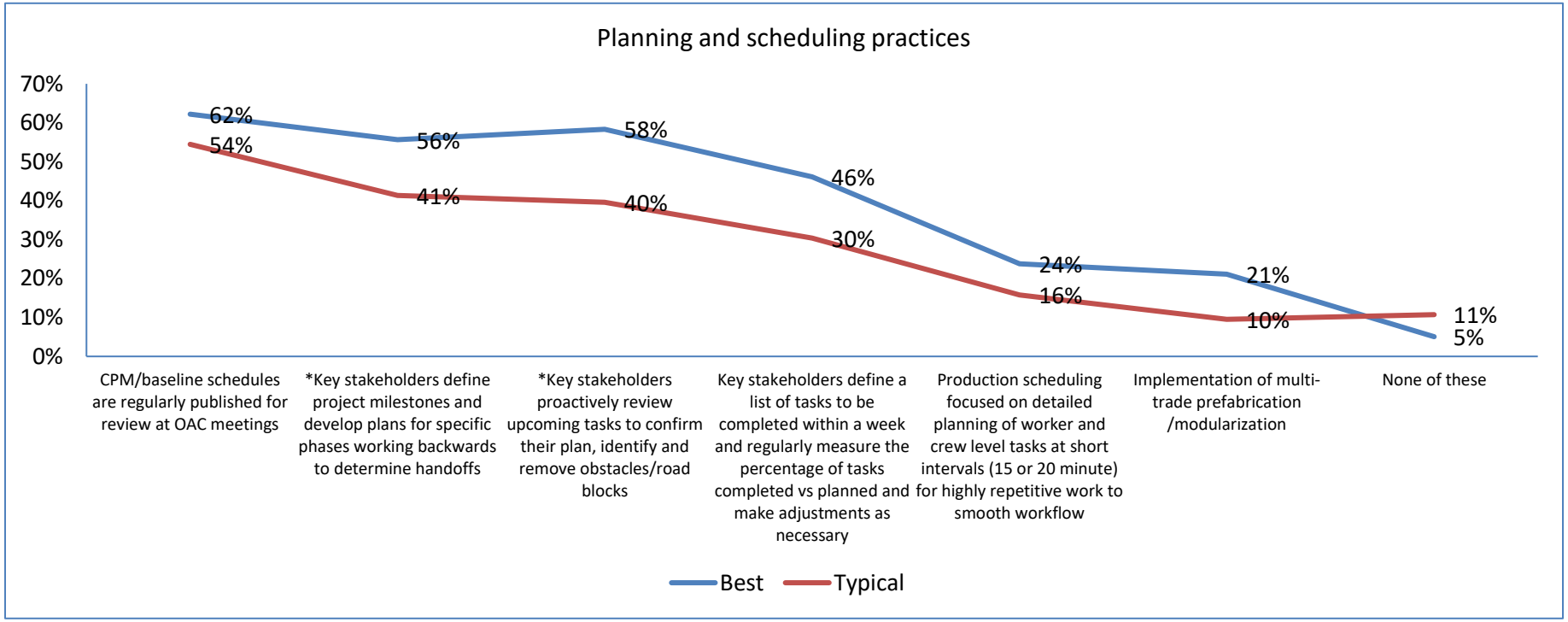
qf4. Which of the following Safety Practices occurred during the construction phase on your best and typical projects?

Process Factors: Planning and Scheduling Practices

- Best projects were more likely to have key stakeholders to help define project milestones and develop plans for phases working backwards to determine handoffs, and define weekly task lists and measure the percentage of tasks completed to make necessary adjustments to plans



qf5. Which of the following Planning and Scheduling Practices occurred during the construction phase on your best and typical projects?

Process Factors: Planning and Scheduling Practices

- For planning and scheduling practices only two differences were noted among contractor groups for items; CPM/baseline schedules are regularly published, and Key stakeholders define a list of tasks to be completed within a week and regularly measure the percentage of tasks completed vs planned and adjust as necessary

CPM/baseline schedules are regularly published for review at OAC meetings	GC/CM	Trades	Civil
Best	76%	46%*	54%
Typical	68%	37%*	39%

Key stakeholders define a list of tasks to be completed within a week and regularly measure the percentage of tasks completed vs planned and make adjustments as necessary	GC/CM	Trades	Civil
Best	52%	44%	27%*
Typical	37%	25%	12%*

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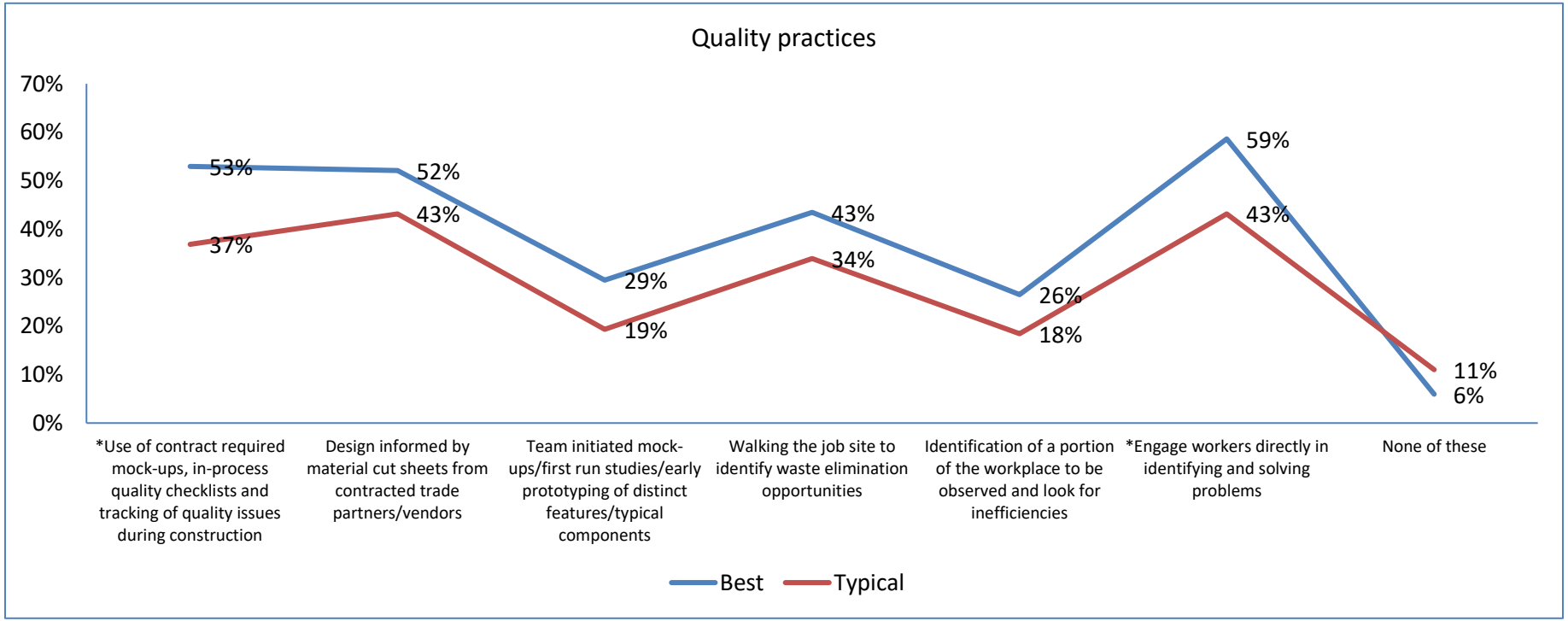
qf5. Which of the following Planning and Scheduling Practices occurred during the construction phase on your best and typical projects?

Process Factors: Quality Practices

- Use of contract required mock-ups, in-process quality checklists and tracking of quality issues during construction and engaging workers directly in identifying and solving problems were practices more frequently conducted on best projects



qf6. Which of the following Quality Practices occurred during the construction phase on your best and typical projects?

Process Factors: Quality Practices

- Many significant differences exist among contractor types for quality practices, see tables for specific differences

Use of contract required mock-ups, in-process quality checklists and tracking of quality issues during construction	GC/CM	Trades	Civil
Best	65%**	45%	32%
Typical	48%**	23%	22%

Team initiated mock-ups/first run studies/early prototyping of distinct features/typical components	GC/CM	Trades	Civil
Best	37%**	22%	15%
Typical	24%	15%	12%

Walking the job site to identify waste elimination opportunities	GC/CM	Trades	Civil
Best	48%	40%	32%
Typical	41%	23%*	29%

Identification of a portion of the workplace to be observed and look for inefficiencies	GC/CM	Trades	Civil
Best	32%	19%	22%
Typical	24%	12%*	12%

None of these	GC/CM	Trades	Civil
Best	4%	7%	10%
Typical	6%**	17%	20%

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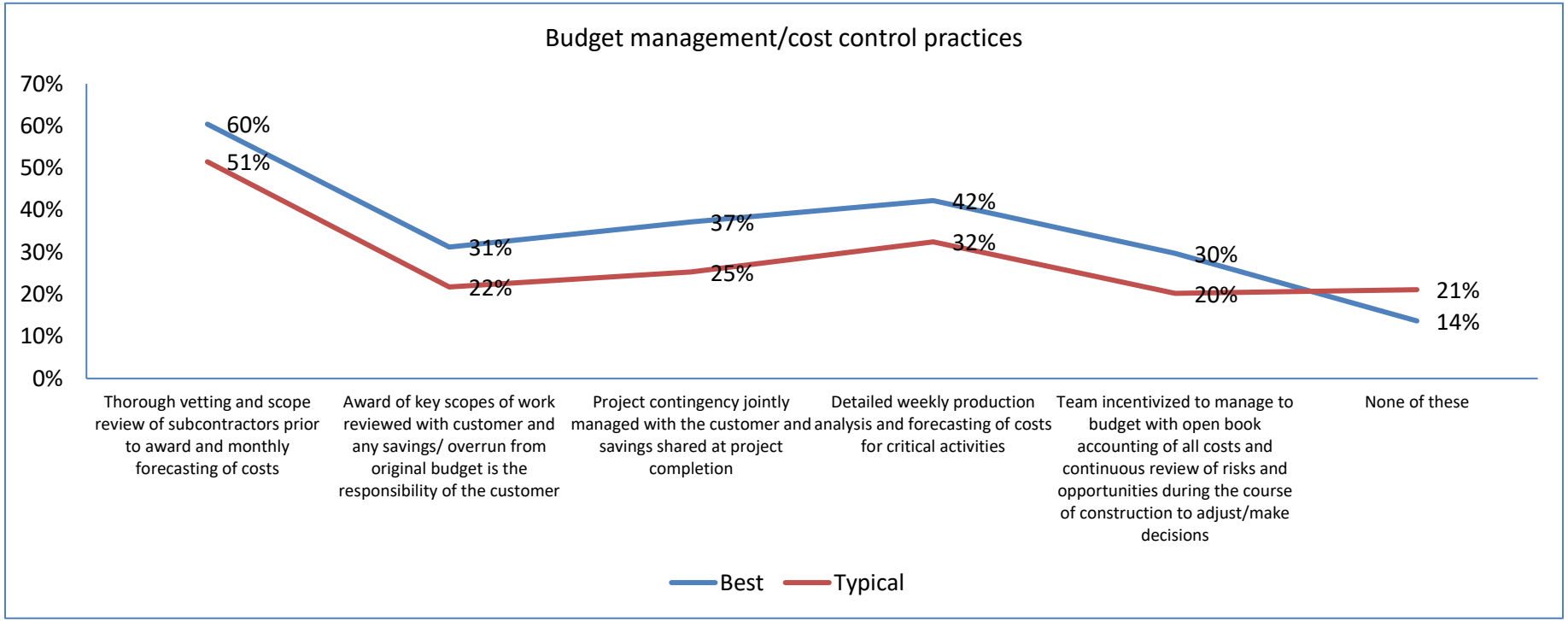
qf6. Which of the following Quality Practices occurred during the construction phase on your best and typical projects?

Process Factors: Budget Management & Cost Control Practices

- Budget management/cost control practices were consistent across best and typical projects, no significant differences in any practices were found



qf7. Which of the following Budget Management/Cost Control Practices occurred during the construction phase on your best and typical projects?

Process Factors: Budget Management & Cost Control Practices

- Budget management/cost control practices were consistent across best and typical projects, however significant differences among contractor groups were found and are noted below

Thorough vetting and scope review of subcontractors prior to award and monthly forecasting of costs	GC/CM	Trades	Civil
Best	73%**	46%	42%
Typical	67%**	31%	34%

Project contingency jointly managed with the customer and savings shared at project completion	GC/CM	Trades	Civil
Best	53%**	15%	24%
Typical	35%	10%*	22%

Team incentivized to manage to budget with open book accounting of all costs and continuous review of risks and opportunities during the course of construction to adjust/make decisions	GC/CM	Trades	Civil
Best	36%	18%*	29%
Typical	26%	8%**	24%

Detailed weekly production analysis and forecasting of costs for critical activities	GC/CM	Trades	Civil
Best	45%	37%	44%
Typical	37%	22%*	29%

None of these	GC/CM	Trades	Civil
Best	6%**	26%	17%
Typical	8%**	42%	27%

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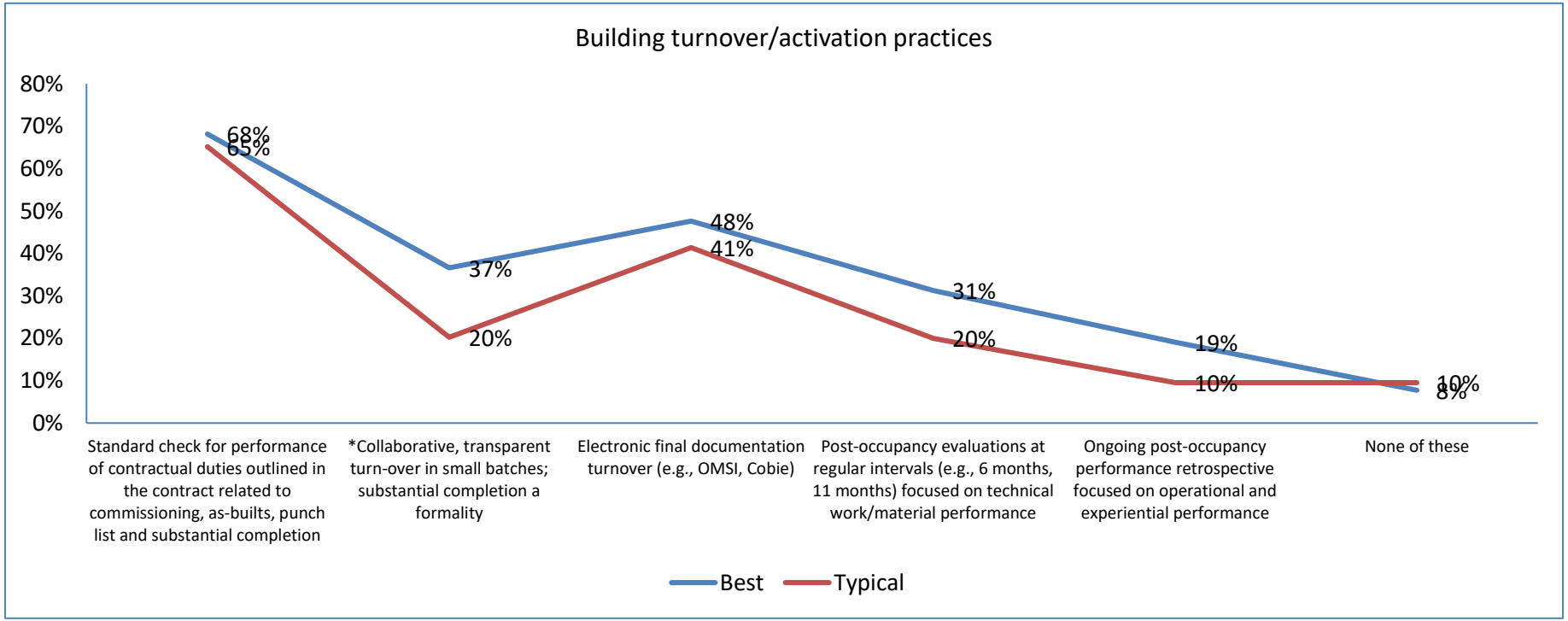
qf7. Which of the following Budget Management/Cost Control Practices occurred during the construction phase on your best and typical projects?

Process Factors: Building Turnover and Activation Practices

- Best projects were more likely to use a collaborative, transparent turn-over in small batches practice than typical projects



qf8. Which of the following building turnover/activation practices occurred following the construction phase on your best and typical projects?

Process Factors: Building Turnover and Activation Practices

- Building turnover and activation practices had several significant differences among contractor groups, noted in tables below

Standard check for performance of contractual duties outlined in the contract	GC/CM	Trades	Civil
Best	44%	29%*	24%
Typical	27%	13%*	10%

Electronic final documentation turnover	GC/CM	Trades	Civil
Best	59%**	36%	27%
Typical	50%**	32%	24%

Post-occupancy evaluations at regular intervals focused on technical work/material performance	GC/CM	Trades	Civil
Best	41%**	21%	12%
Typical	30%**	7%	5%

Ongoing post-occupancy performance retrospective focused on operational and experiential performance	GC/CM	Trades	Civil
Best	26%**	13%	5%
Typical	13%	5%	5%

Standard check for performance of contractual duties outlined in the contract	GC/CM	Trades	Civil
Best	69%	69%	61%
Typical	72%	56%*	61%

None of these	GC/CM	Trades	Civil
Best	3%**	12%	20%
Typical	3%**	16%	22%

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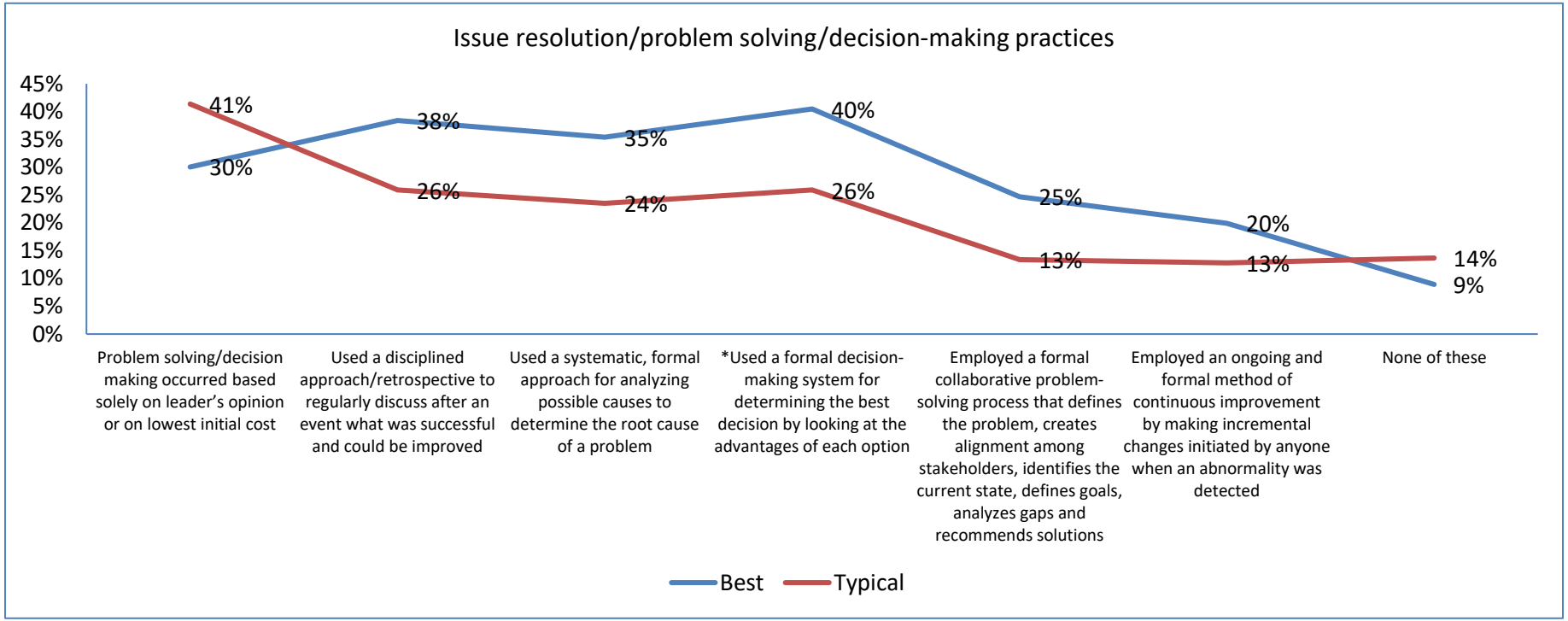
qf8. Which of the following building turnover/activation practices occurred following the construction phase on your best and typical projects?

Process Factors: Issue Resolution & Decision-Making Practices

- Using a formal decision-making system for determining the best decision by looking at the advantages of each option was more frequently done on best projects than typical ones



qf9. Which of the following were issue resolution/problem solving/decision-making practices used on your best and typical projects?

Process Factors: Issue Resolution & Decision-Making Practices

- Significant difference among contractor groups for issue resolution and decision-making practices are noted below

Used a disciplined approach to discuss after an event what was successful and could be improved	GC/CM	Trades	Civil
Best	45%	28%*	36%
Typical	31%	19%	24%

Used a formal approach to determine the root cause of a problem	GC/CM	Trades	Civil
Best	40%	26%*	39%
Typical	29%	14%*	24%

Used a decision-making system for determining the best decision by looking at the advantages of each option	GC/CM	Trades	Civil
Best	46%	37%	27%
Typical	33%	16%*	22%

Employed a collaborative process defining the problem, create alignment among stakeholders, identify the current state, defines goals, analyzes gaps and recommends solutions	GC/CM	Trades	Civil
Best	32%	15%*	17%
Typical	18%	6%*	15%

Standard check for performance of contractual duties outlined in the contract	GC/CM	Trades	Civil
Best	69%	69%	61%
Typical	72%	56%*	61%

None of these	GC/CM	Trades	Civil
Best	5%	15%*	10%
Typical	10%	18%	20%

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qf9. Which of the following were issue resolution/problem solving/decision-making practices used on your best and typical projects?