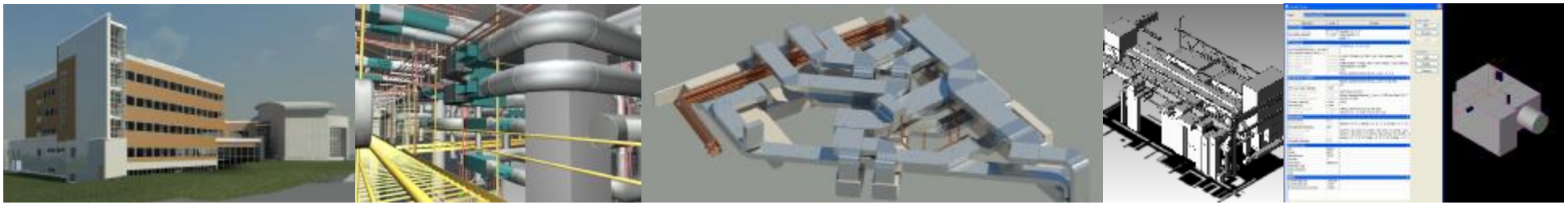
McGraw-Hill Construction Research on BIM Users



FEDERAL FACILITIES COUNCIL

Steve Jones
McGraw-Hill Construction

Images: Dunham Engineering, University Mechanical

McGraw Hill CONSTRUCTION

Speaker

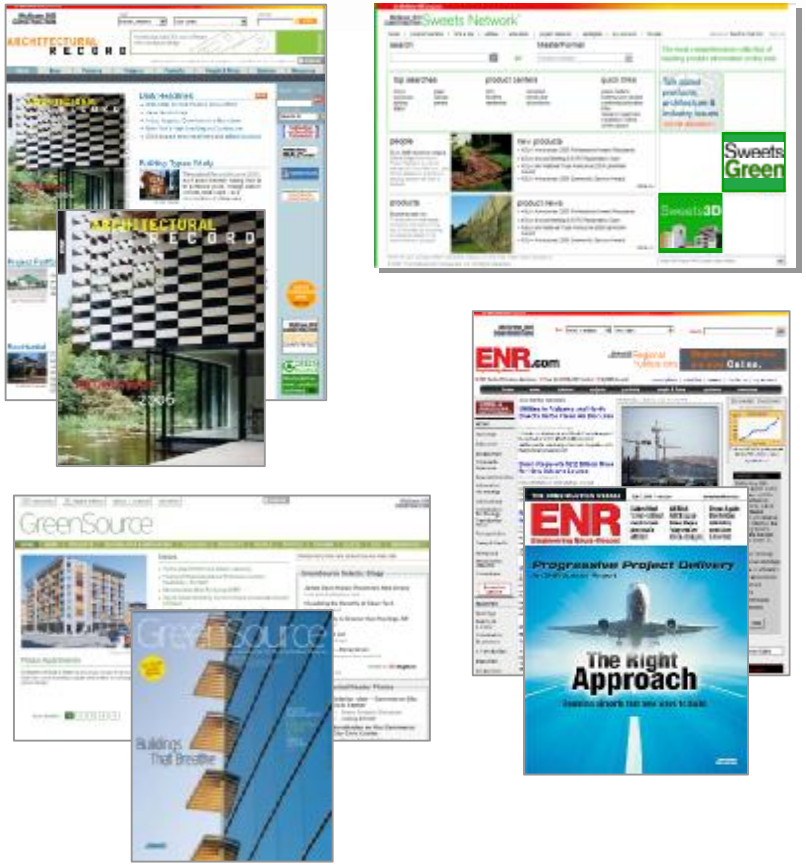
Steve Jones

- **BA from Johns Hopkins, MBA from Wharton**
- **19 years in Design**
  - *Principal, Burt Hill (1,400-person global A/E firm)*
- **3 years in Technology**
  - *Vice President, Primavera Systems*
- **6 years McGraw-Hill Construction**
  - *Business Development for content and technology*
  - *Thought Leadership re: BIM, Virtual Design & Construction, Integrated Project Delivery*

McGraw-Hill Construction

McGraw-Hill CONSTRUCTION

Dodge
Sweets
Architectural Record
ENR
Regional Publications



Research

construction.ecnext.com

CASRO

McGraw-Hill CONSTRUCTION

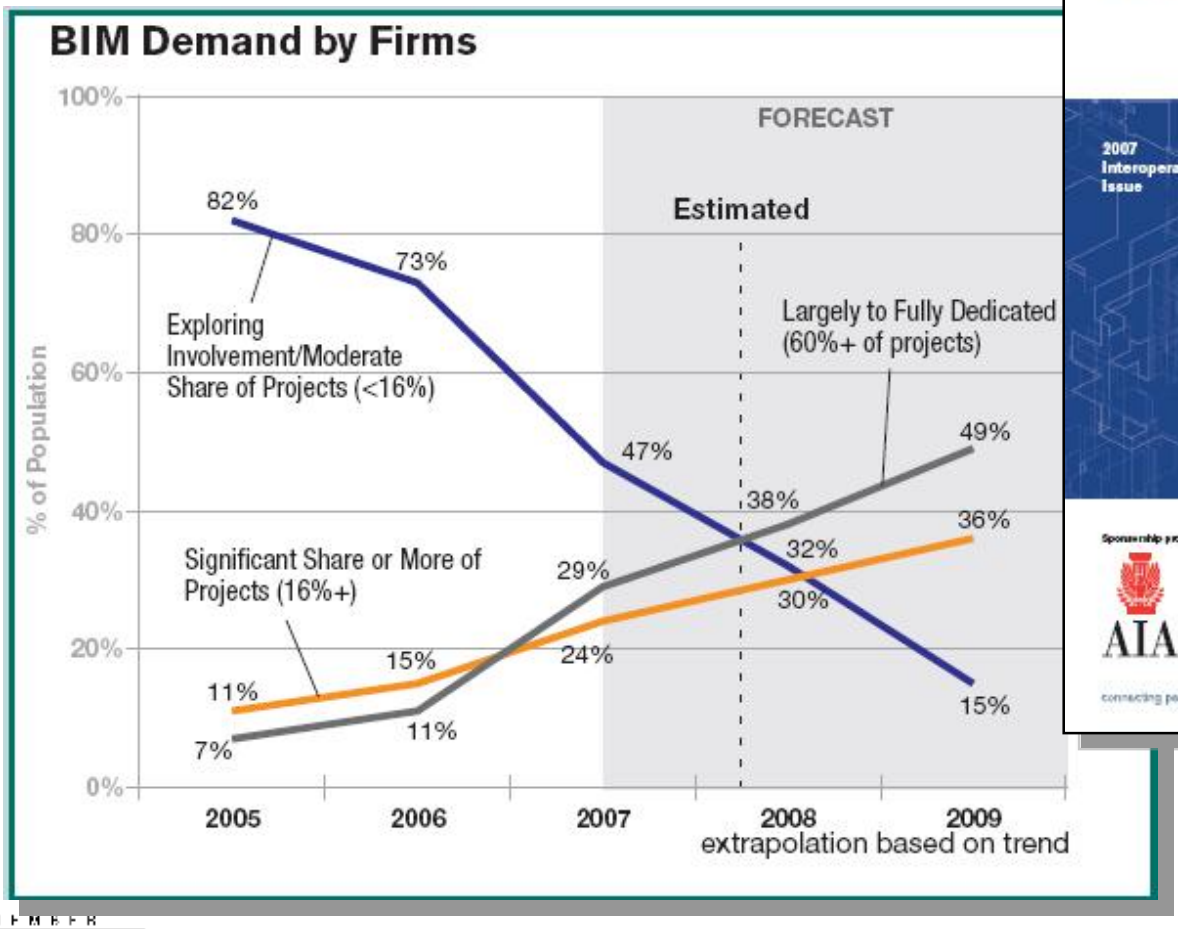
SmartMarket Report on Interoperability (Nov 2007)

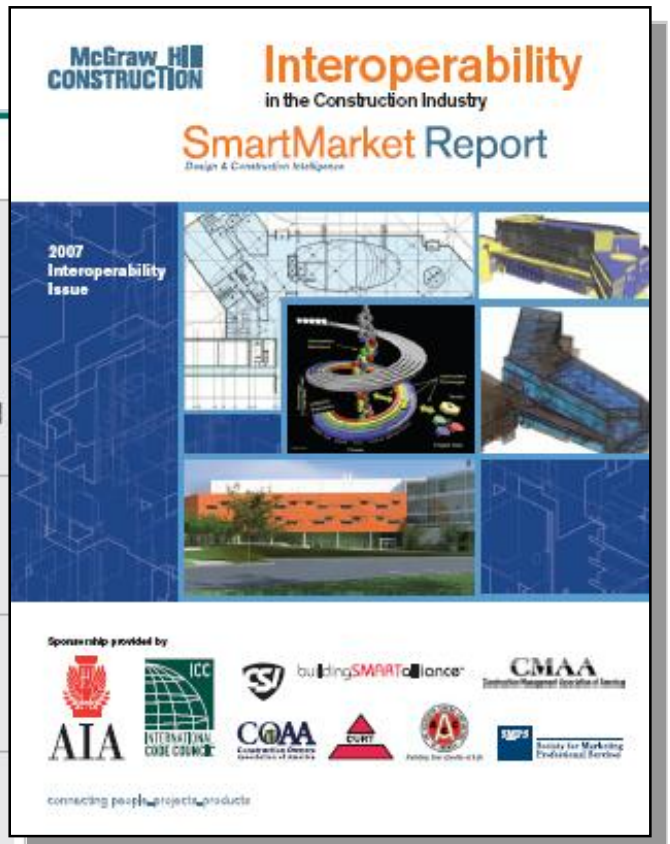
- 3% of project cost related to lack of interoperability

Sponsored by 9 Industry Associations

SmartMarket Report on Interoperability (Nov 2007)

- 3% of project cost related to lack of interoperability
- BIM "tipping point" in AEC/O in 2008





McGraw-Hill Construction

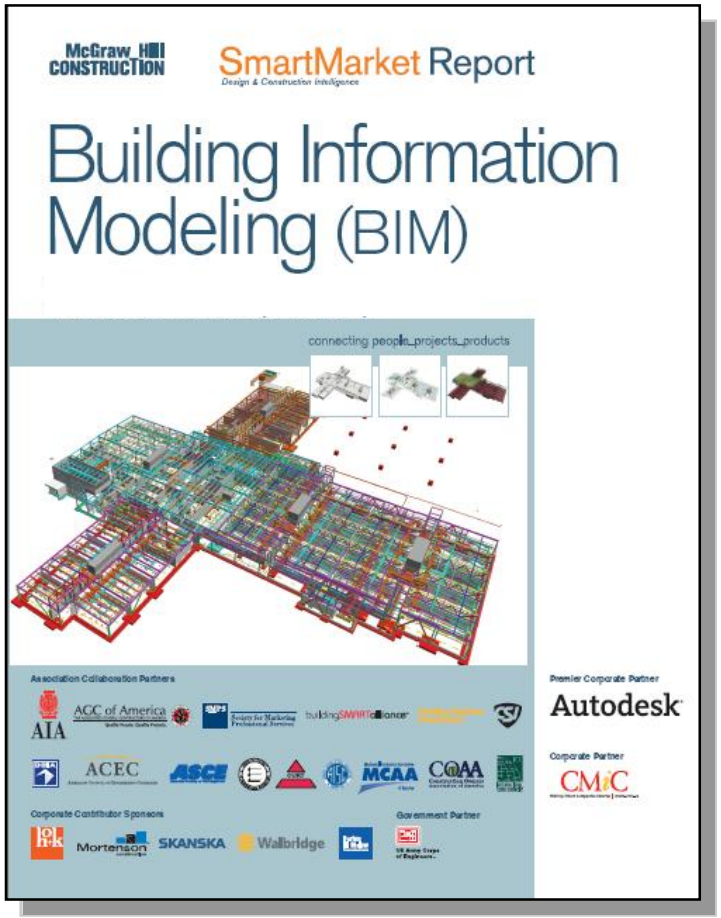
- **Not "IF", but "WHEN"**
- **2008 research focused on BIM users**
  - Impact of Adoption and Implementation
    - **Internal, External**
  - Determining Value of BIM
    - **Qualitative and Quantitative**
  - BIM Infrastructure
    - **Content**
    - **Hardware, Software, Model management, Interoperability**
    - **Training, Certification**
    - **Contracts**

McGraw-Hill Construction SmartMarket Report on BIM

Released December 4, 2008

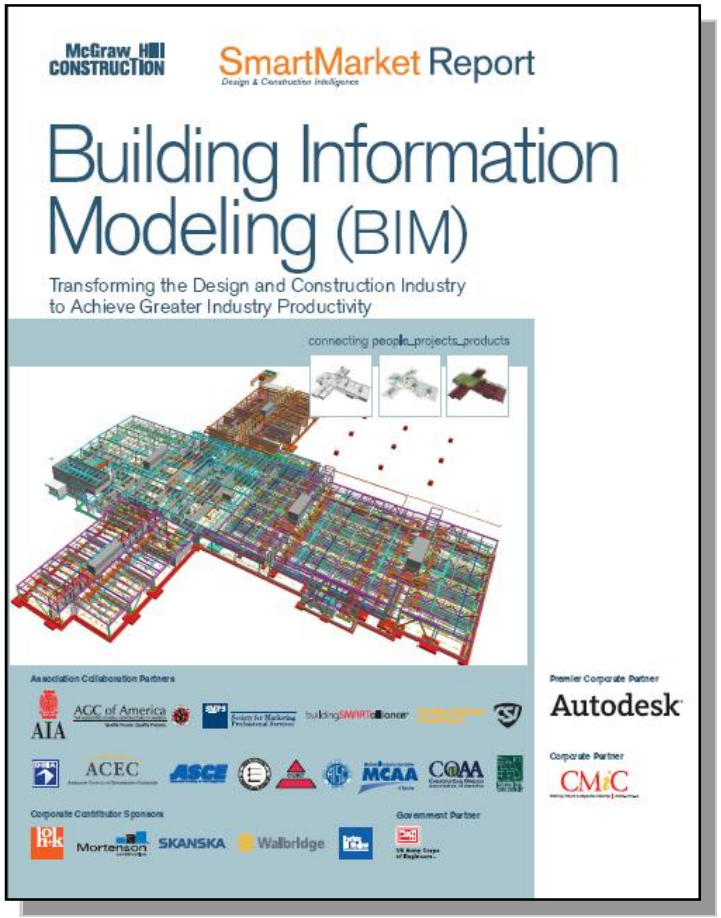
23 Sponsors:

- ***Corporate (7):***
  - Autodesk (Premier Corporate Partner)
  - CMiC (Corporate Partner)
  - Barton Malow
  - HOK
  - Mortenson Construction
  - Skanska
  - Walbridge
- ***Associations (15):***
  - AGC, ACEC, AIA, AISC, ASCE, ASPE, CURT, COAA, CSI, DBIA, ICC, MCAA, SMPS, buildingSMART Alliance, and Charles Pankow Foundation
- ***Government:***
  - U.S. Army Corps of Engineers



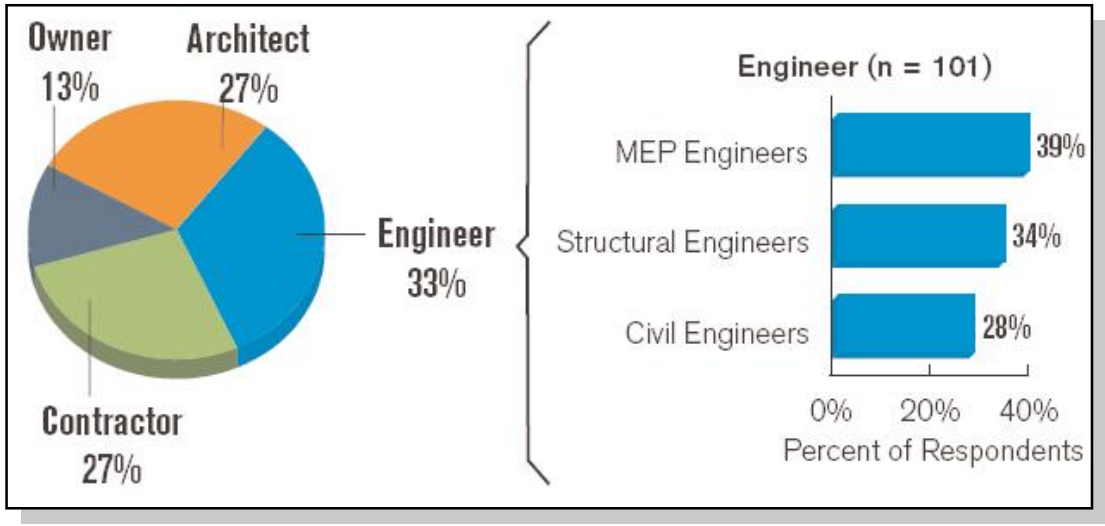
McGraw-Hill Construction SmartMarket Report on BIM

- **Study only BIM users**
- **Track 5 major aspects:**
  - Adoption
  - Implementation
  - ROI
  - Impact (internal, external)
  - Infrastructure (Standards, Content, Software, Training, Certification, Outsourcing)
- **Baseline for future progress**
  - Aspects that will change over time
  - Future Follow-Up Studies



Research Process

- **40 minute phone interviews**
  - 35 page survey questionnaire
  - Vetted by sponsors
- **302 BIM users***
  - 39 Owners
  - 80 Contractors
    - **CM, GC and Trade**
  - 101 Engineers
    - **Civil, MEP, Structural**
  - 82 Architects



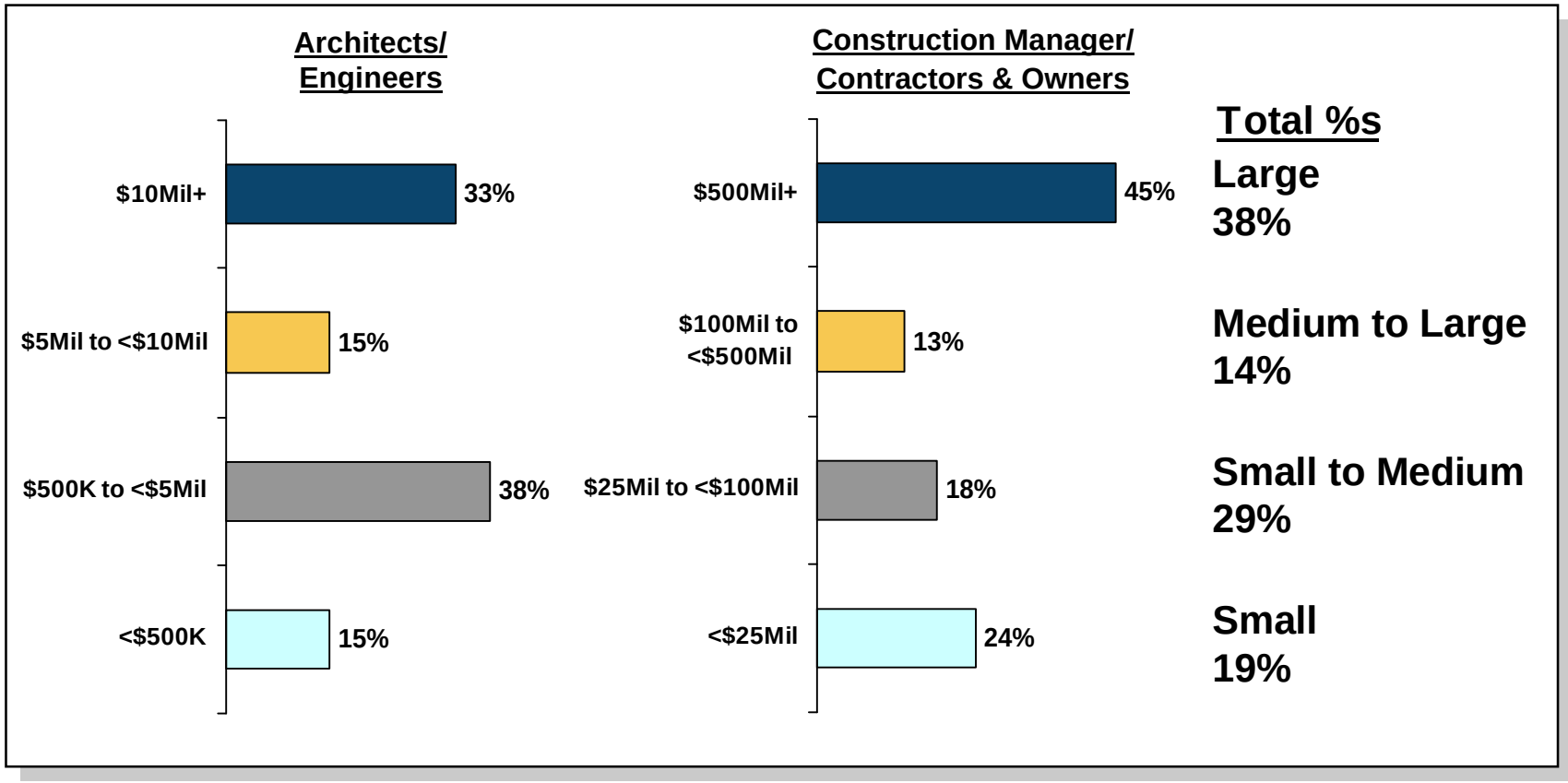
(*statistically significant)

MEMBER CASRO

McGraw Hill CONSTRUCTION

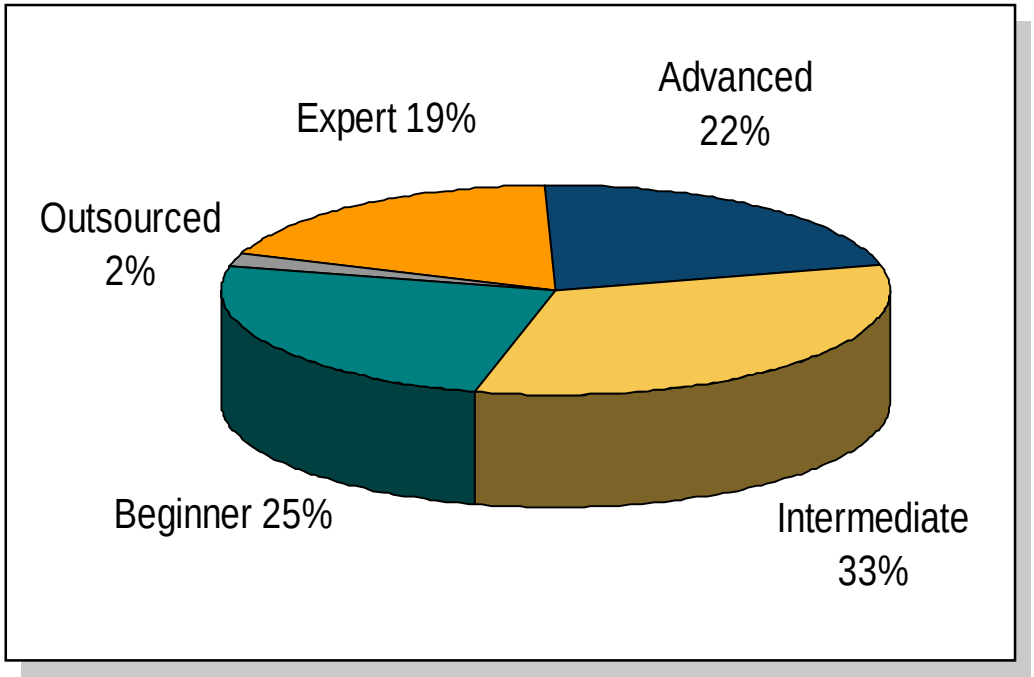
Screening by Company Size

è 4 tiers of company sizes (S, S-M, M-L, L)



Screening by BIM Sophistication

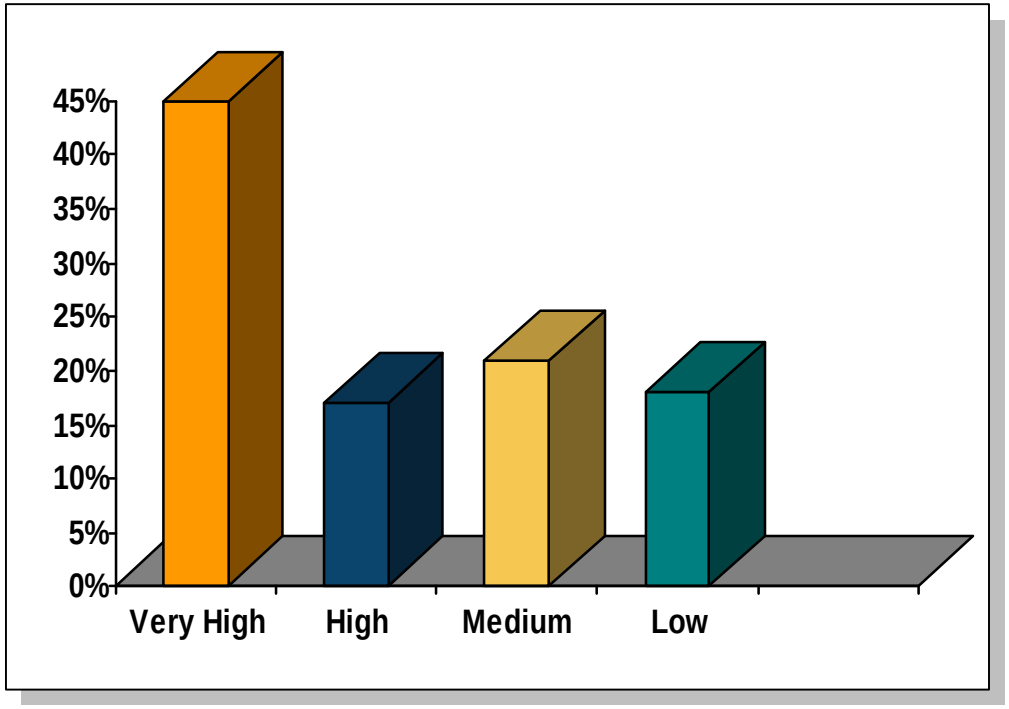
- 19% Expert
- 22% Advanced
- 33% Intermediate
- 25% Beginner
- 2% Outsourced



Screening by Current & Future BIM Projects

è BIM project involvement (2009 forecast)

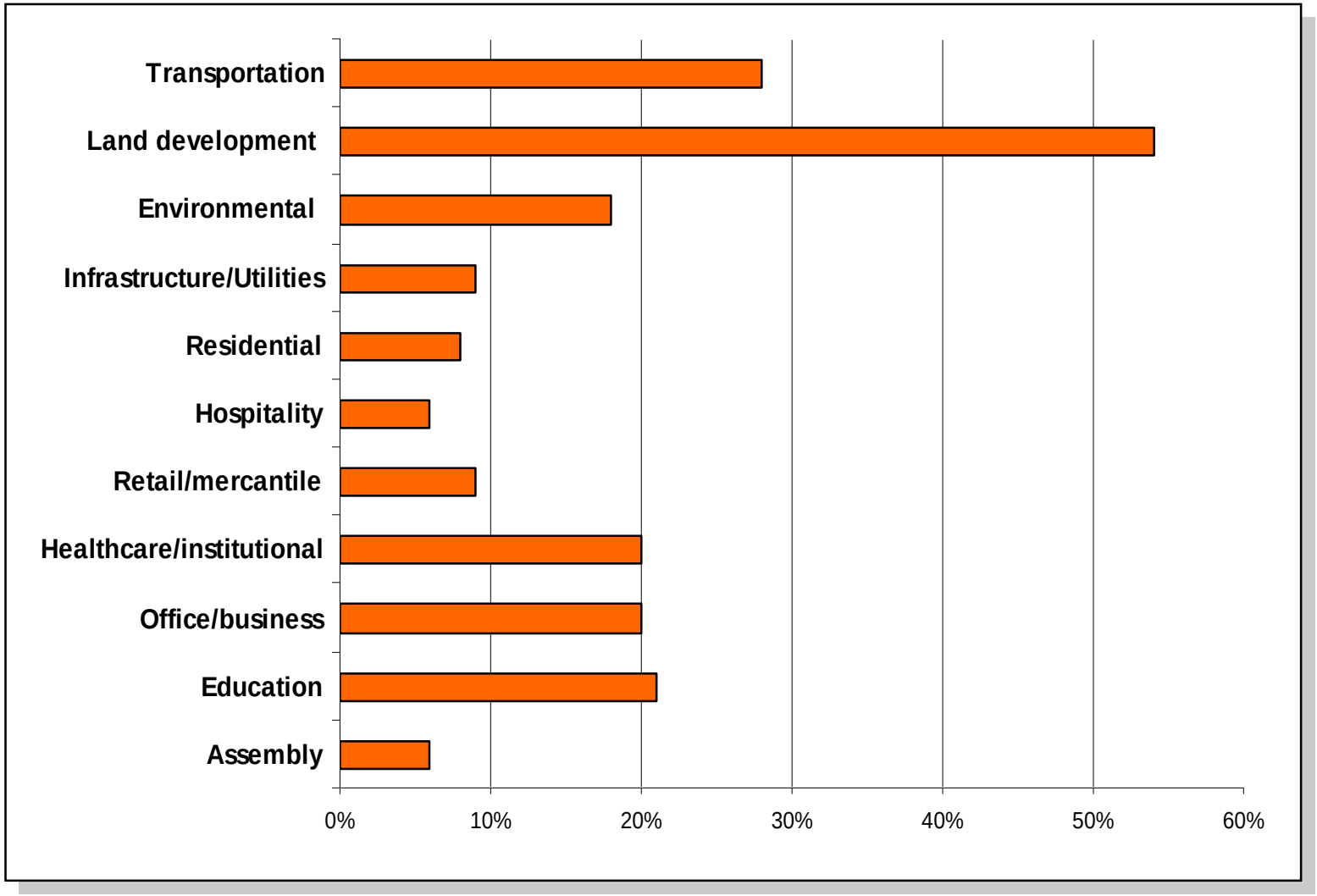
- 45% Very High [>60%]
- 17% High [30-60%]
- 21% Medium [15-30%]
- 18% Low [<15%]



MEMBER CASRO

McGraw Hill CONSTRUCTION

Screening by Project Types



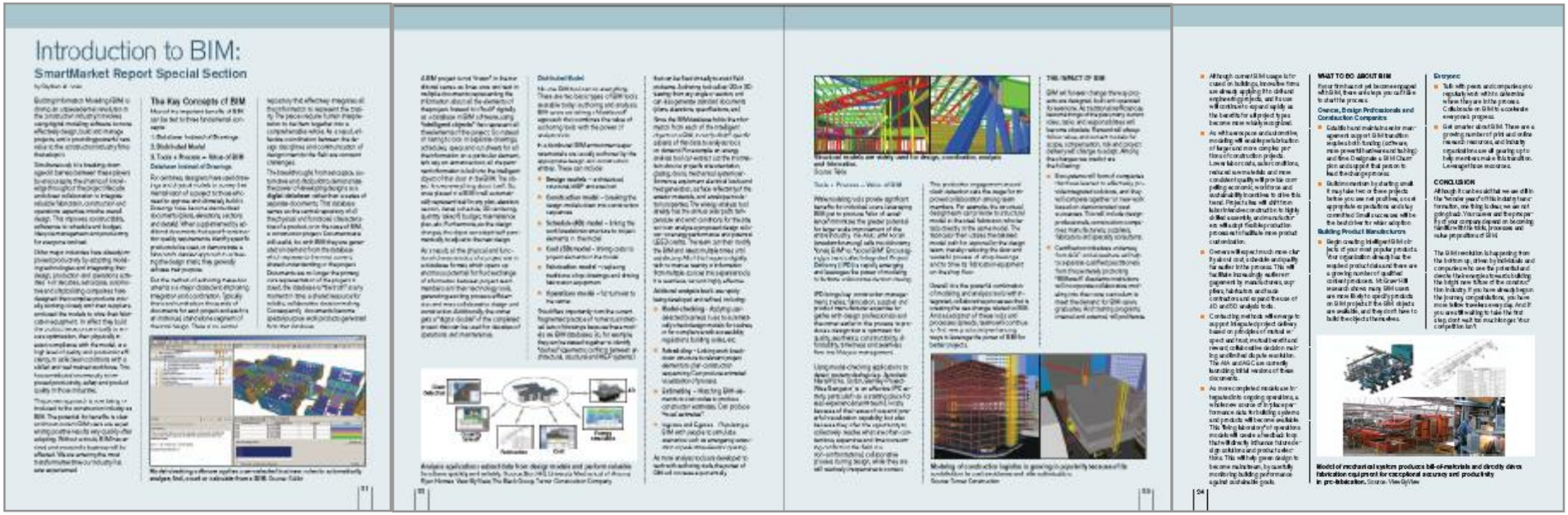
Major Findings

- **63% of BIM users will use it on more than 30% of their projects in 2009**
- **72% of BIM users say that BIM has had an impact on their internal project processes**
- **82% of Expert BIM users believe that BIM has a very positive impact on their company's productivity**
- **Contractors expect to see the greatest % growth of BIM use in 2009**
- **Users who measure it report higher ROI than the perceived ROI of those going on "gut feel"**

McGraw-Hill Construction SmartMarket Report on BIM

Released December 4, 2008

- Special Section: 4pp center
  - **“Introduction to BIM” as a tutorial**
  - **Please distribute as much as you need to help people get on board**


Introduction to BIM:
SmartMarket Report Special Section

BIM Case Studies

INFRASTRUCTURE

- **PCL Construction**
  - "Lonely BIM"

Case Study:

PCL Construction

by Bruce Buckley

Change doesn't often come quickly to companies with over a century of experience. In the construction world, BIM (the advent of BIM) has executives at PCL Construction based in Denver, Colorado, rethinking their view on internal structures and process. The 102-year-old firm is undergoing a transformation that uses BIM to make virtual design and construction (VDC) a new way part of its practice.

"In three years, we want VDC to be fully integrated into what we do," says Ed Haugland, virtual construction manager at PCL.

The company's VDC initiative is to build projects twice—once in the virtual world and once in the real world. Before crews take to the field, a project is modeled virtually. PCL teams use BIM to create a prototype where they can identify issues before they have an impact on budget and schedule. When it's time to build the project in the real world, Haugland says the goal is to have eliminated at least 50 percent of issues before they reach the field.

The process redefines roles engineers' inputs the team minimizes redesigns, requests for information, coordination issues and rework on site.

Through VDC, the company aims to improve risk management and communication.

"It's about spending more time planning and less time fighting fires," Haugland says.

Big Returns

So far, the initiative is paying off in a big way for the company. Haugland estimates that PCL is realizing roughly a 500 percent return on investment with BIM. The vast majority of that payback is coming from client satisfaction efforts that greatly reduce costly change orders. However, the company realizes additional benefits that aren't calculated into ROI.

Memorial Hospital, Colorado Springs, Colorado

This hard-to-quantify savings time and effort" he says. "Some of it is just gut feeling. A lot of what we do results in 'problem avoidance.' That's a benefit that's reliable in the construction industry, whether you can quantify it or not."

As traditional lines of process change, so does internal hierarchy. Haugland oversees PCL's BIM initiative from the corporate level—a position that didn't exist five years ago. The company has also hired a lead zone full-time BIM modeler in each of its 12 U.S. districts. "We had to create those positions and are working on making a career path for them," he says.

The goal is to have at least one "BIM champion" in each district, who can serve as a BIM expert and oversee VDC efforts regionally, Haugland says. The company also typically places an on-site modeler on its BIM projects, taking the place of a project engineer. "This isn't something you can do with a modeling department in the corporate office," he says. "If someone in the field needs something, the modeler on site can turn around and handle it right away."

Depending on the number of projects underway, additional modelers can be brought on as necessary, however Haugland says this is only a short-term fix. Eventually, he hopes that BIM will be a skill set that a variety of staff members can employ.

"In the next year, we're looking at sending field engineers through BIM training and making it a step on their career path," he says. "After six months of working with it, then they are able to go out on a site and use it. It becomes a spoke in the wheel of your career development."

Internal Issues

Although VDC could redefine some of PCL's processes, the company isn't ready to toss out its proven practices. Using BIM data to help generate scheduling analysis—often called 4D—has been an easy call, Haugland says.

"There are big returns on low effort with 4D," he says.

However, the company is hesitant to fully integrate estimating functions—or 5D—into its BIM work. Haugland says that PCL is investigating how it fits its existing estimating processes and making BIM work with that framework.

"The estimating process here has been developed over the last 100 years," he says. "In order to get [5D] to work, you've got to alter it to work with the system. It's about taking the software and making it work for us. It's not about rethinking estimating. It will never work that way."

External Forces

While the company works through its own internal issues as it moves forward with BIM, it isn't waiting for others to get up to speed. Haugland says the company sees BIM on projects whether other team members use it or not. He says that PCL may rarely receive a usable BIM model from designers. Although receiving a model from a designer could cut down on PCL's workload, the company sees significant ROI regardless.

However, Haugland says, BIM will change the way it interacts with subcontractors. The company often specifies basic file requirements from subs, so that data exchanged between firms can work with its BIM-related software.

The key is to not force subs to learn BIM, he says.

"If they are unable to do the modeling themselves, we've got outsourcing options we can refer them to," he says. "We help make the connection and they pay for it. It shows up as a line item in their bid. We've found that if we don't give them that option, they come back with bids that are completely outrageous. By making those connections, we mitigate that."

Although PCL usually initiates the discussion to use BIM on a project, Haugland says that eventually needs to change.

"In the long run, we need to find some way to get from design-intent models to construction models," he says. "That's a burning question throughout the industry right now. We don't want to be building every model. In the end, we don't want to be a modeling com-

pany. This is a construction company and BIM is a tool we use to get there."

Recent successes

Through recent BIM projects, PCL has found value at different phases in the construction process.

BIM was beneficial in pursuit of its Interpretive Gardens project in Denver. Haugland says the models were integral in helping PCL win the project, showing the owners a 4D schedule of construction phasing along with a quality survey. With 100 man-hours spent on BIM work, Haugland says the company gained a competitive advantage during project pursuit, but caused the contractor to sell itself more aptly, and given it a valuable communication tool with all the team.

On PCL's Silver the project in Telluride, Colorado, BIM helped PCL avoid costly errors during preconstruction. Haugland says the project site, which is set along a steep hillside, is sensitive because it neighbors a geocide that operates most of the year. Trucks, traffic and idle homes located uphill from the site were also of concern to the town council. The team used a 4D schedule of excavation and shoring in BIM to show how it would mitigate issues which helped PCL gain approvals from the town council, Haugland says.

Silver Mine, Telluride, Colorado

PCL also used its Silver Mine model to pull quantities as a check to the original takeoff. The original estimate for excavation material was set at 100,000 cubic yards. As a result, PCL ordered a nearly $3 million error before guaranteed maximum price was finalized. The combined effort required 560 man-hours, generating expenses well short of its total cost savings.

PCL has consistently seen payoffs during the construction phase. On the Memorial Hospital project in Colorado Springs, Colorado, PCL used BIM to overcome numerous challenges, but perhaps none greater than clash detection. In addition to locating the complex array of MEP systems commonly seen in hospitals, Haugland says the architectural design was complicated and nonlinear. By layering the architectural, structural and MEP systems in BIM, he says the team discovered nearly 2,000 total clashes. Although the real majority were errors that could have been caught and fixed easily in the field, Haugland says that at least 500 of them would have had significant impacts on cost and schedule. From pull through construction, PCL logged nearly 1,200 man-hours in BIM.

BIM Case Studies

INFRASTRUCTURE

- **PCL Construction**
  - "Lonely BIM"
- **Burt Hill – Springfield Literacy Ctr**
  - Green BIM/Educational facility

Case Study:

Springfield Literacy Center

BIM Case Studies

INFRASTRUCTURE

- **PCL Construction**
  - "Lonely BIM"
- **Burt Hill – Springfield Literacy Ctr**
  - Green BIM/educational facility
- **Crate & Barrel**
  - Owner national program

Case Study:

Crate & Barrel

By Dave Barista

BIM Case Studies

INFRASTRUCTURE

- **PCL Construction**
  - "Lonely BIM"
- **Burt Hill – Springfield Literacy Ctr**
  - Green BIM/Educational facility
- **Crate & Barrel**
  - Owner national program
- **UCSF**
  - "Social BIM" integrated project delivery/ health care

Case Study:

UCSF Cardiovascular Research Institute

by Bruce Buckley

On the campus of the University of California, San Francisco, build team members are using BIM to find harmony. In constructing the university's new $224- million 226,000-square-foot Cardiovascular Research Institute laboratory, team members are adopting BIM as part of a strategy to break down traditional barriers between firms and deliver the project on time and on budget.

"This is a job where roles had to be changed and people had to be willing to look at things in a new way," says Lumilda Rose Culpito, principal at SmithGroup.

The project, which SmithGroup was awarded in 2005, represents the San Francisco office's first large-scale foray into building information modeling.

"This is one of the most efficient labs we've ever designed," Rose Culpito explains. "We were interested in doing a major BIM project and this was the right opportunity."

Thanks to the owner, that decision came easy. Michael Bade, director of capital programs in UCSF's Capital Projects and Facilities Management department, was also eager to put BIM to the test. After spending 12 years working on construction projects in Japan, Bade wanted to find a more cooperative way of working on public projects.

"When I came to work for the university, I saw projects run into difficulties because of the lack of cooperation and problems happening because of a lack of complete information," Bade recalls. "Since I became responsible for UCSF's project delivery processes in 2004, I've been looking for ways to use cutting-edge tools and processes to improve that situation and allow projects to benefit from improved information flow and management processes."

Early on, SmithGroup's use of BIM helped set the stage. Starting in November 2006, the firm got up to speed with BIM during the schematic design phase. Once design development began in April 2007, the larger process change that BIM promotes became more obvious. Architects, structural engineers and MEP designers all fed information into the model. Many of the details that traditionally weren't expressed until later had to be addressed.

"In BIM you input elements and you have to know a lot more details so that the software can draw it for you," Rose Culpito says. "You have to spend the time at that point to investigate what you need, which takes more time to input."

As a result, instead of spending the anticipated four months in the DD phase and eight months in the construction documents phase, SmithGroup devoted six months to each phase.

But those early design details paid off in other ways. Thanks to the additional project data, UCSF could bring other team members on earlier and accelerate portions of the work. Steel orders were running at a 10-month lead time, so the team was able to sequence the creation of BIM packages from the model to get steel orders placed in the critical path and the design was at 30%.

Contractors were also brought on during design development, a move that requires avoiding the traditional design-bid-build delivery method used on projects. With approval from the state legislature, UCSF experimented with a best value system. When contractors submitted bids, they also answered questions. In the detailed areas bid out by key, including questions about each firm's expertise in BIM.

UCSF scored the answers and divided the score into the dollar amount of bids to get a cost per point. With the lowest cost per point bid, Rudolf and Sletten of Redwood City, California, was awarded the job.

The same process was also used with awarding major subcontracts for the MEP and building envelope work.

Although the bidding process took place during a time of major price escalations in the Bay Area, bids came in as projected, keeping the project on budget.

"BIM helped take out a lot of the guesswork," Bade says. "Doing designs in BIM and showing a sequence that you have a coordinated job makes it desirable for contractors. Suddenly you have more bidders, prices come down and risk premiums evaporate. It's a virtuous circle."

Leading up to the start of foundation work in January 2008, use of BIM was well underway among contractors. In addition to using BIM for clash detection, Rudolf and Sletten did advanced 4D (schedule) simulations of the structural steel system, site logistics and the building's highly complex skin system.

"We took the model, revised the organization and added model elements in order to be sure of the components in place to do weekly work simulations, including showing the equipment that would be used for lifts," says Michael Pistorese, director of technical development at Rudolf and Sletten. "By doing that, you can see instantly any object or component that hasn't been included in the schedule. You quickly learn what's missing."

While BIM facilitates the frequent exchange of data between team members, UCSF is pushing for even greater teamwork. Bade instituted a project management method among key team members and prime subcontractors that rewards cooperation through incentives. Each team member has a weekly work plan, but instead of paying out incentives for individual performance, the results are judged collectively. If the team doesn't reach its goals together, no one receives a bonus.

"The key is anticipating issues," Bade says. "The team works to anticipate issues, clear constraints and develop the information needed to build and meet goals. It uses peer pressure and rewards people for cooperating."

To help lower communication barriers, representatives of every key firm are housed in the same site trailer.

"The benefit is that people develop relationships by working in the same space," Bade adds. "You can go and ask questions on an informal basis and solve problems before they become RFI."

With completion scheduled for December 2010, Bade is confident that the strategies which have kept the project on budget and on schedule so far will keep the project on course to the finish.

"The information we have is really good and we have confidence that the building can stay on target," he says. "We'll avoid a lot of rework, avoid a lot of downtime and improve our overall productivity. It's all about information flow."

1. Adoption of BIM

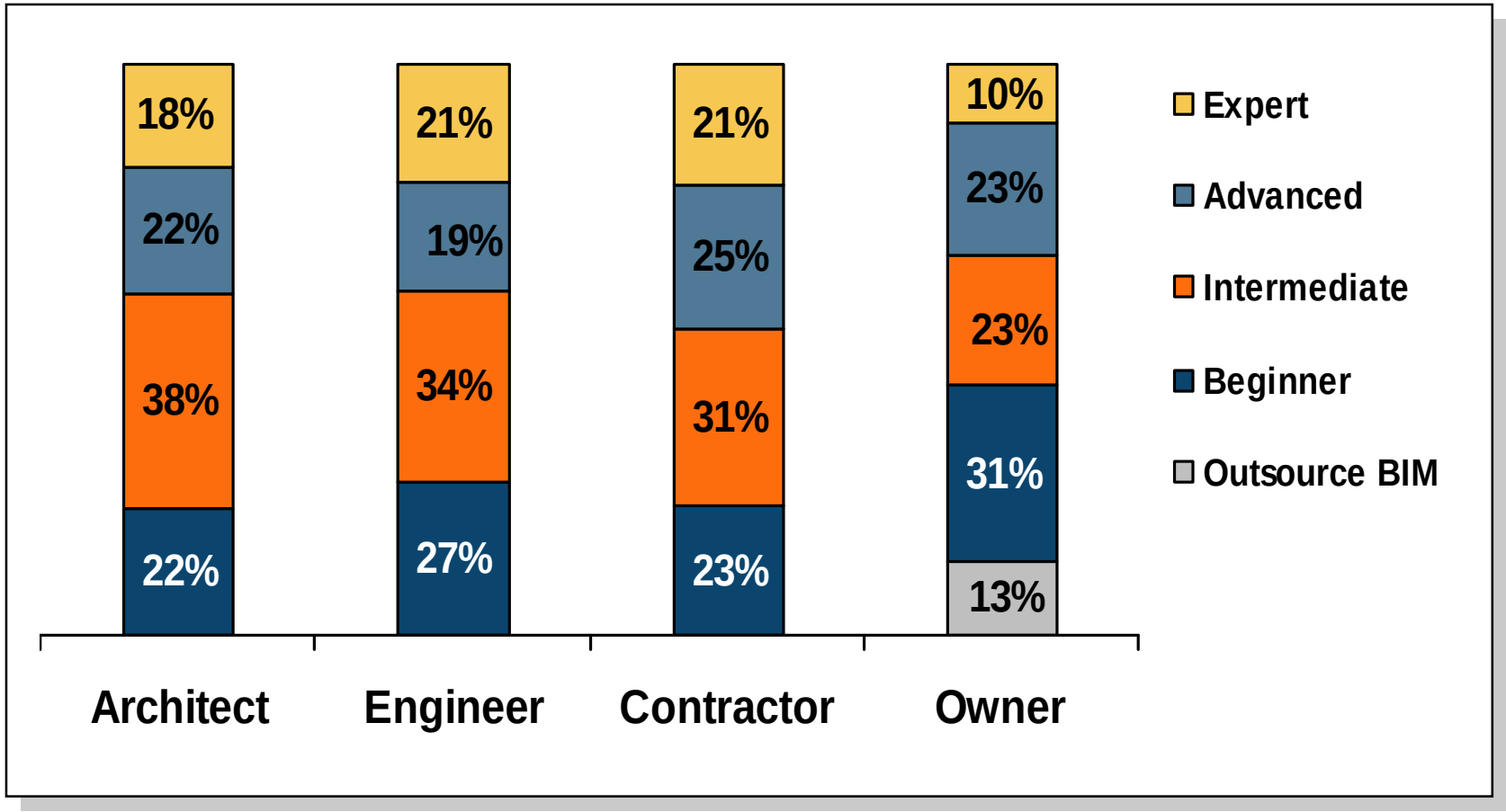
Image: Dunham Engineering

Adoption of BIM – Key Survey Focus Areas

- Level of BIM Sophistication
- Percent of Current & Future Projects Involving BIM
- Frequency of 2D-to-BIM Use Among Contractors
- Impact of BIM Implementation
- Perceived Net Effect of BIM on Future Use
- Challenges to BIM Adoption

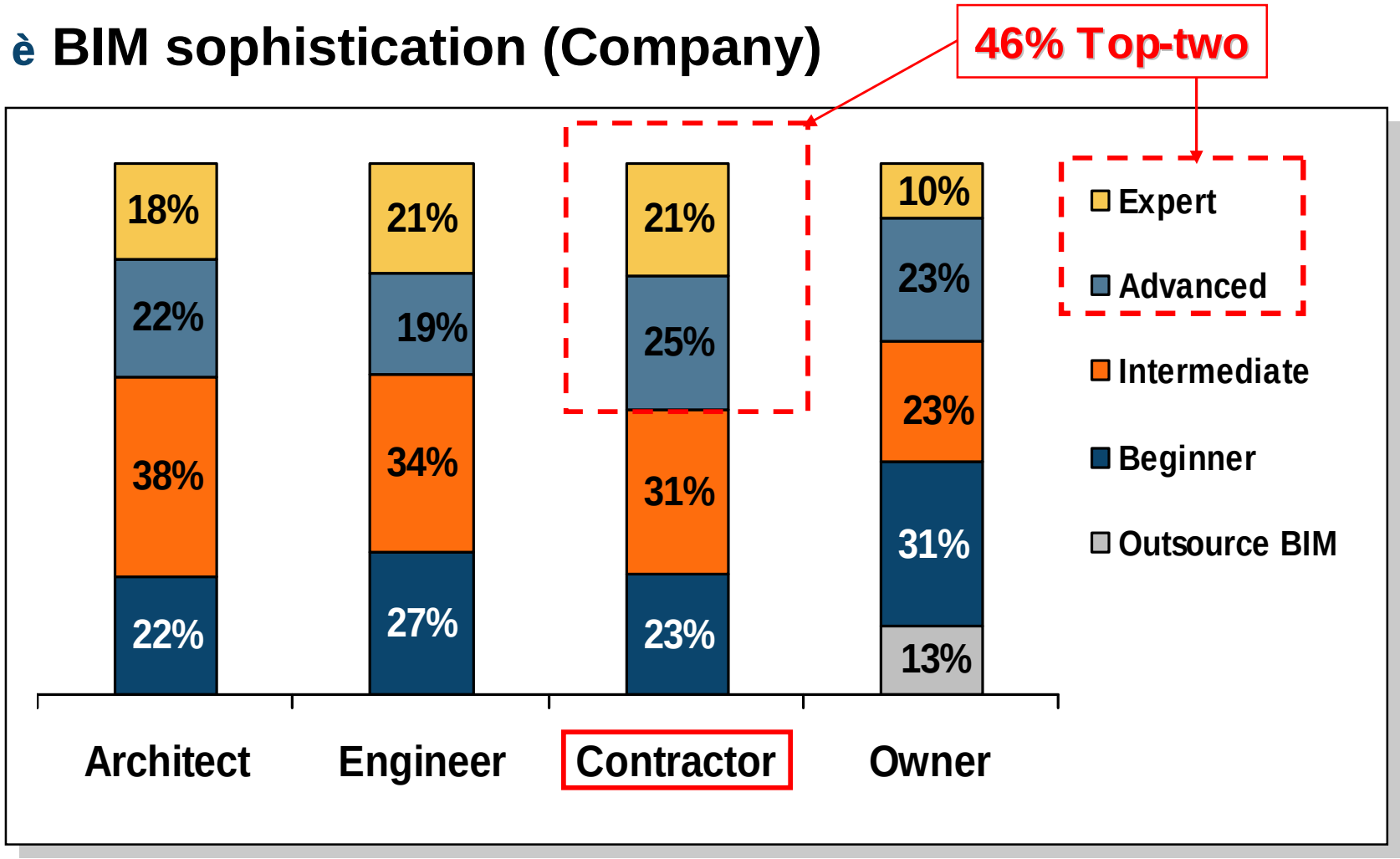
Level of BIM Sophistication By Profession

è BIM sophistication (Company)



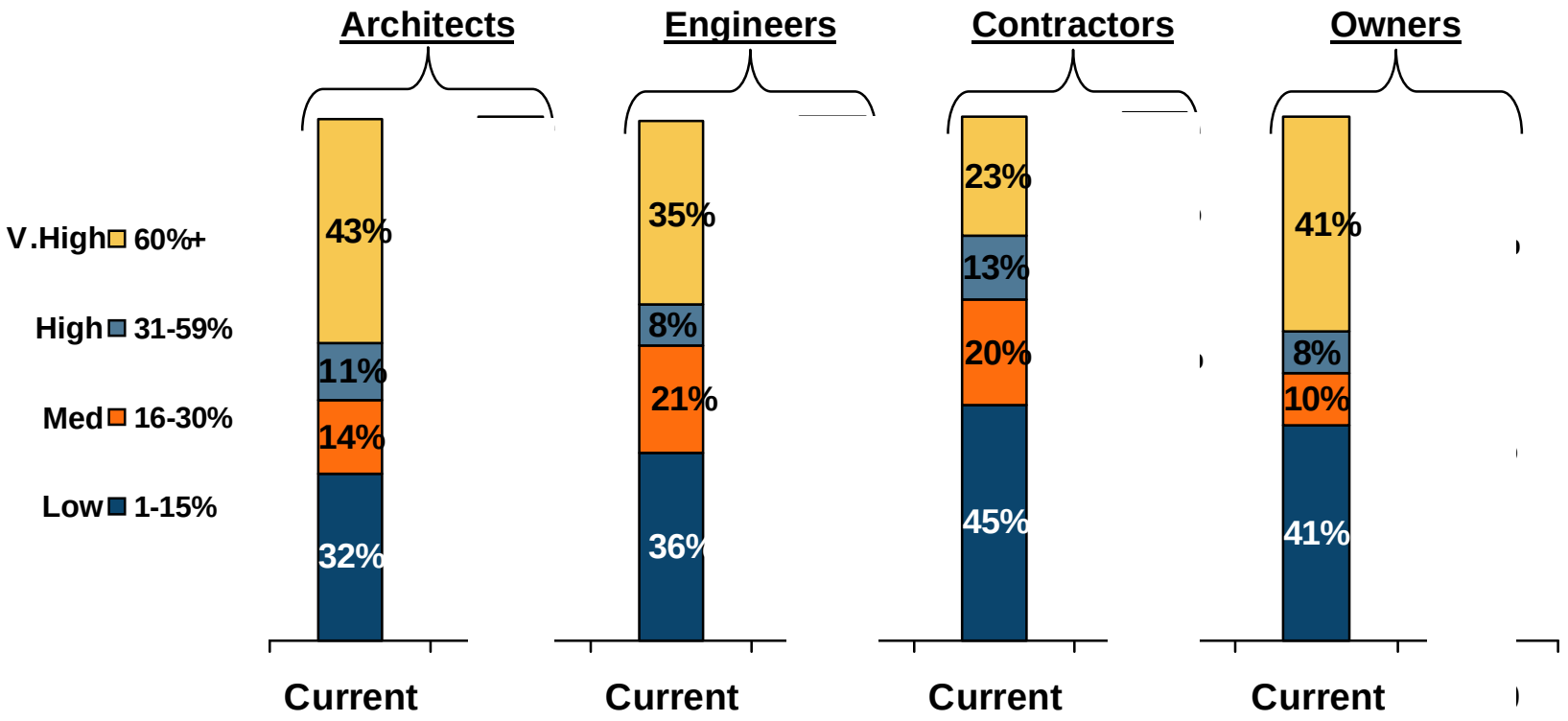
Level of BIM Sophistication By Profession

è BIM sophistication (Company)



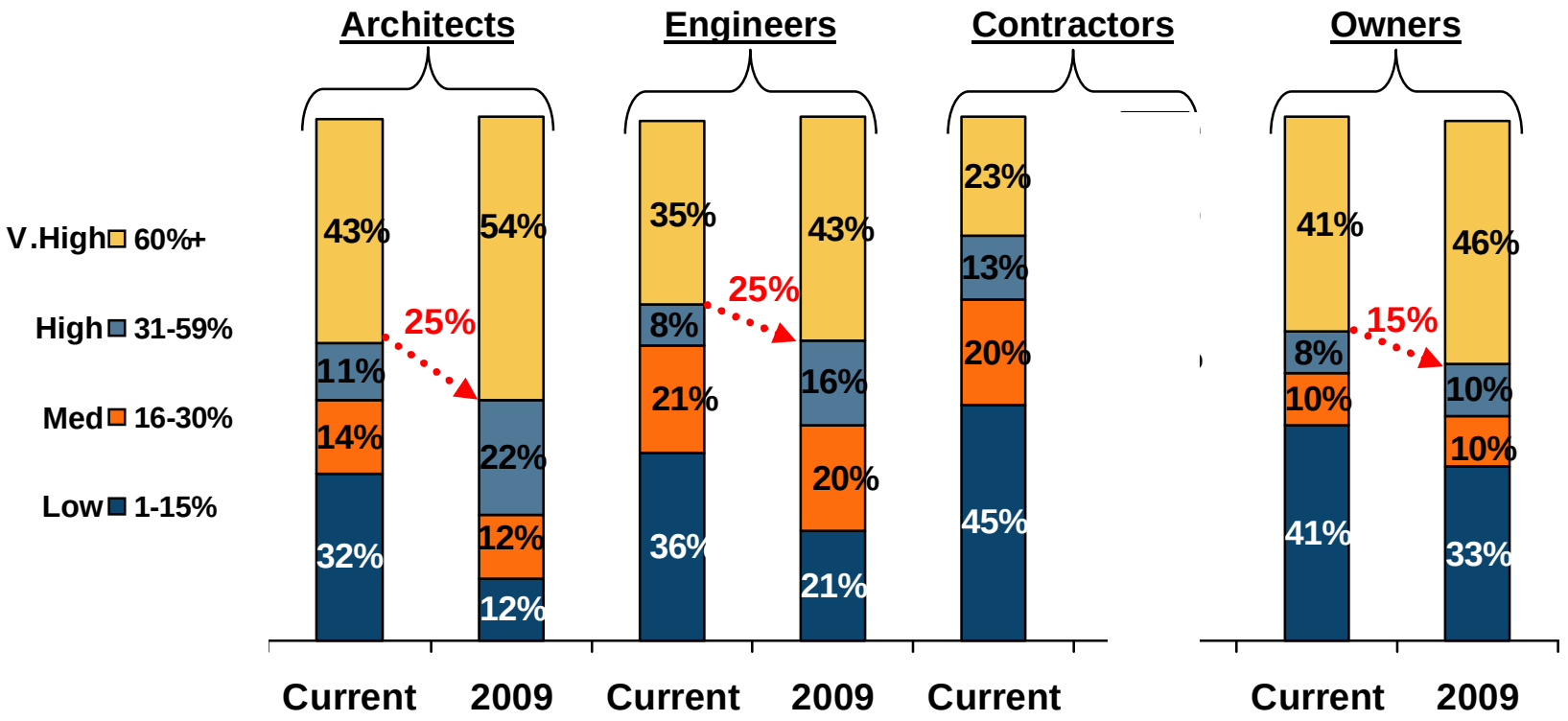
Current & Future BIM Projects

è BIM project involvement (Company Type)



Current & Future BIM Projects

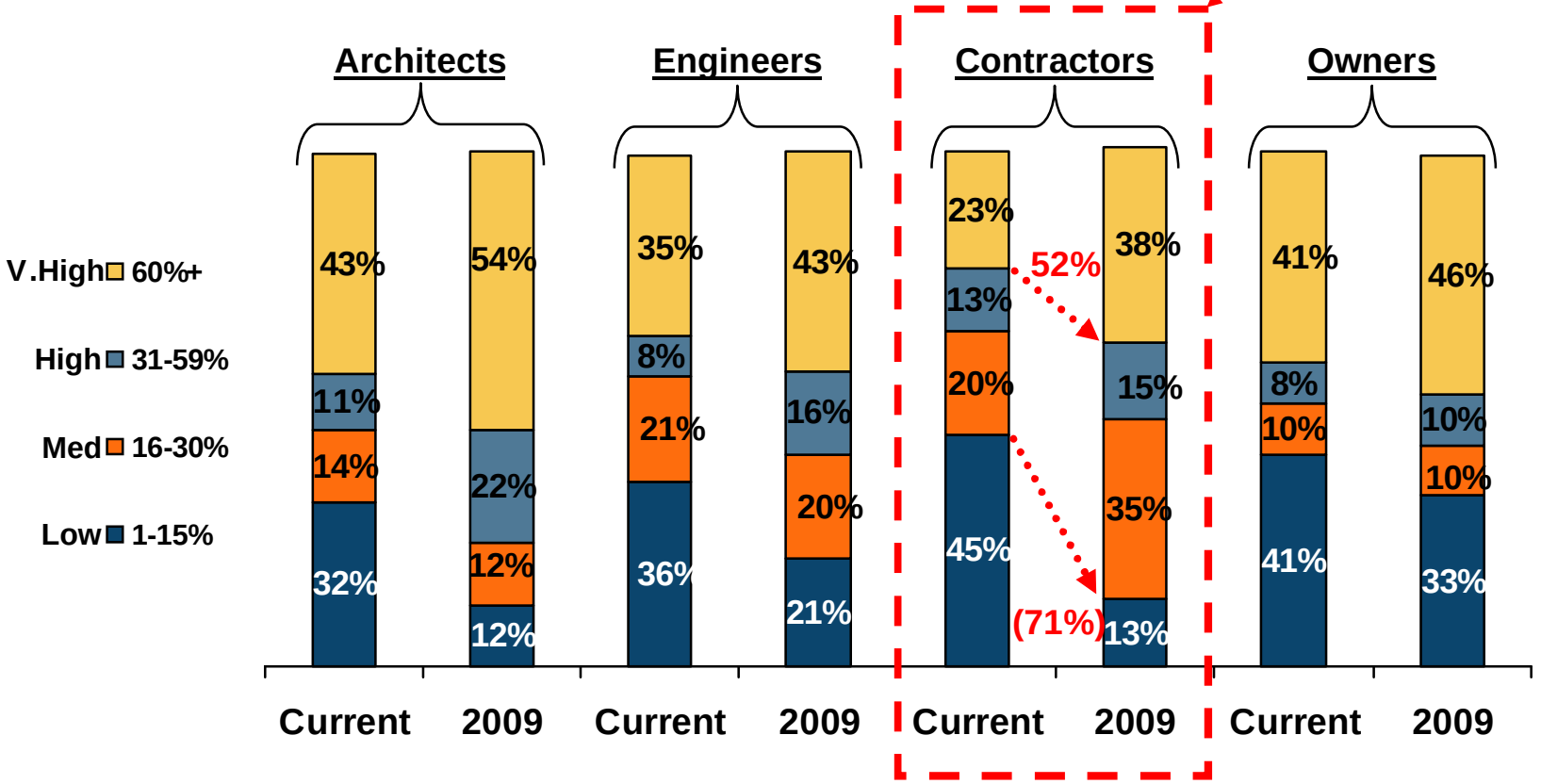
è BIM project involvement (Company Type)



Current & Future BIM Projects

2009:
Year of the Contractor

è BIM project involvement (Company Type)



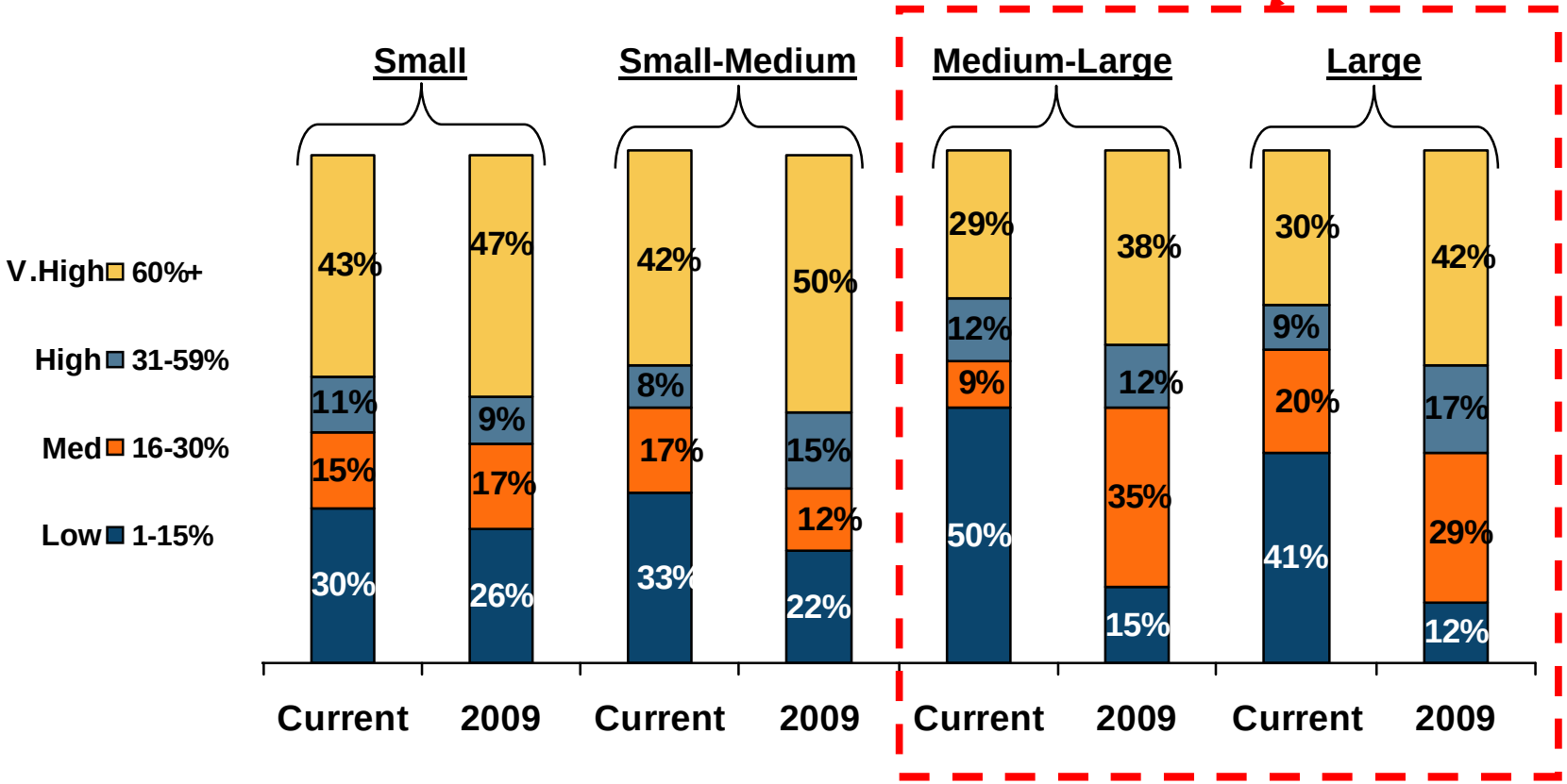
MEMBER CASRO

McGraw Hill CONSTRUCTION

Current & Future BIM Projects

Larger Users Slower to Expand Usage

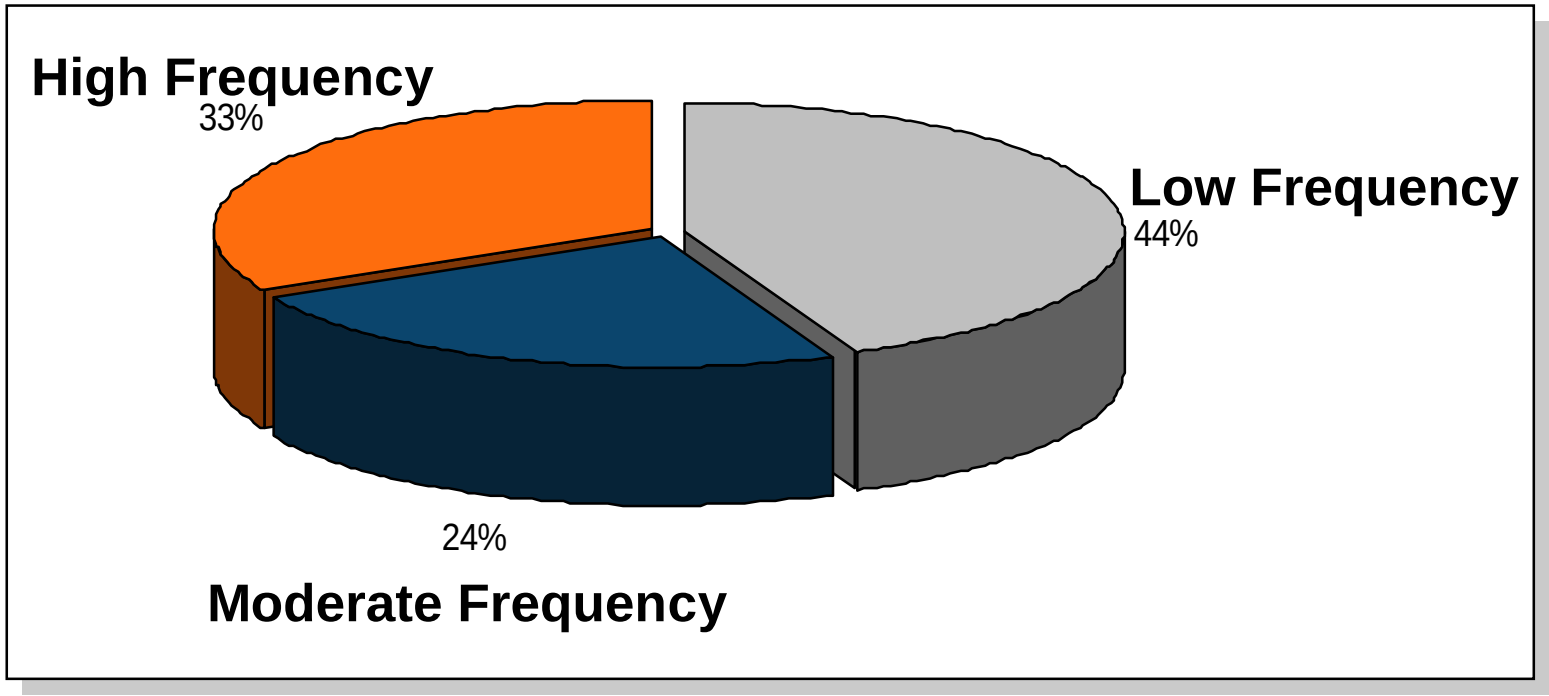
è BIM project involvement (Company Size)



2D-to-BIM Use Among Contractors

è 60% Contractors frequently 2D-BIM

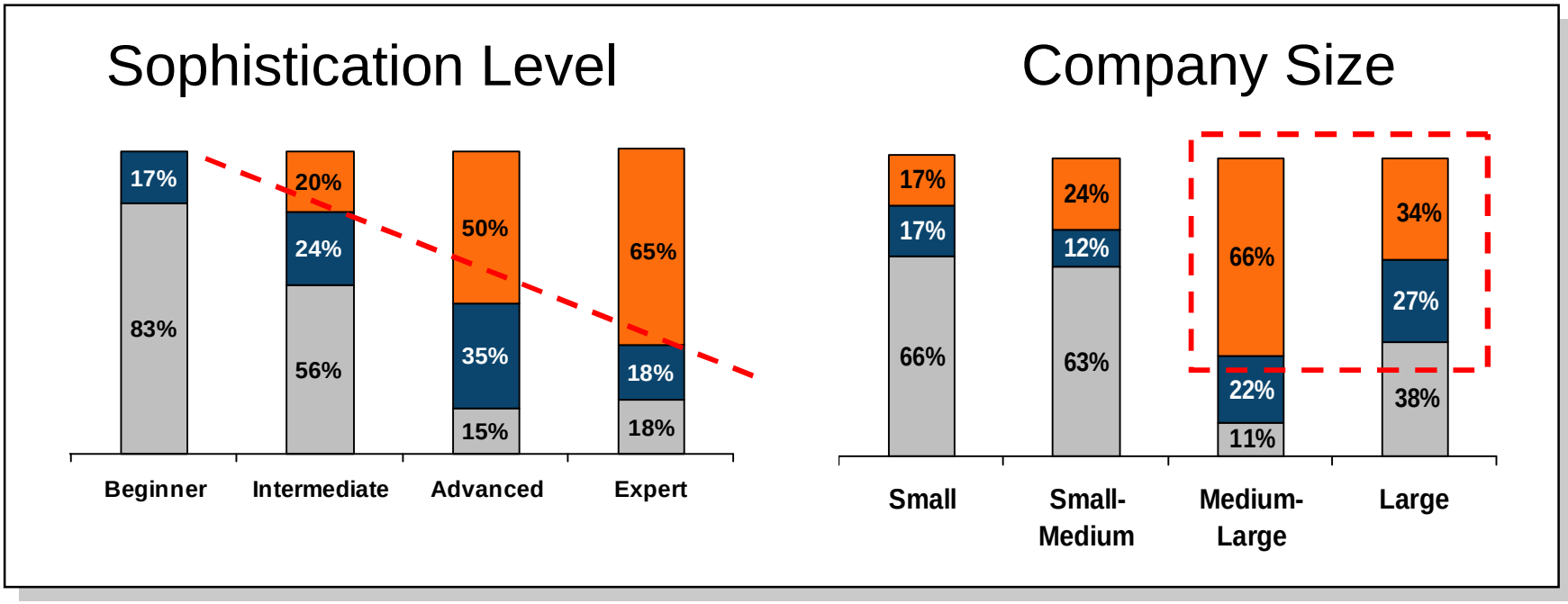
– “Lonely BIM”



2D-to-BIM Use Among Contractors

è BIM sophistication more than company size

– "Lonely BIM"



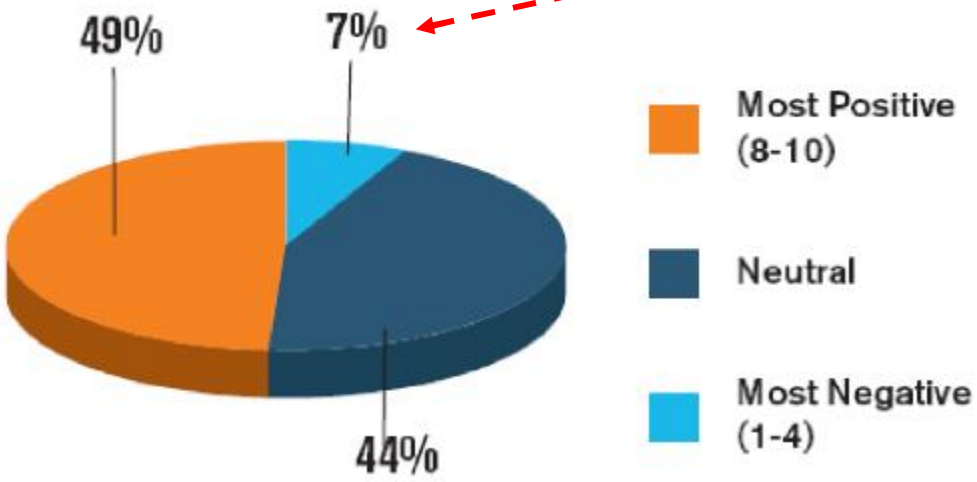
Q2. When you work on a project that has been designed in conventional 2D how often do you model it in BIM yourself? Please use a scale from 1 to 10, where one is Never and 10 is Always.
Asked only among Construction Managers/ Contractors/ Subcontractors = 80

Positive Impact of BIM Implementation

è Only 7% negative impact

Mostly Beginners

All Respondents

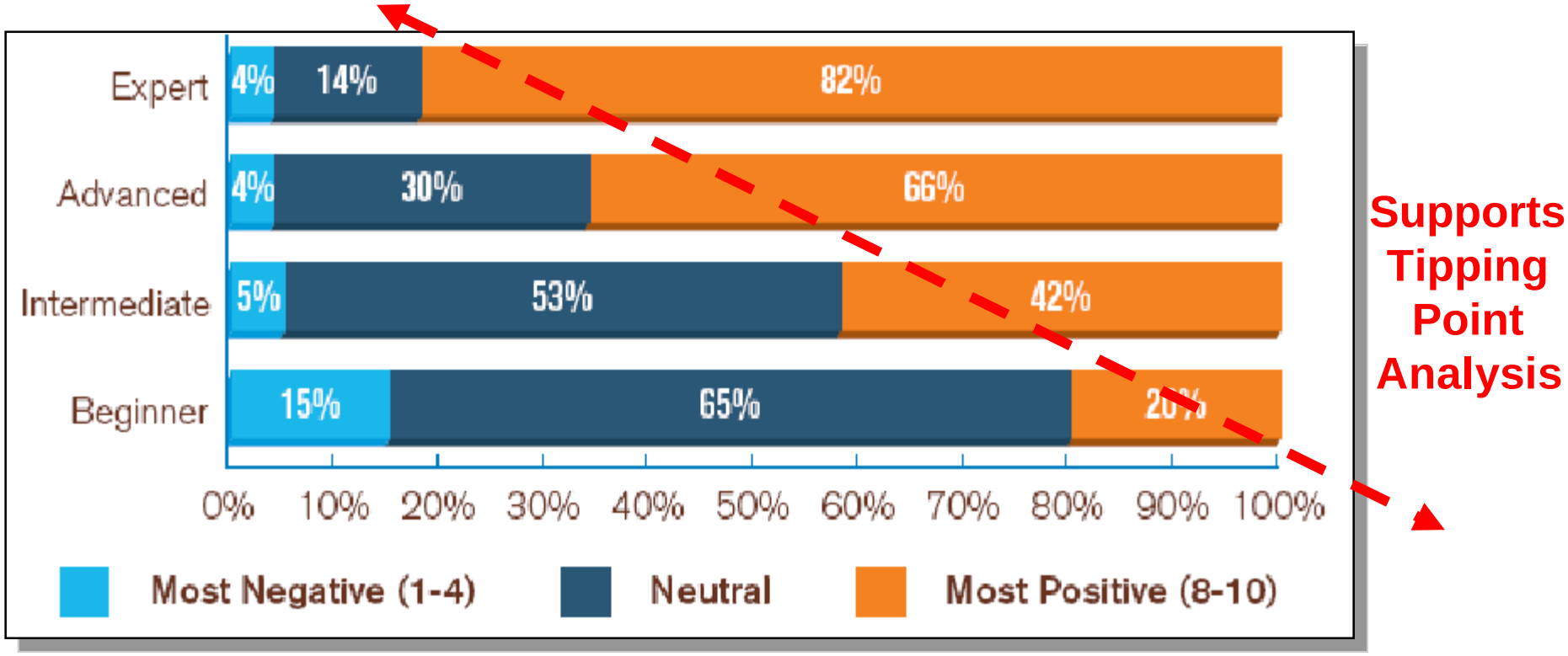


MEMBER CASRO

McGraw Hill CONSTRUCTION

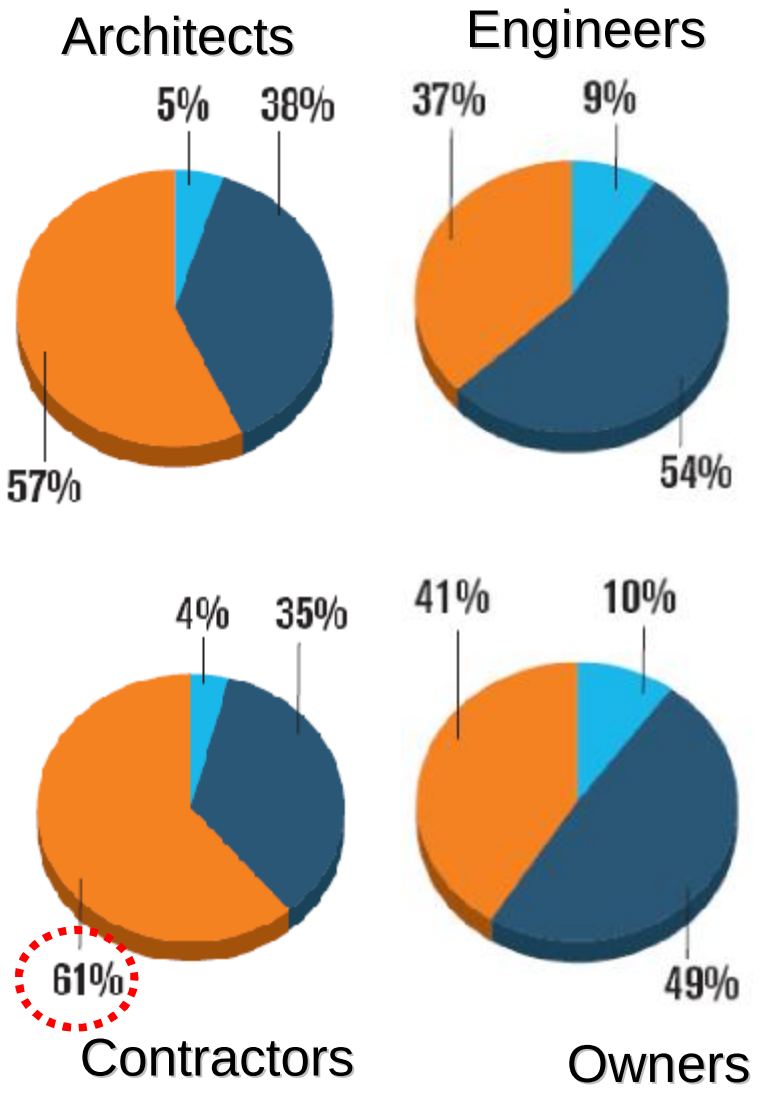
Impact by BIM Experience Level

è Expertise directly impacts positive experience



Positive Impact of BIM Implementation

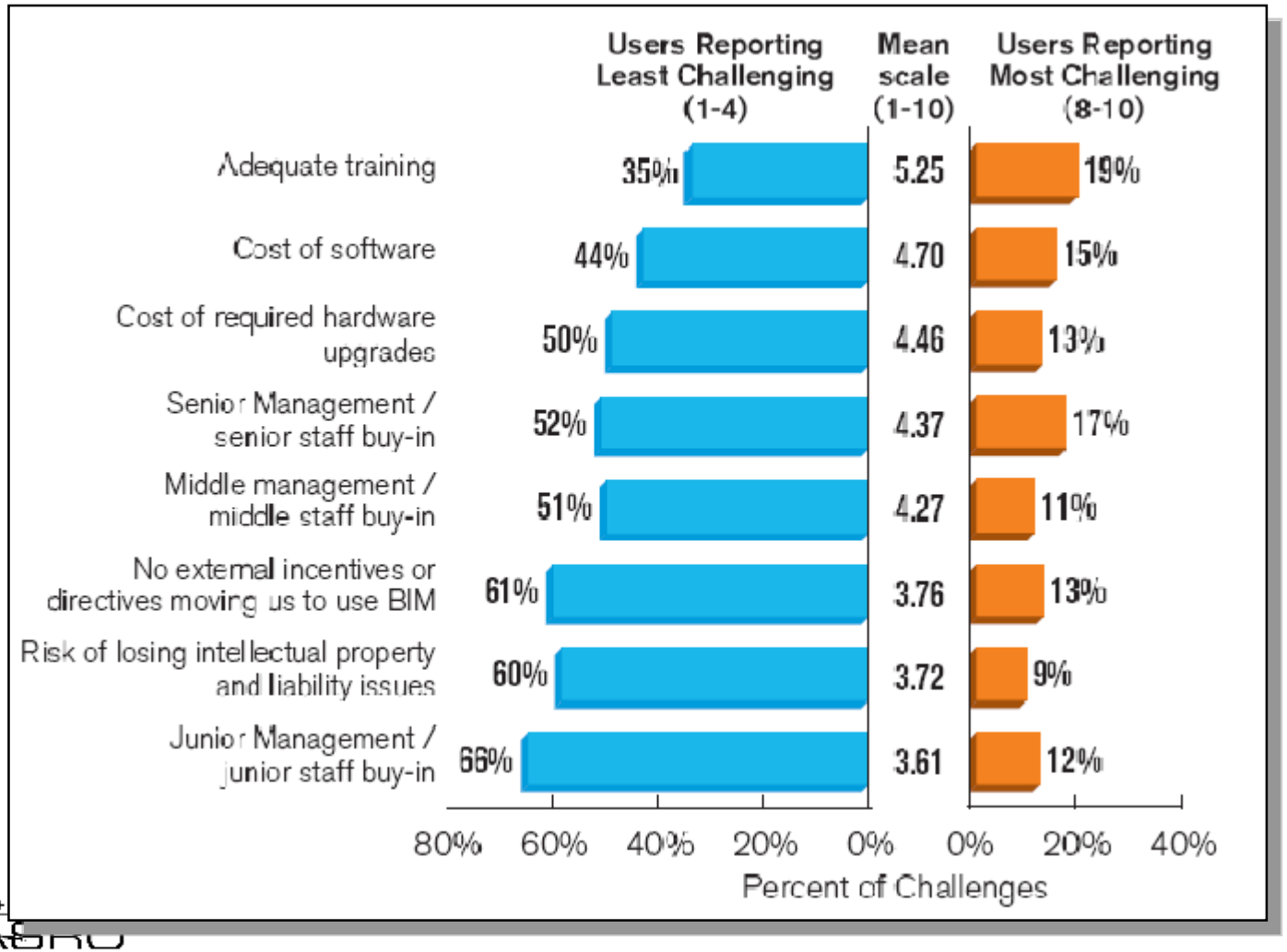
- **Contractors most positive impact of BIM**



"Year of the Contractor"

Challenges to BIM Adoption

- **Training, software/hardware costs, sr mgt buy-in**
  - Jr staff and IP issues least troublesome



Adoption of BIM

è Take-aways:

- Architects still lead in extent of adoption
  - **Majority will be "Very Heavy" Users in 2009**
- Contractors catching up fast
  - **Not waiting for design professionals (Lonely BIM)**
- Smaller firms dive deeper faster than large
- More expertise = more satisfaction/benefit
  - **Will drive deeper adoption**
- Top challenges
  - **Software costs**
  - **Hardware costs**
  - **Senior Management**

2. Implementation & Usage of BIM

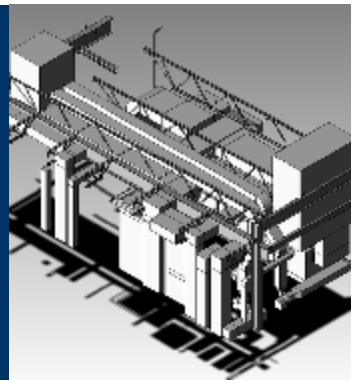


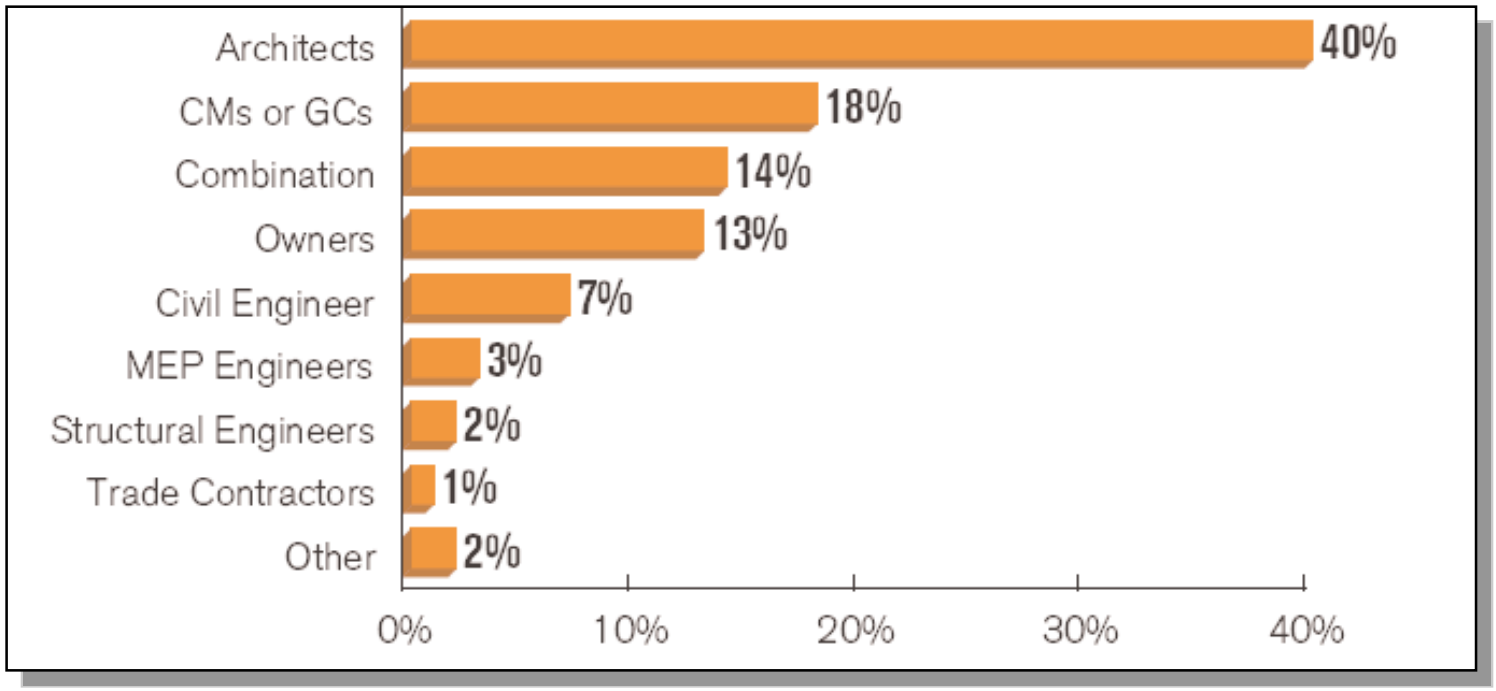
Image: Dunham Engineering

Implementation and Usage of BIM - Key Survey Focus Areas

- **Primary Driver of BIM Project Team**
- **Extra Payments to Designers/Contractors by Owners**
- **Frequency of Modelling Specific Elements in BIM**
  - Architectural, Mechanical, Electrical, Plumbing/FP , Civil, Structural
- **Integration of Scheduling Data with BIM**
- **Integration of Cost Data with BIM**
- **Outsourcing of BIM**
- **Level of Involvement in Green Projects**
- **BIM Impact on Green Projects**
- **BIM Features to Improve Impact on Green Projects**

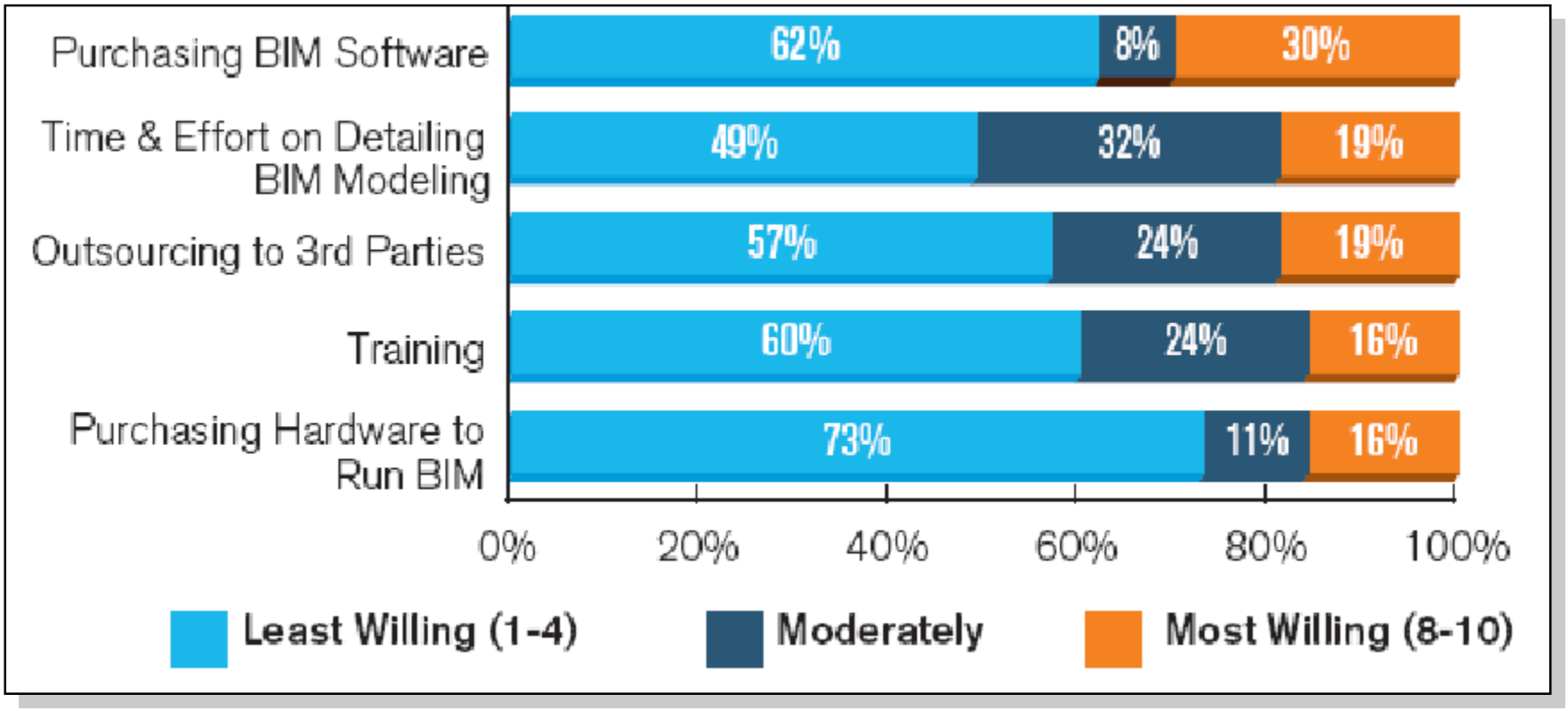
Primary Driver of BIM Project Team

- **Architects, CM/GC, combination**



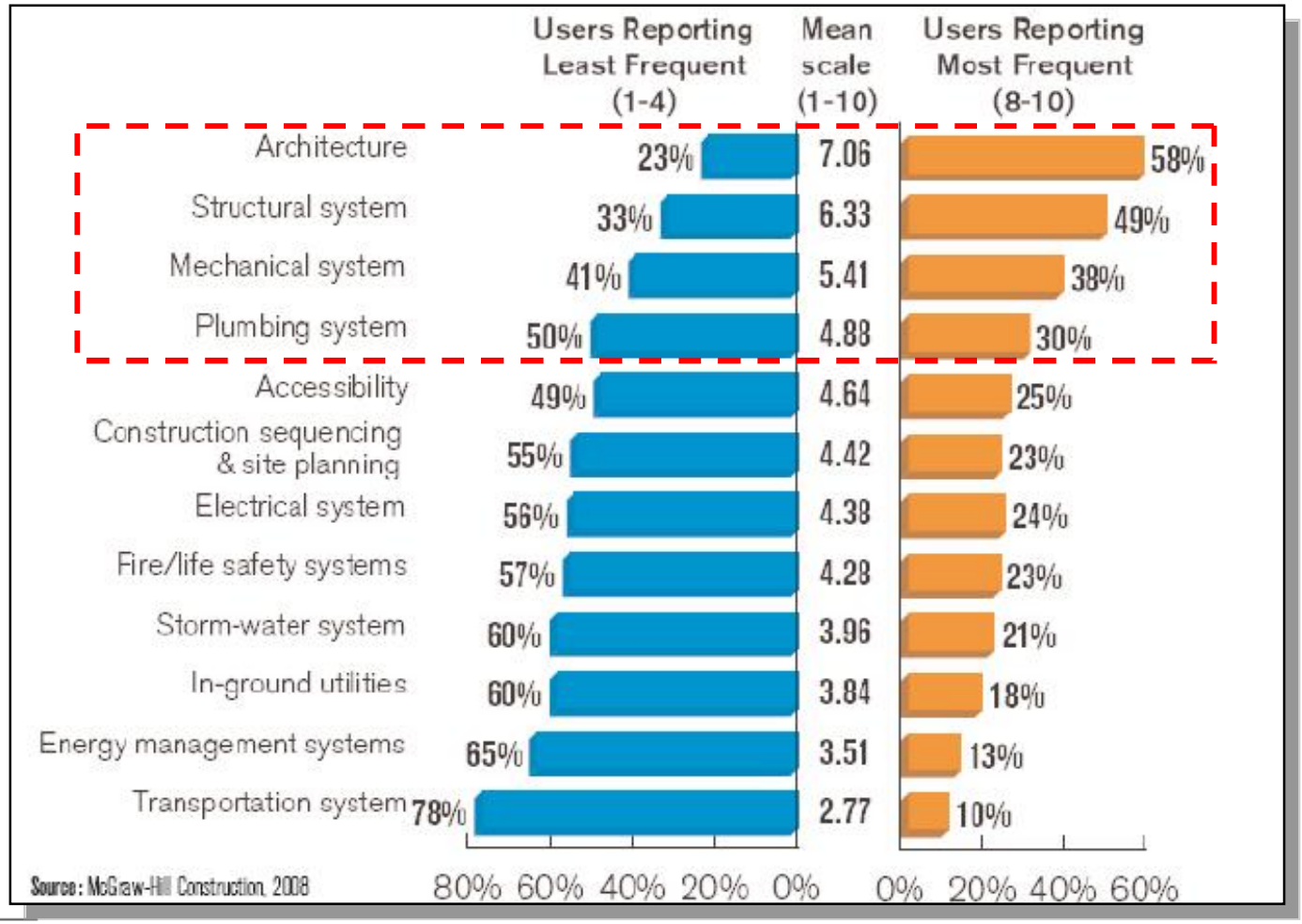
Owners Willingness to Pay Extra for BIM

- **Software, extra time**



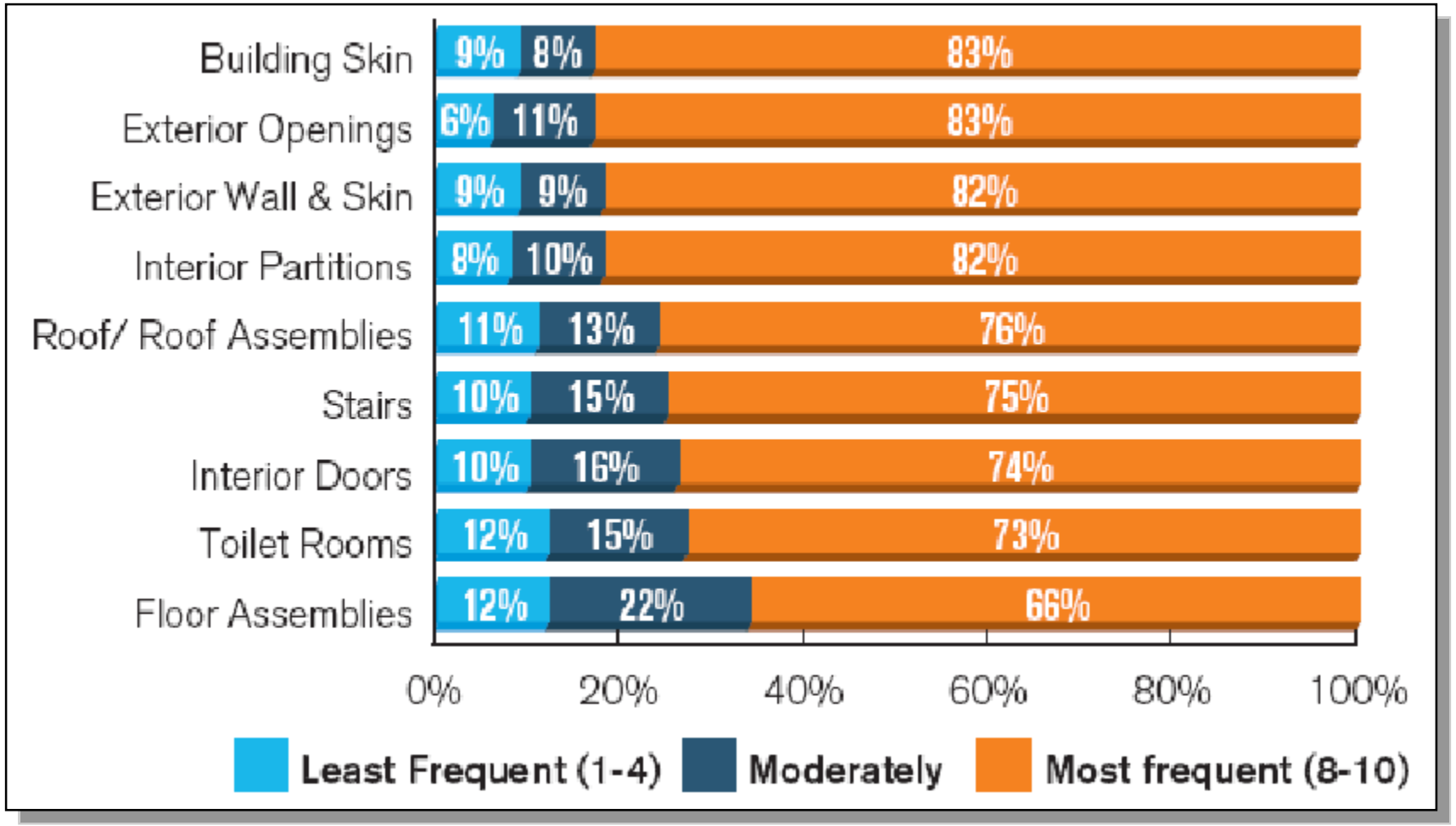
Frequency of Modeling Elements with BIM

- **Architecture, Structure, Mechanical, Plumbing**



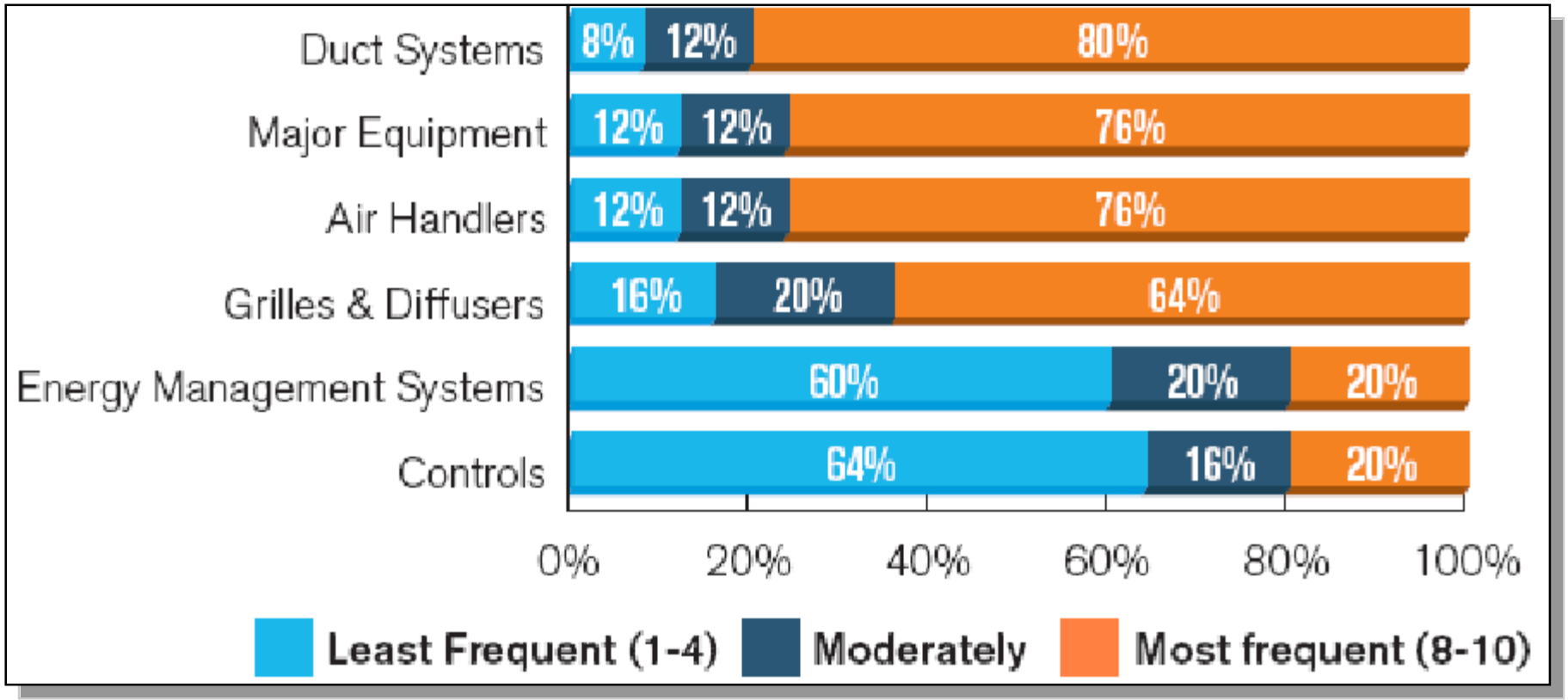
Modeling Architectural Elements in BIM

- **Exterior envelope and openings, partitions**



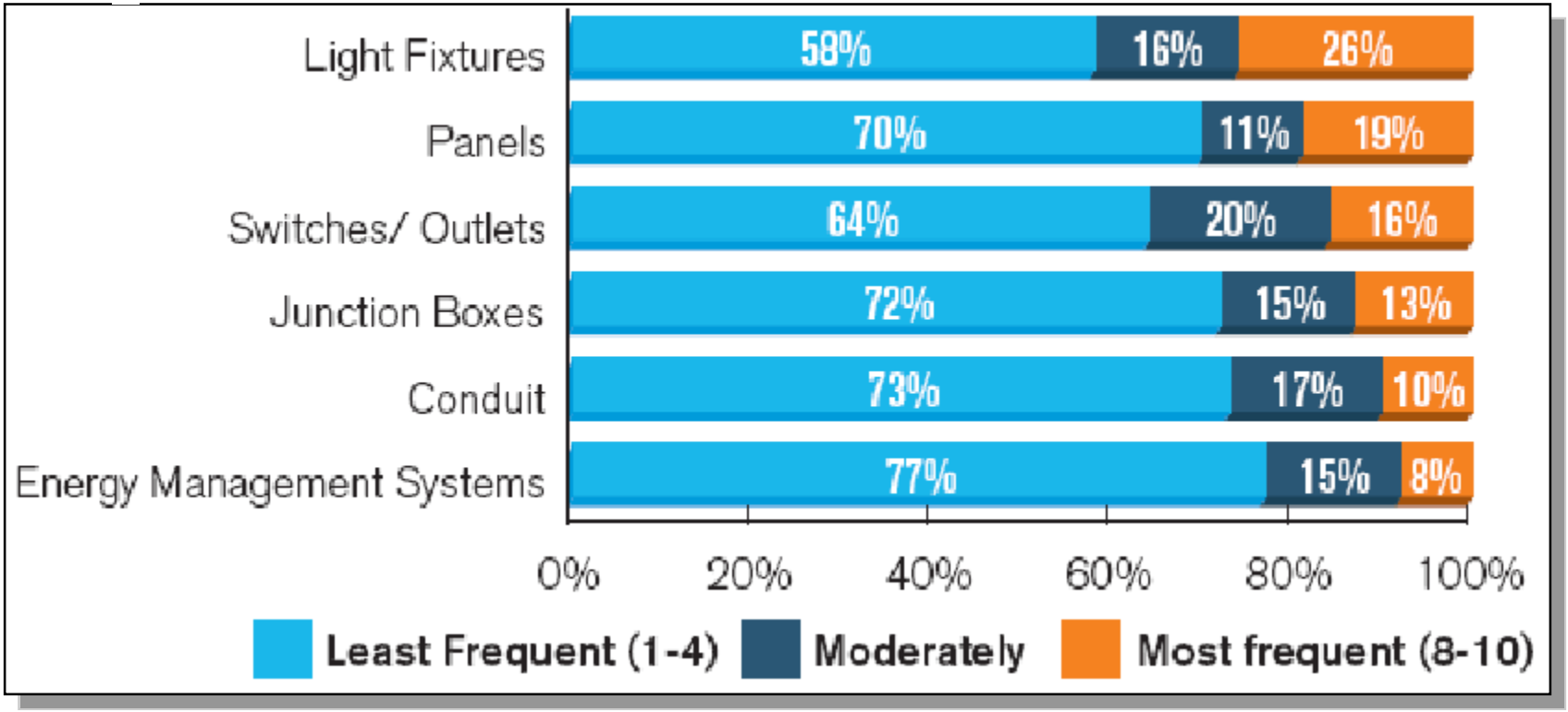
Modeling Mechanical Engineering Elements in BIM

- **Ducts, Air Handlers, Grilles/Diffusers**



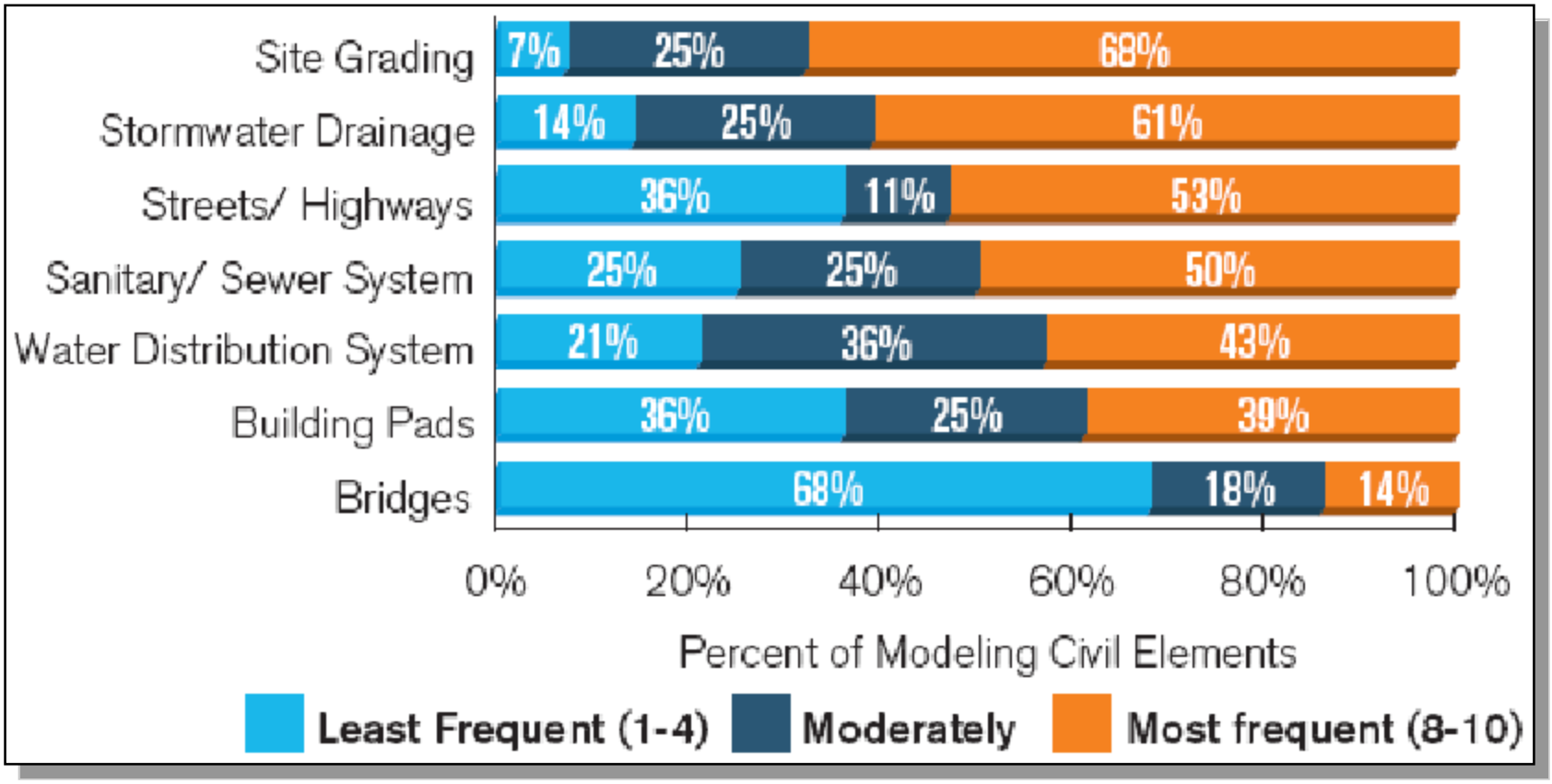
Modeling Electrical Design Elements in BIM

è Light fixtures, panels, switches/outlets



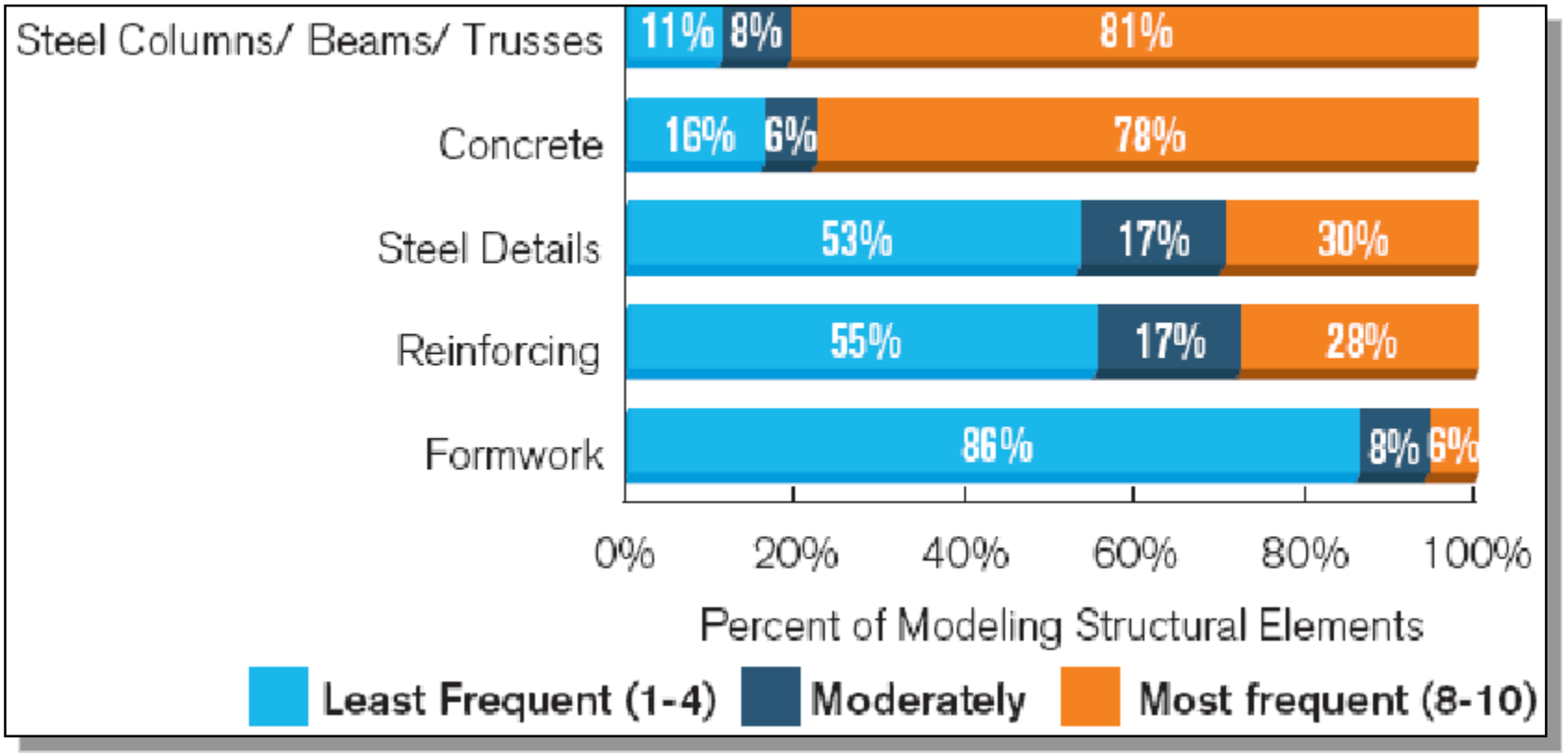
Modeling Civil Engineering Design Elements in BIM

- **Site grading, stormwater drainage**



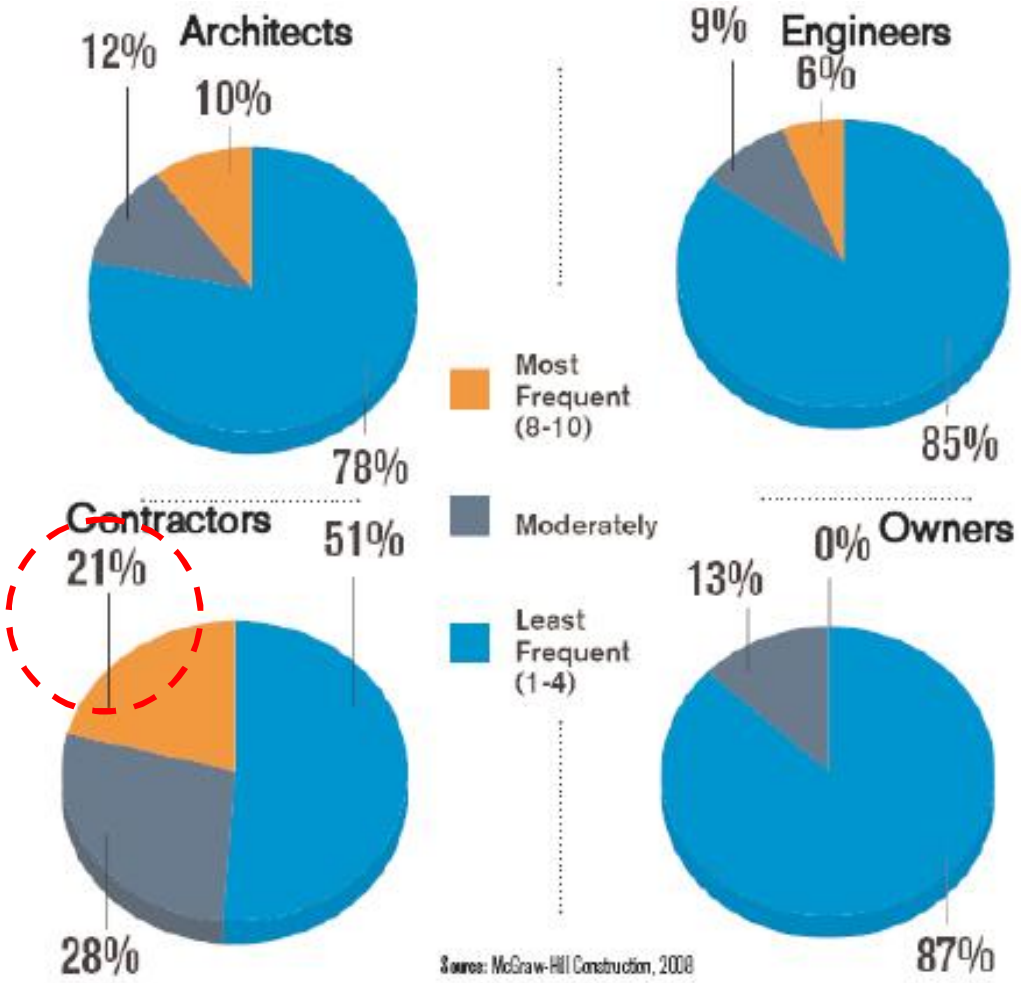
Modeling Structural Engineering Design Elements in BIM

- **Steel columns, beams, trusses**



Integration of Scheduling Data with BIM

- **4D gaining traction with contractors**



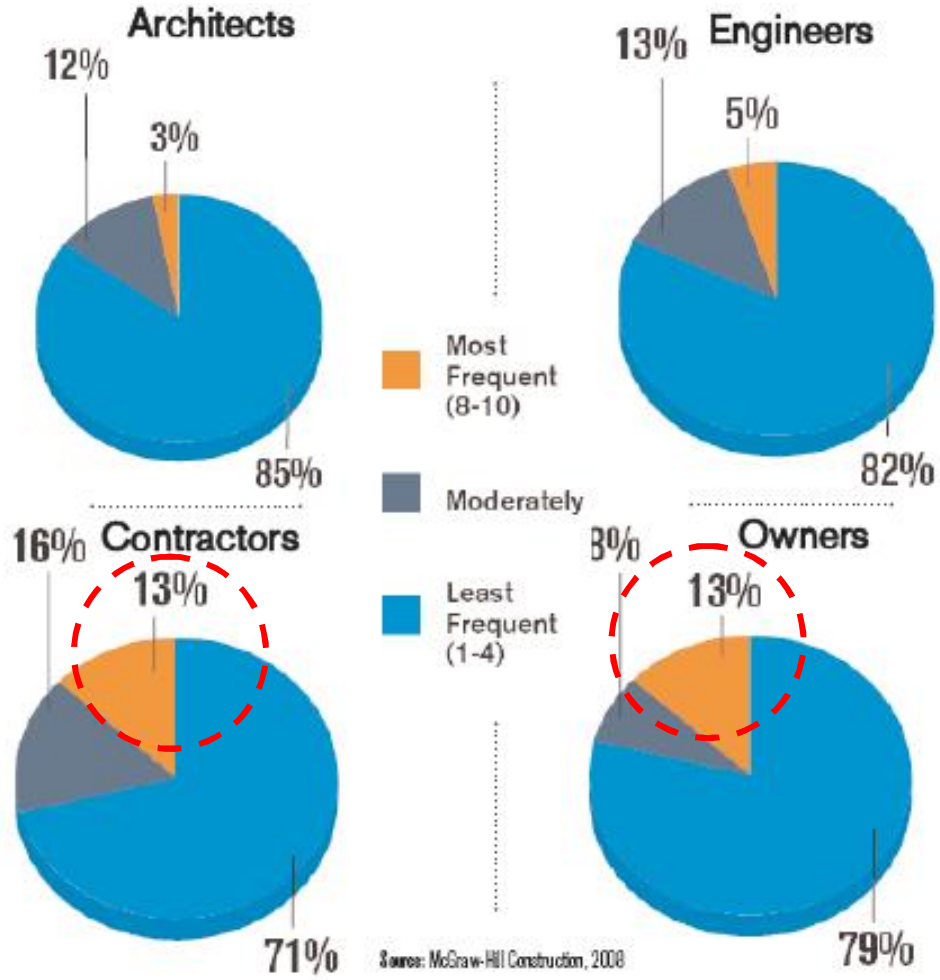
MEMBER CASRO

McGraw Hill CONSTRUCTION

Integration of Cost Data with BIM by Respondent Type

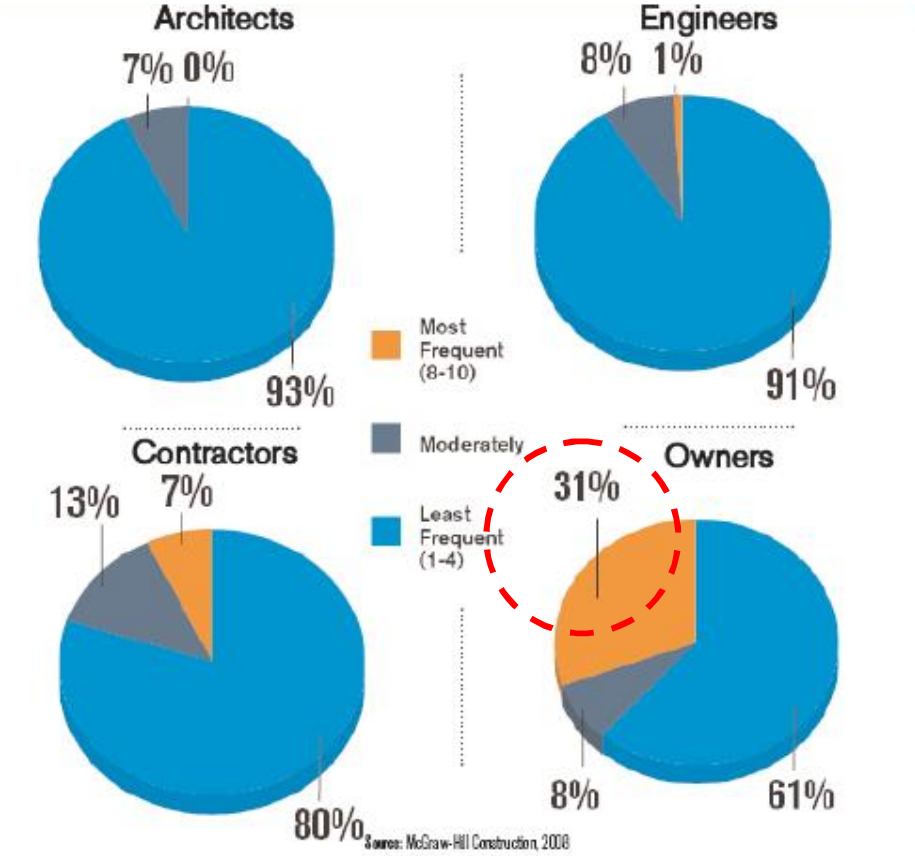
è Minimal 5D usage yet

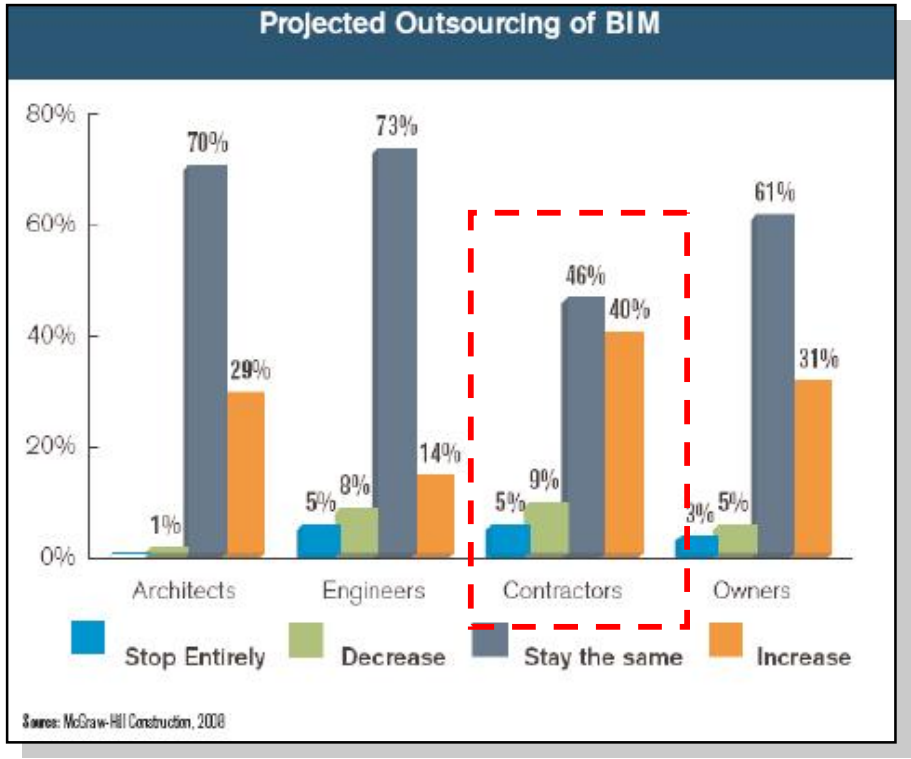
- Contractors, Owners lead



Outsourcing of BIM

- **Owners do most, Contractors project most increase**



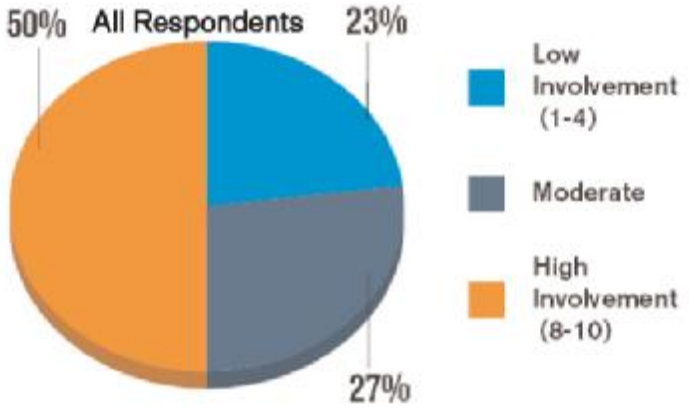


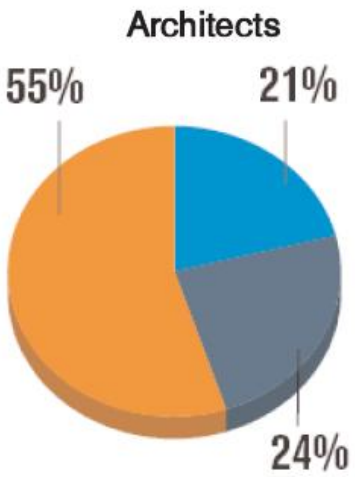
MEMBER CASRO

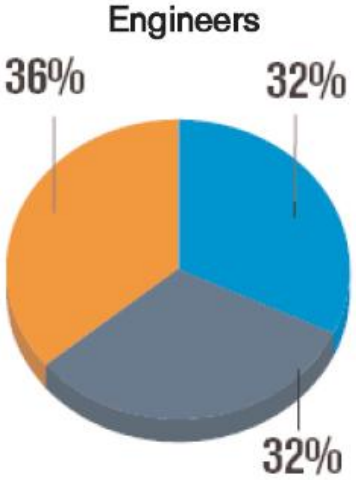
McGraw Hill CONSTRUCTION

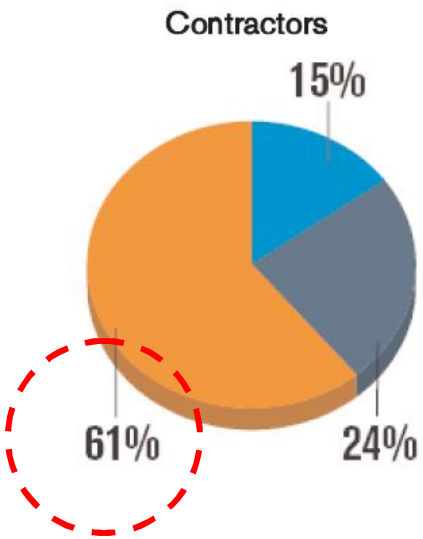
Level of Involvement in Green Projects

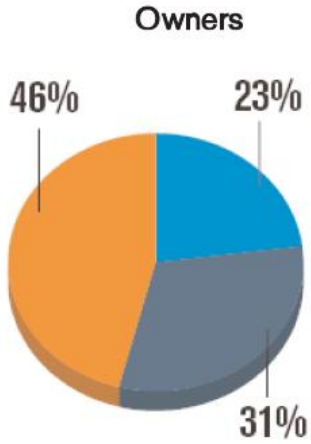
- **Extensive green activity**
  - Contractors 61%





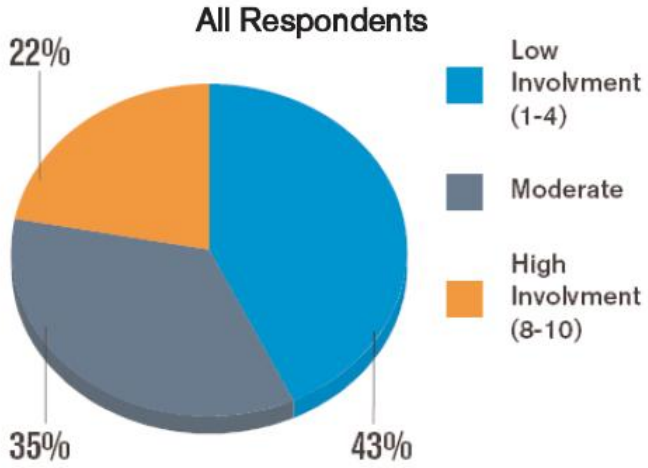


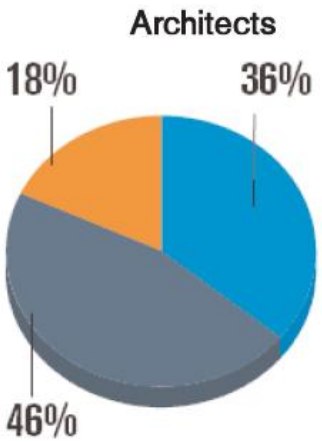


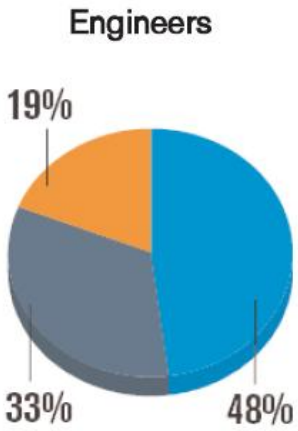


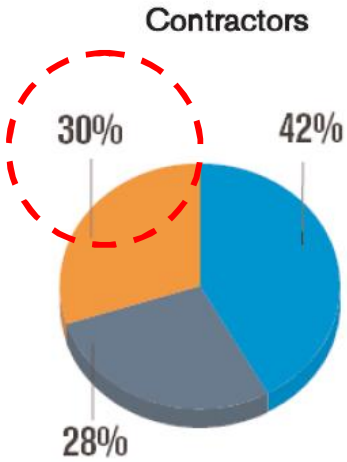
BIM Use in Green Projects by Respondent Type

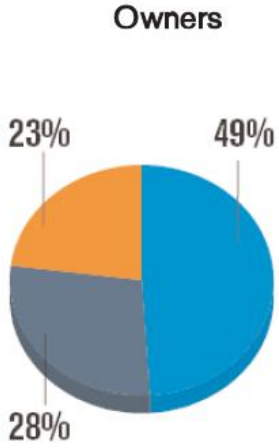
- **Less green BIM**





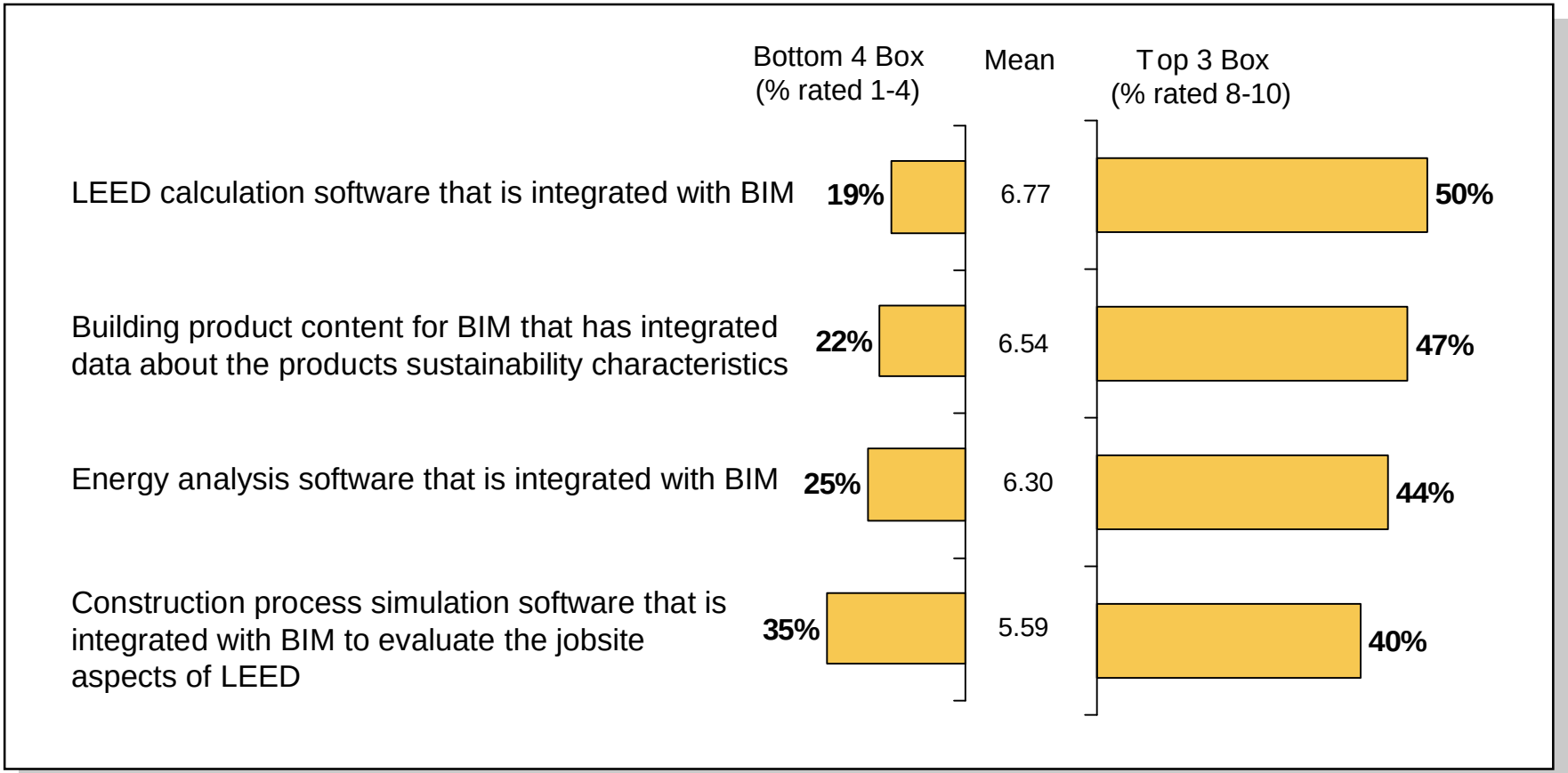






BIM Features that Would Improve Impact on Green Projects

è LEED calculator, data-rich product models



Implementation and Usage of BIM

è Take-aways:

- Architects driving on teams 2:1 over Contractors
- Owners least unwilling to pay for
  - **Software, Extra time**
- Strong demand for wide variety of BIM building product content
- 4D gaining traction with contractors
- 5D still early
- High demand for outsourcing by contractors in 2009
  - **Oppty for architects with skills**
- Green BIM still maturing
  - **#1 need: Integrated LEED calculator**
  - **#2 need: Data-rich building product content**

3. Value of BIM

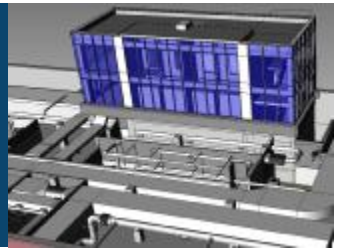


Image: Dunham Engineering

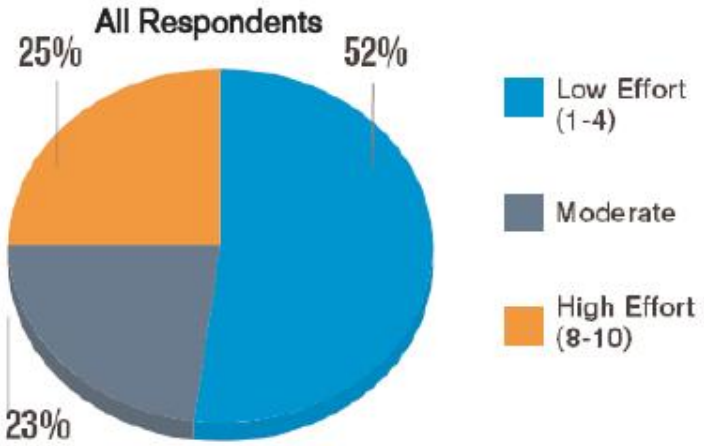
Value of BIM - Key Survey Focus Areas

- Involvement in Measuring ROI
- Important Aspects for Measuring ROI
- Perceived ROI

Measuring ROI on BIM by Respondent Type

è Low focus on ROI

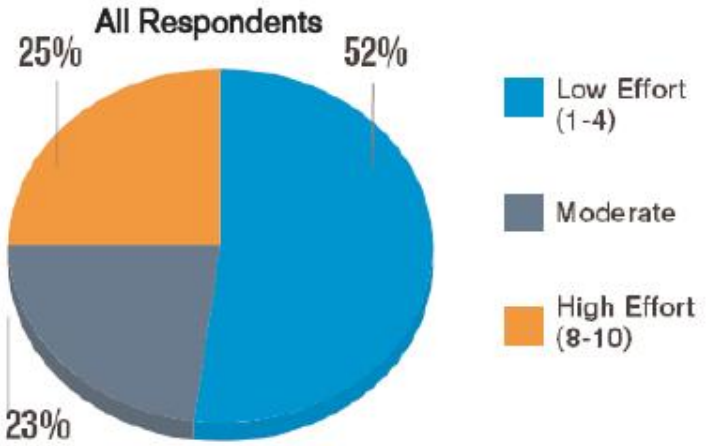
- Only 25% high effort

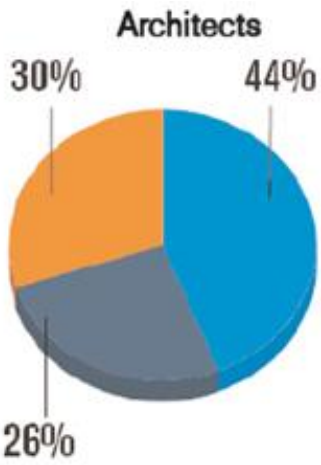


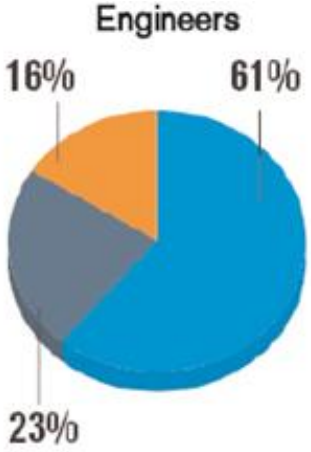
Measuring ROI on BIM by Respondent Type

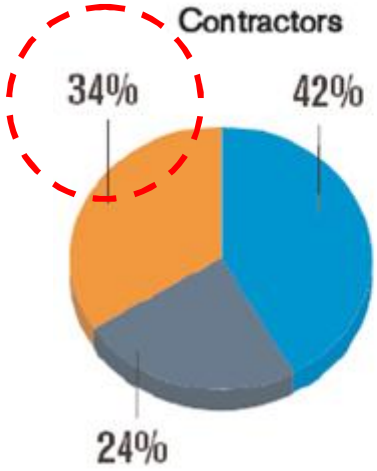
è Low focus on ROI

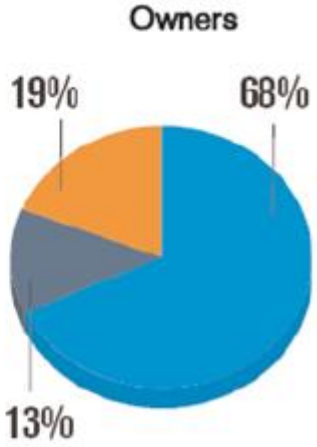
- Contractors lead





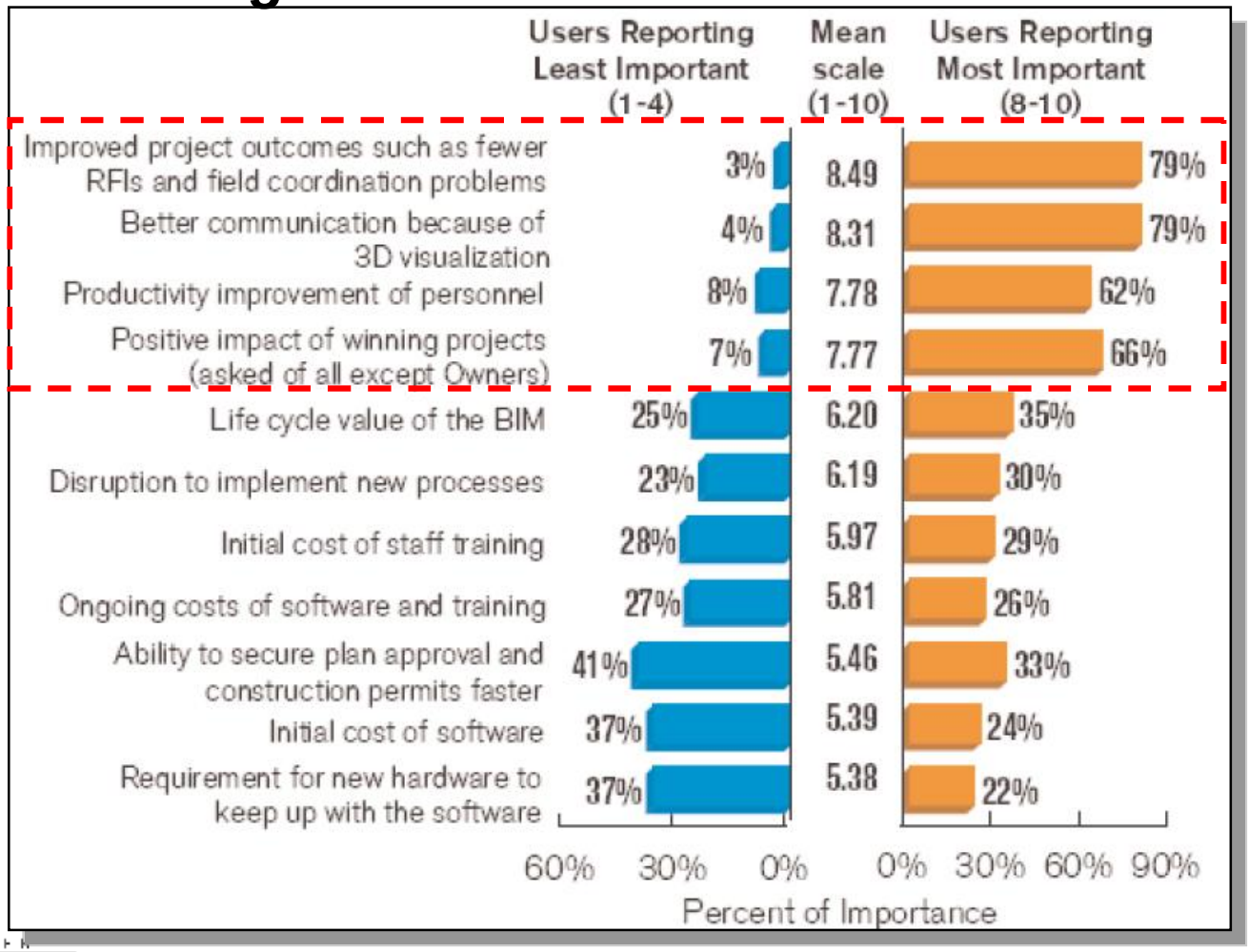






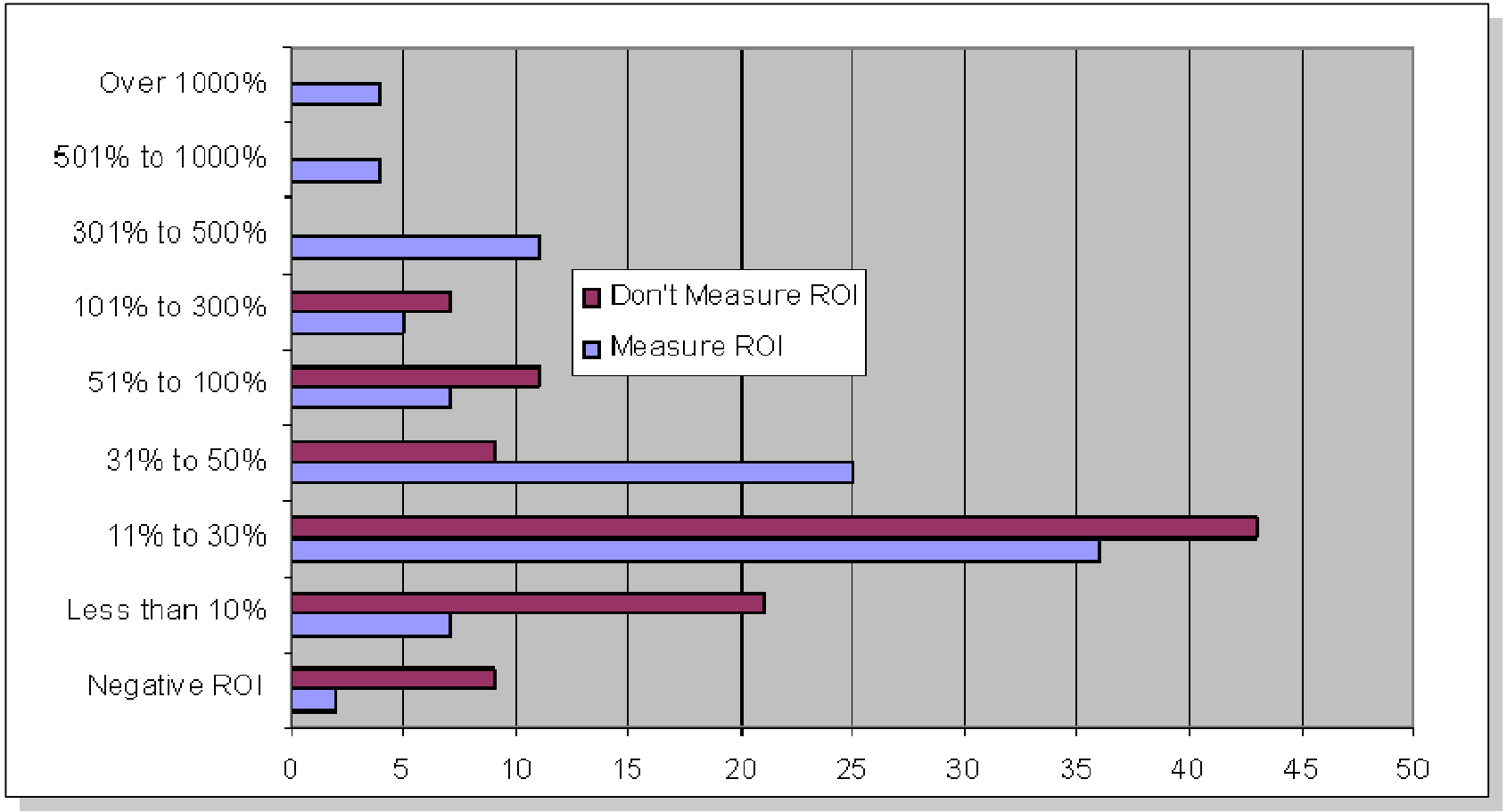
Importance of Aspects for Measuring ROI

- **Improved outcomes, communication, productivity, marketing**



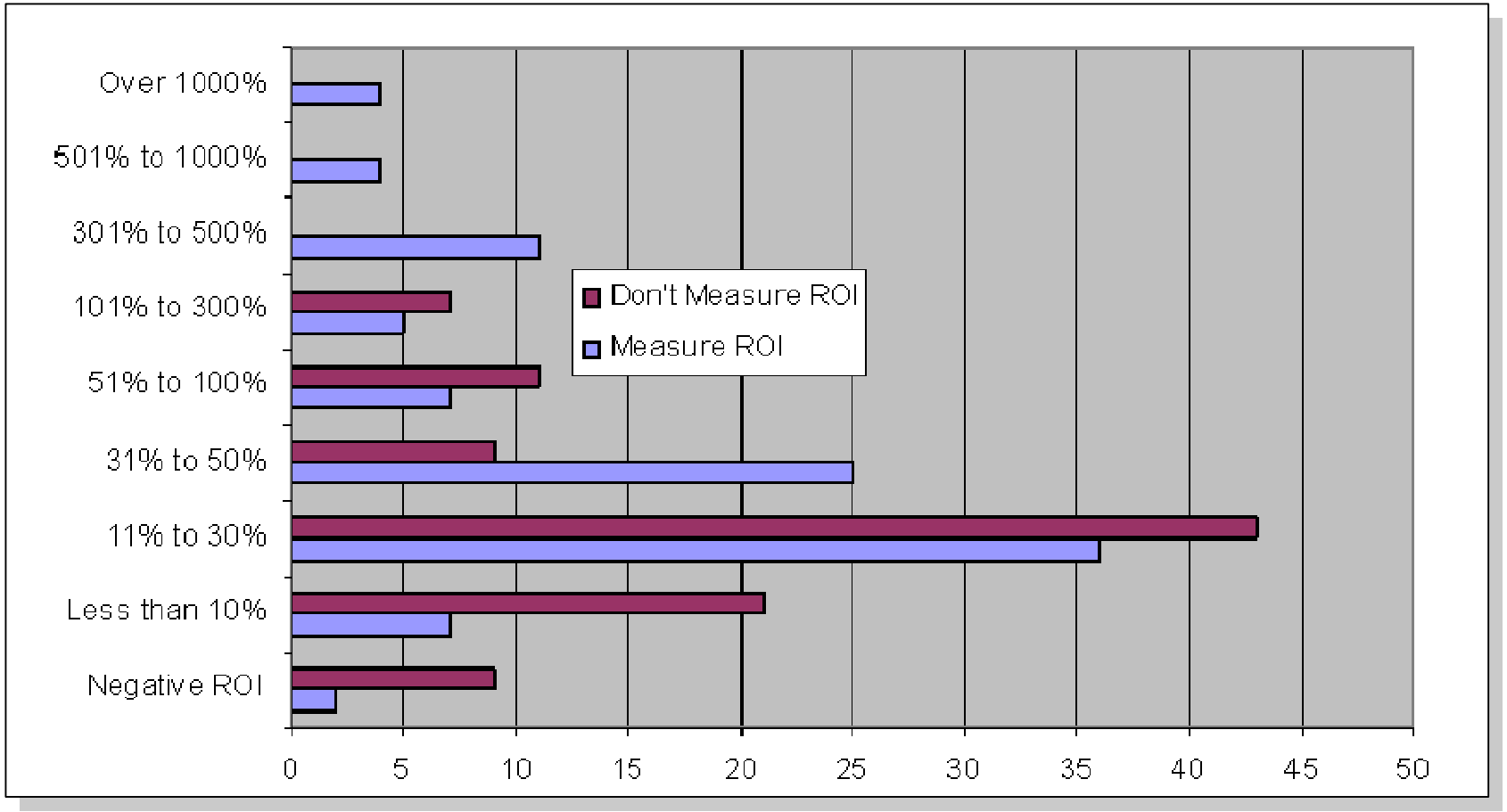
Perceived ROI

- **Perceived ROI is greater for firms that measure ROI**



Perceived ROI

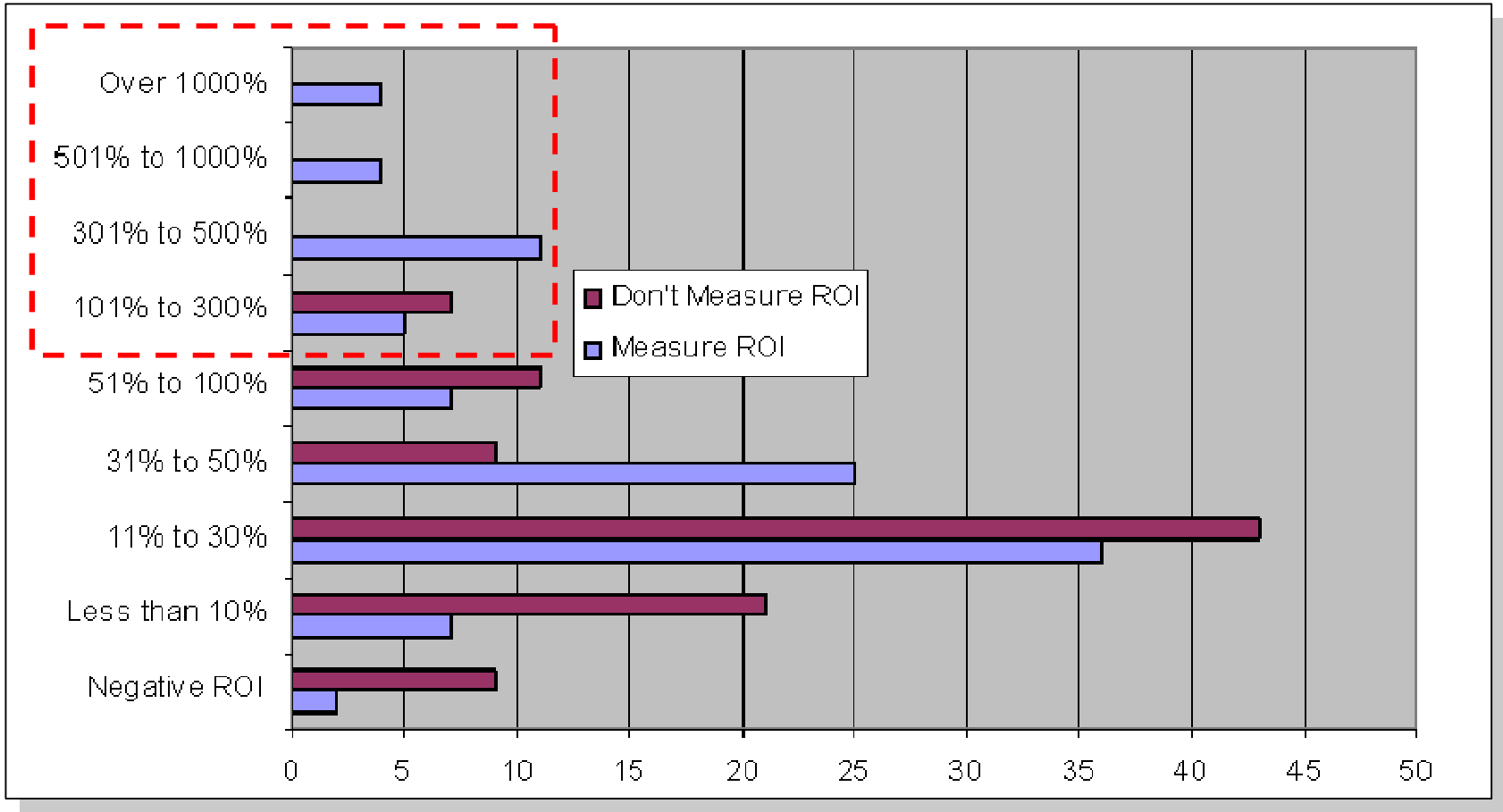
è Perceived ROI is greater for firms that measure ROI



Perceived ROI

è Perceived ROI is greater for firms that measure ROI

- 1/3 of trackers report ROI > 100%



Value of BIM

è Take-aways

- Low involvement in Measuring ROI
  - **Contractors lead**
  - **2009 will produce more metrics as contractors adopt**
- Important Aspects for Measuring ROI
  - **Quantifiable project outcomes**
  - **Communication**
  - **Productivity**
  - **Marketing**
- Perceived ROI higher with measurers than non-measurers
  - **1/3 of trackers >100%**

4. Impact of BIM on Internal & External Processes

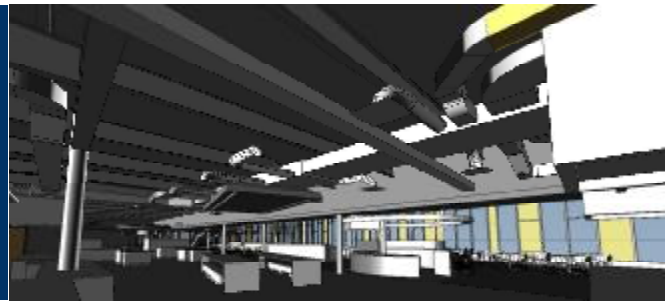


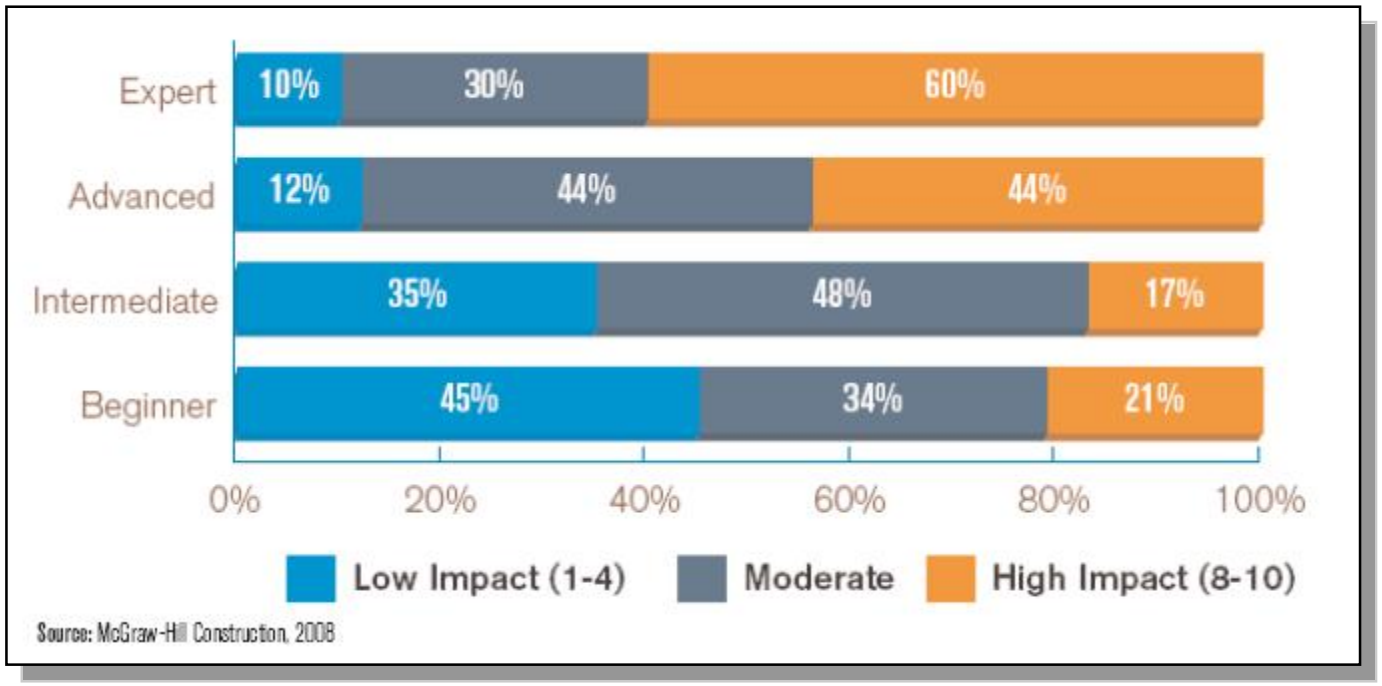
Image: Dunham Engineering

Impact of BIM Usage – Key Survey Focus Areas

- Impact of BIM on Internal Project Processes
- Impact of BIM on External Project Processes
- Frequency of Participation in BIM-Related Activities
- Type of Contract Used on BIM Projects
- Awareness of Initiatives to Develop BIM Contract Forms
- Perceived Risks Using BIM (Unprompted)

Impact of BIM on Project Processes

è Strong relationship between impact and expertise

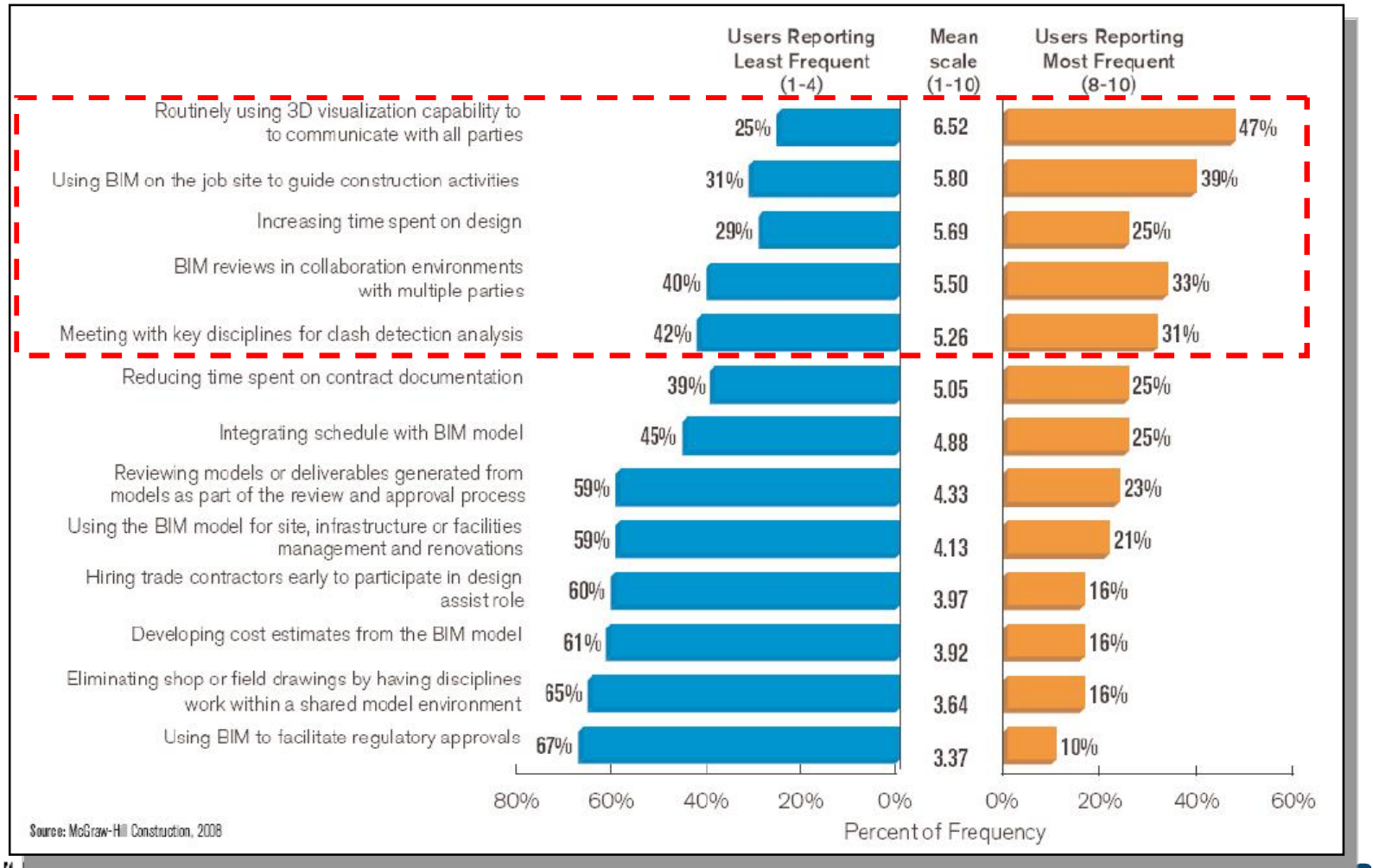


MEMBER CASRO

McGraw Hill CONSTRUCTION

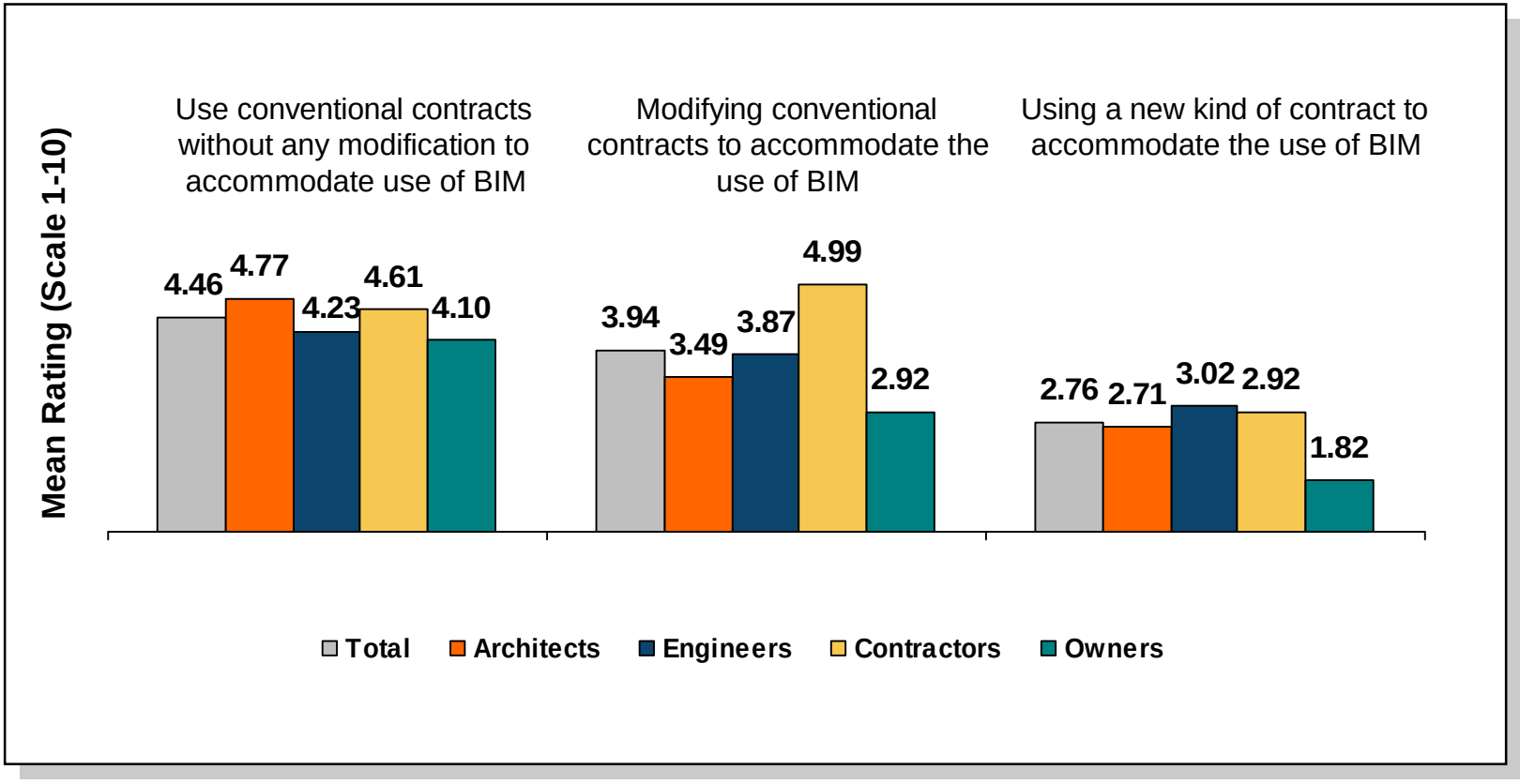
Frequency of Participation in BIM-Related Activities

è Visualization, jobsite, collaborative design reviews



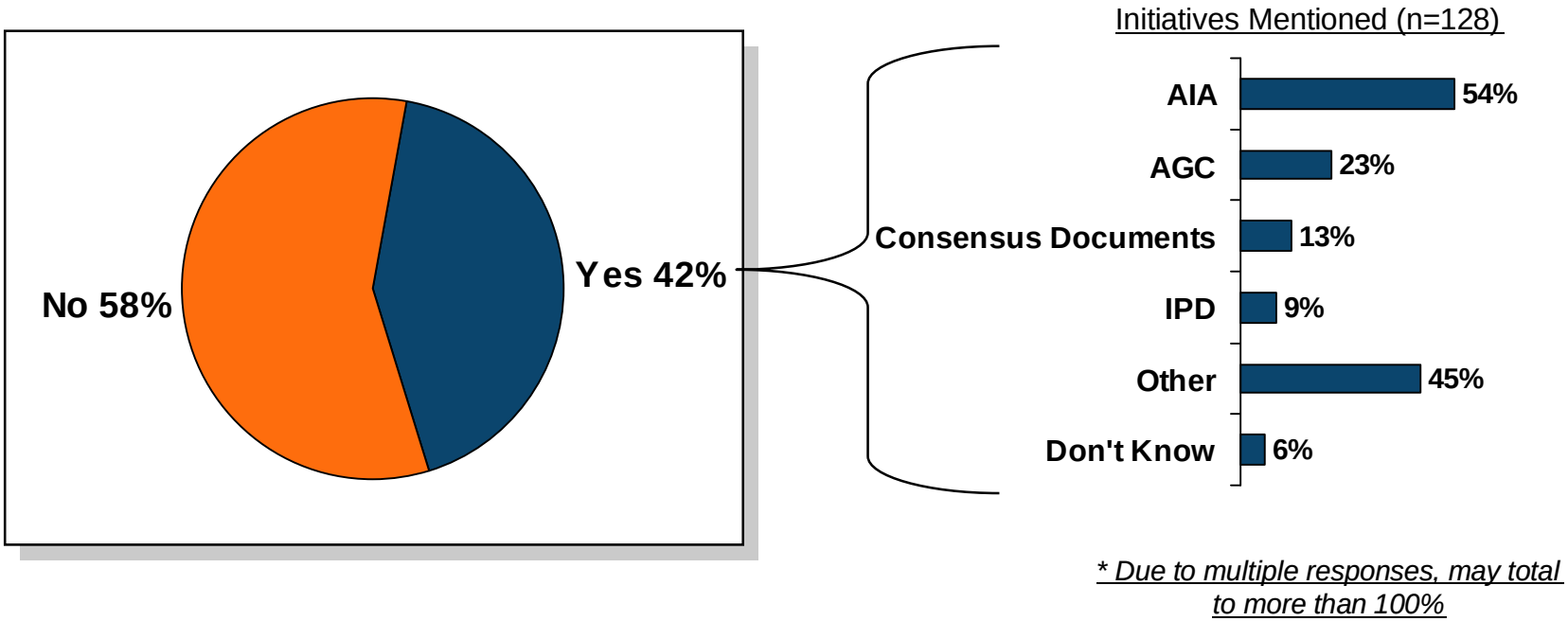
Type of Contract Used on BIM Projects

è Conventional contracts still dominate



Awareness of Initiatives to Develop BIM Contract Forms

è Only 40% awareness of BIM contract initiatives



** Due to multiple responses, may total to more than 100%*

Perceived Risks Using BIM (Unprompted)

è Errors by other, inexperienced BIM users

	Total	Architect	Engineer	Contractor	Owner
	(n=302)	(n=82)	(n=101)	(n=80)	(n=39)
Errors/ Accuracy Issues	11%	9%	9%	11%	21%
Liability & Legal Issues	10%	11%	10%	13%	0%
Inexperience of end-users/ Learning curve	11%	17%	4%	10%	18%
"Ownership" of the model after distribution/ taking responsibility for changes made by others	8%	12%	9%	5%	5%
Miscommunication/ Lack of coordination	4%	4%	4%	5%	5%
Over-reliance on Models and Computers	3%	1%	5%	3%	5%
Encouraging BIM buy-in from clients and other end-users	3%	4%	1%	6%	0%
Time considerations	3%	4%	5%	0%	5%
Not having appropriate amount of data (too little/ too much)	3%	4%	3%	1%	3%
General misuse of BIM software or misuse of BIM output by end-users	3%	0%	7%	1%	0%
Don't Know/ Can't think of any	10%	11%	13%	4%	10%
Don't see any risks	14%	12%	11%	18%	21%
Other*	17%	12%	20%	24%	8%

Source: McGraw-Hill Construction, 2008

Impact of BIM Usage

è Take-aways

- Direct relationship between amount of impact and level of BIM expertise
- Frequency of Participation in BIM-Related Activities
  - **3D visualization for communication, clash detection, collaborative mtgs, jobsite coordination,**
- Std contracts still most commonly used on BIM projects
  - **New ones emerging (AIA/IPD, AGC Consensus Docs, Australian)**
  - **Low awareness of initiatives to develop BIM contract forms**
- Low concern about risk
  - **Top perceived risk related to people making poor models**

5. BIM Infrastructure

Content, Standards, Technology, Training

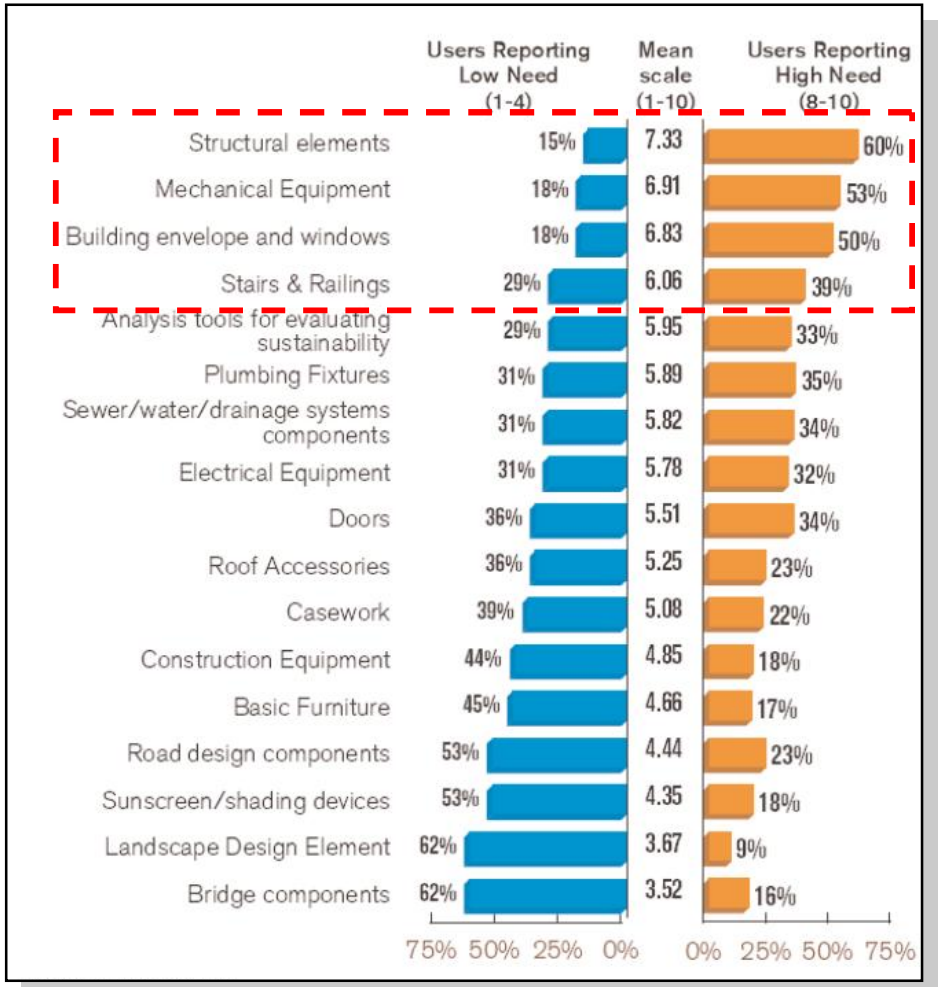
Image: Dunham Engineering

BIM Content - Key Survey Focus Areas

- **Priority of Need for BIM Content**
  - 17 choices of project elements
- **Preference for Generic vs Proprietary (Mfr-specific)**
- **Sources for BIM content**

Developing BIM-Related Content

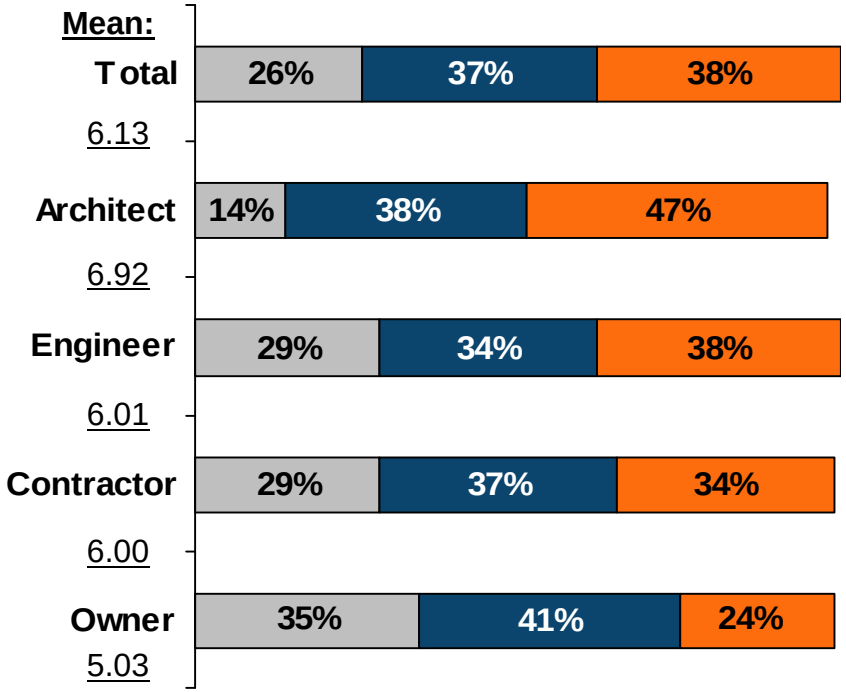
- **Structural, mechanical, building envelope, stairs**



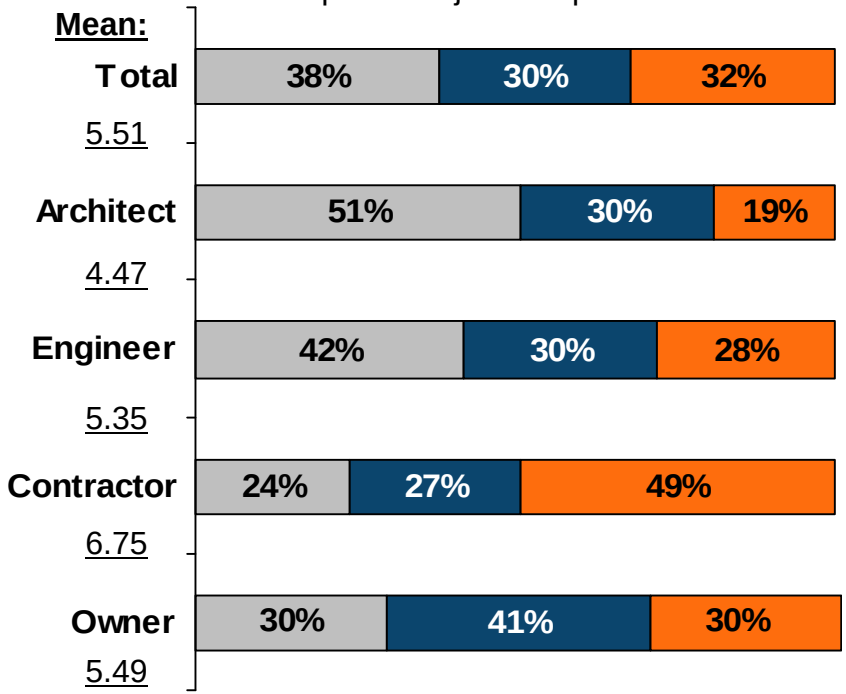
Preferences for Object Modeling

§ **Architects and Engineers favor starting their BIM design with generic objects before moving on to manufacturer-specific objects at a later stage. Contractors and Owners differ however, and prefer to begin their design with as many manufacturer objects as possible.**

"I prefer to begin a BIM design with generic objects, then substitute them with manufacturer-specific objects later."



"I prefer to begin a design with as many manufacturer-specific objects as possible."



Don't Know, N=10

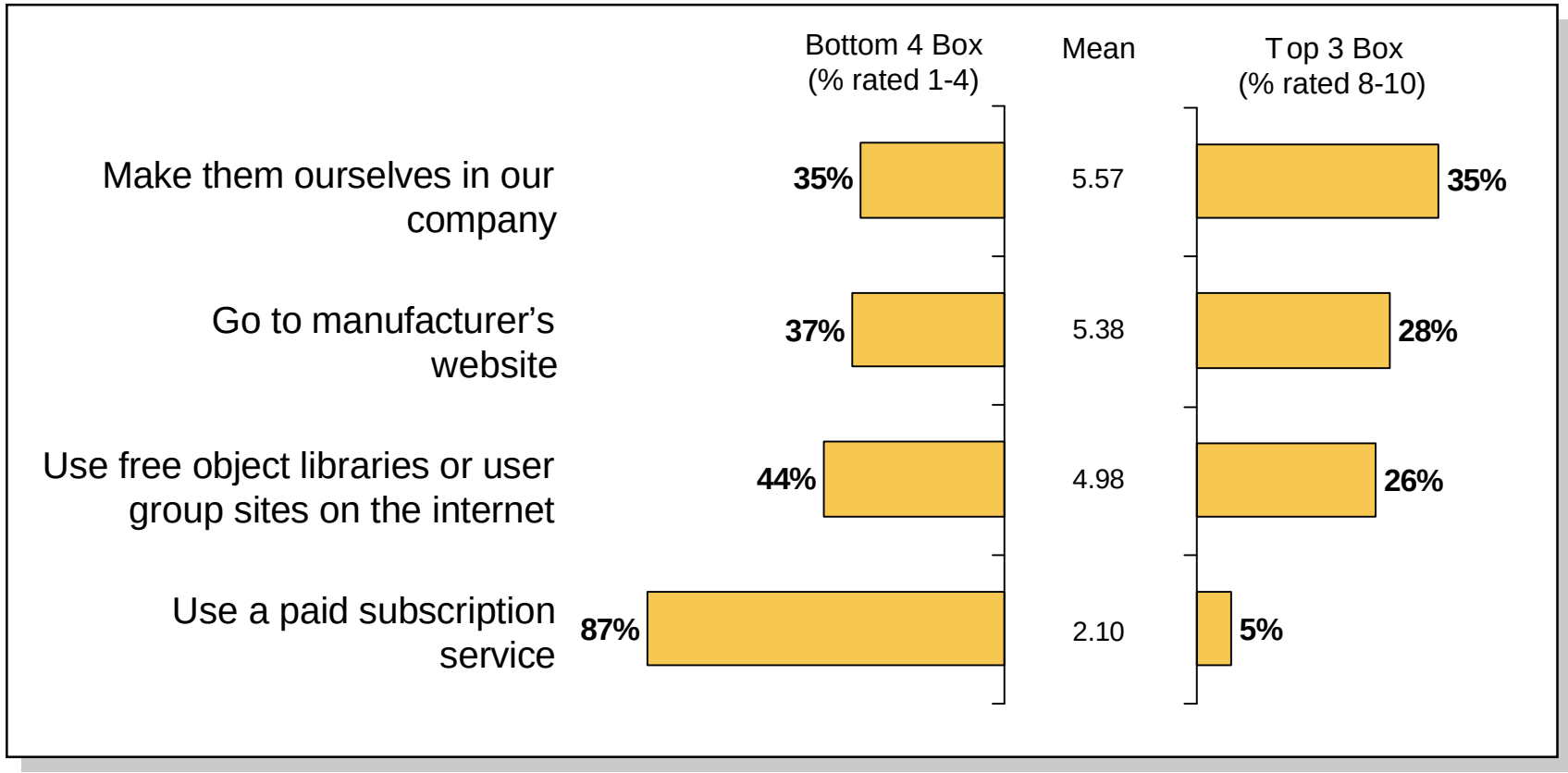
1 - 4 | 5 - 7 | 8 - 10

Don't Know, N=10

Q29. Using a scale from 1 to 10, where 1 is Totally Disagree and 10 is Totally Agree, how much do you agree with each of the folowing statements… Total=292, Architect=78-80, Engineer=96-98, Contractor=79 and Owner=37

Frequency of Sourcing Objects for BIM

è Homemade, mfr sites, object libraries

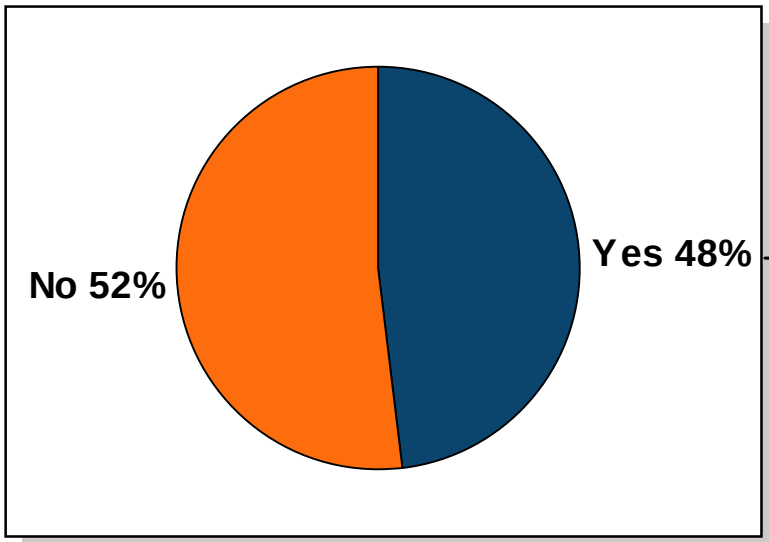


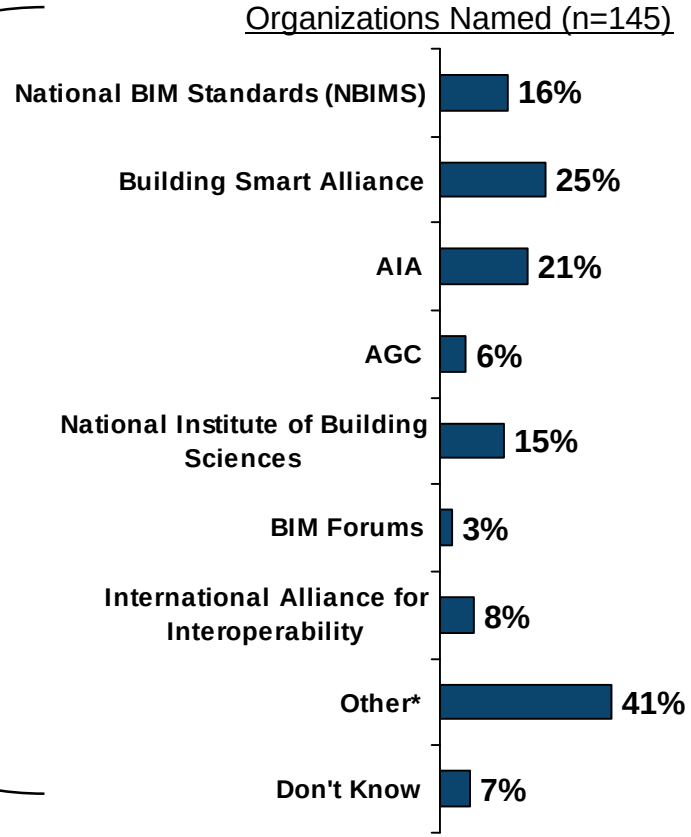
BIM Standards - Key Survey Focus Areas

- **Awareness of BIM Standard Organizations and Initiatives**
- **Who should Drive Development of BIM Standards**

Awareness of BIM Standard Organizations

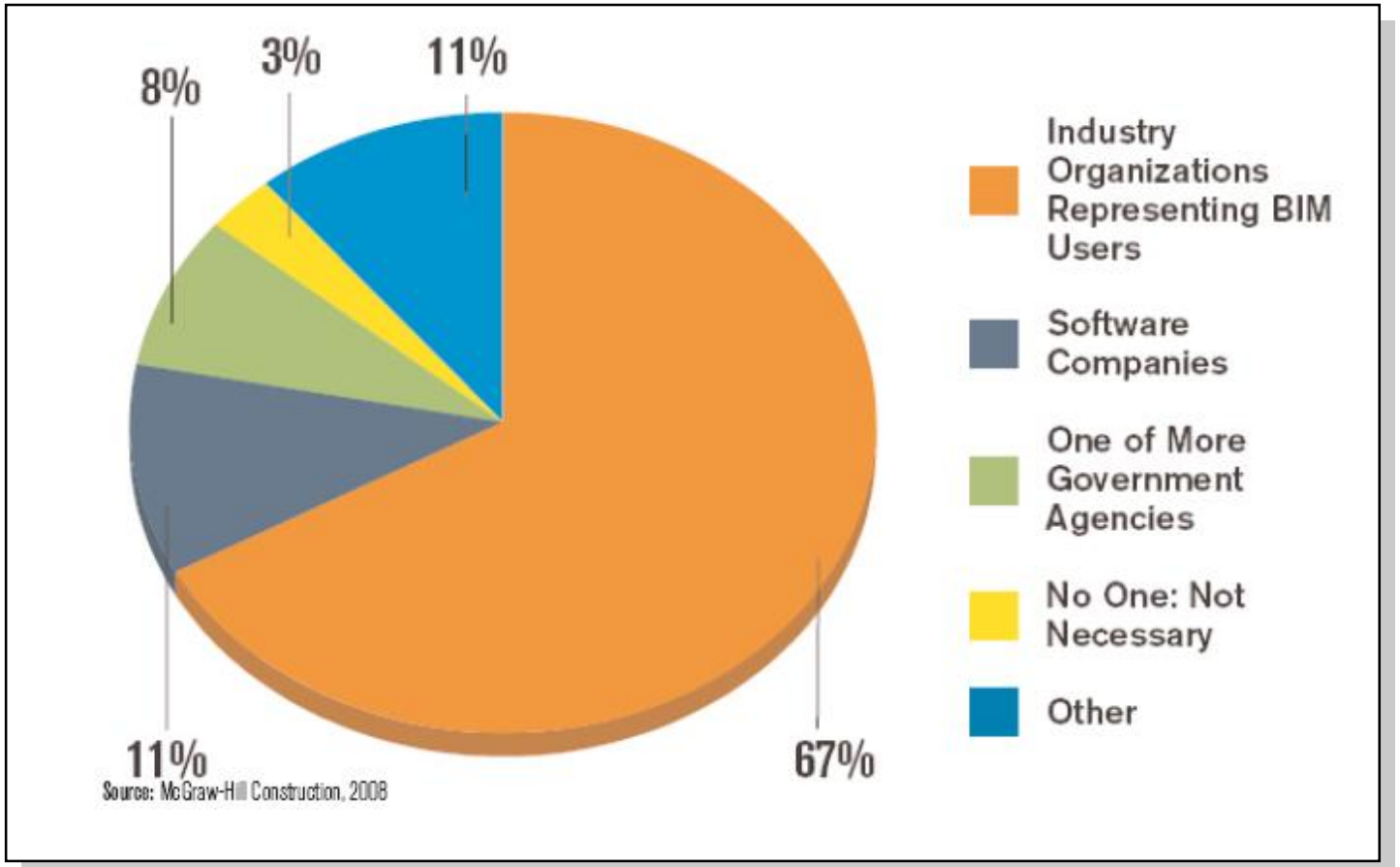
è Only 48% awareness of BIM standard initiatives





Development of BIM Standards

- **Everybody wants their industry org to do it**



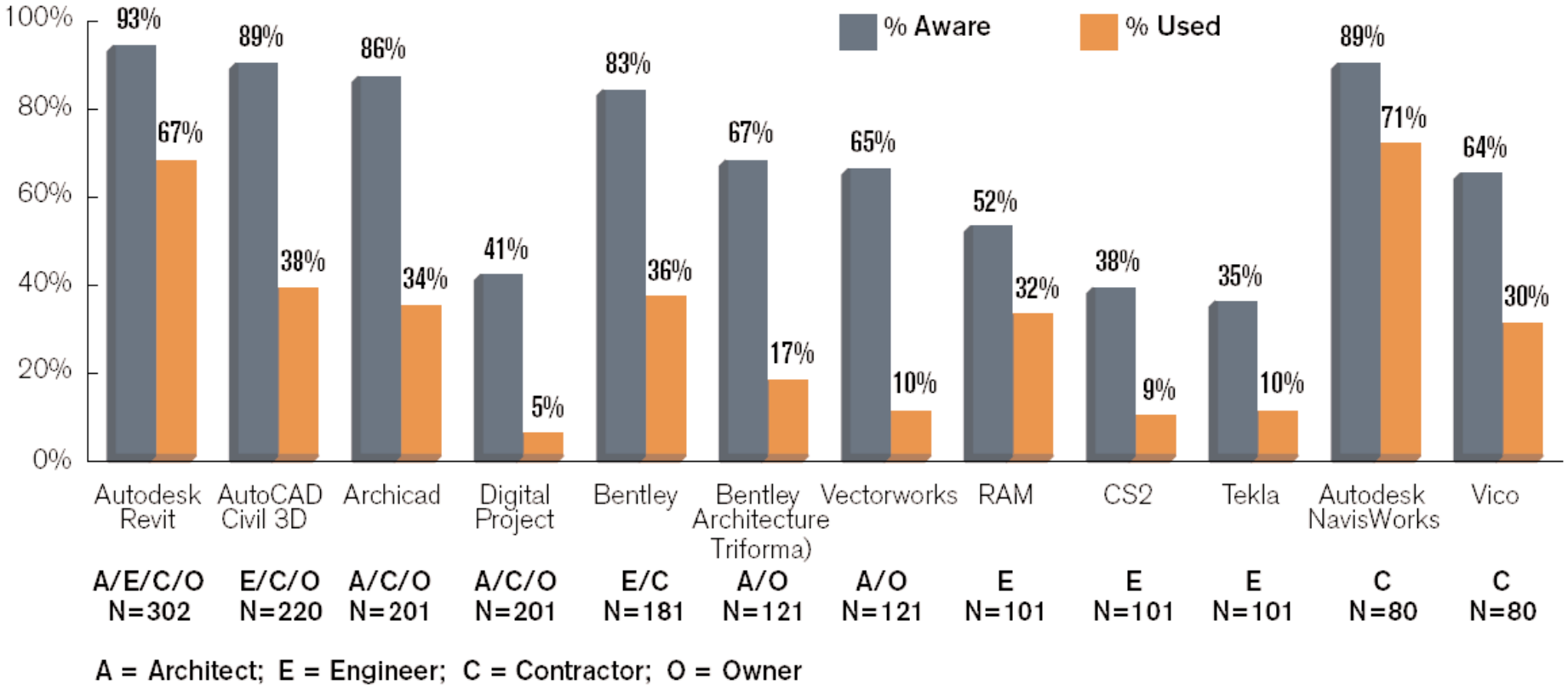
BIM Software - Key Survey Focus Areas

- **Level of Experience of BIM Tools: Total Awareness**
- **Use of BIM Analysis Tools**
- **Improving BIM Software (Unprompted)**

Level of Experience with BIM Tools: Total Awareness

è Broad awareness

– Usage is more focused



A = Architect; E = Engineer; C = Contractor; O = Owner

Improving BIM Software: Unprompted Suggestions

è Interoperability #1 request for improvement

Interoperability: improve ability for different software packages to work together	30%
Make software more user-friendly	17%
Improve training	6%
Add more user tools and options to BIM software	5%
More standardization for BIM process	4%
Make more of an effort to listen to the software users and incorporate their feedback	5%
Make software less expensive	3%
Make software that is faster and more powerful	2%
Other*	19%
Nothing to improve/ No opinion	13%

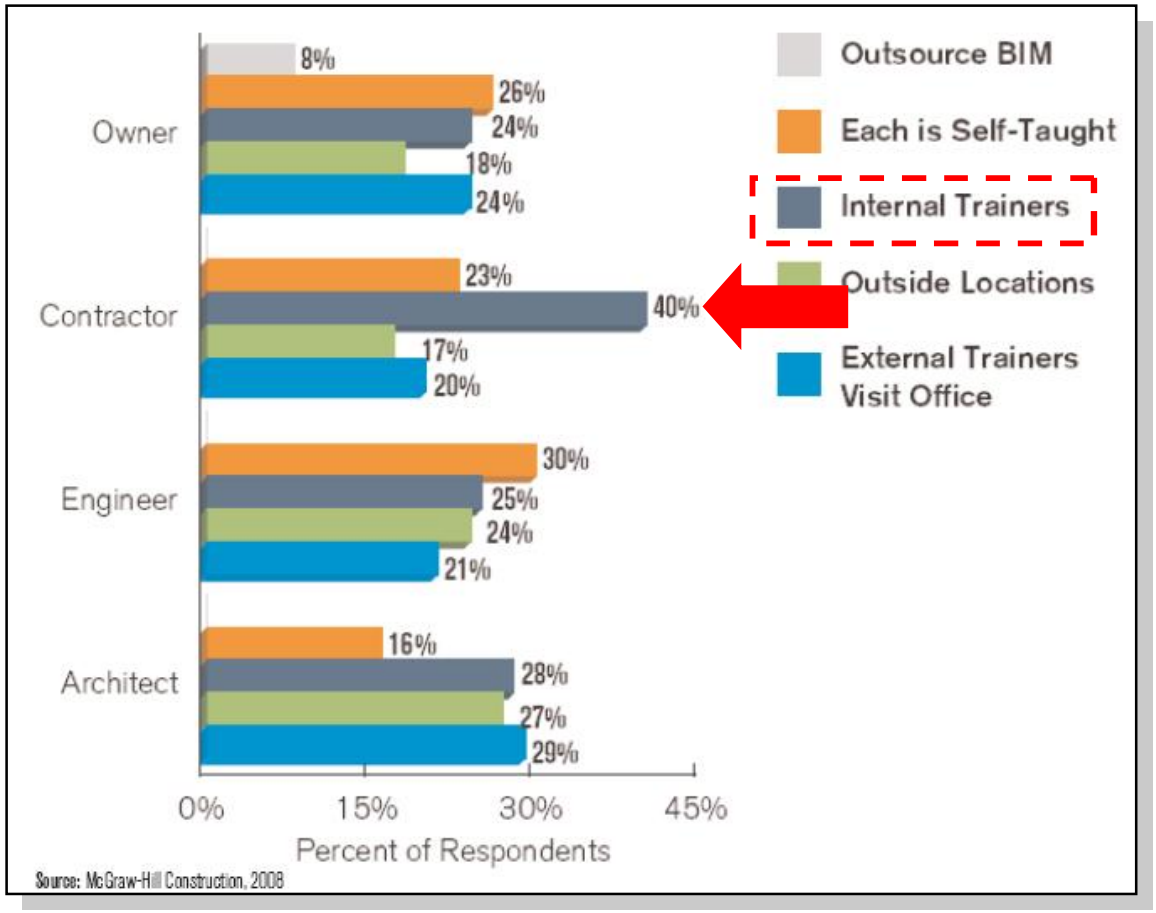
Source: McGraw-Hill Construction, 2008

Education, Training & Certification - Key Survey Focus Areas

- **How is BIM Training Done at Your Company**
- **Current Level of BIM Training at Your Company**
- **Adequacy of BIM Training Available**
- **Importance of BIM Training Needs**
- **Awareness of BIM Certification Organizations**
- **Likelihood of Working with BIM Certification Sources**

Methods of BIM Training – Respondent Type

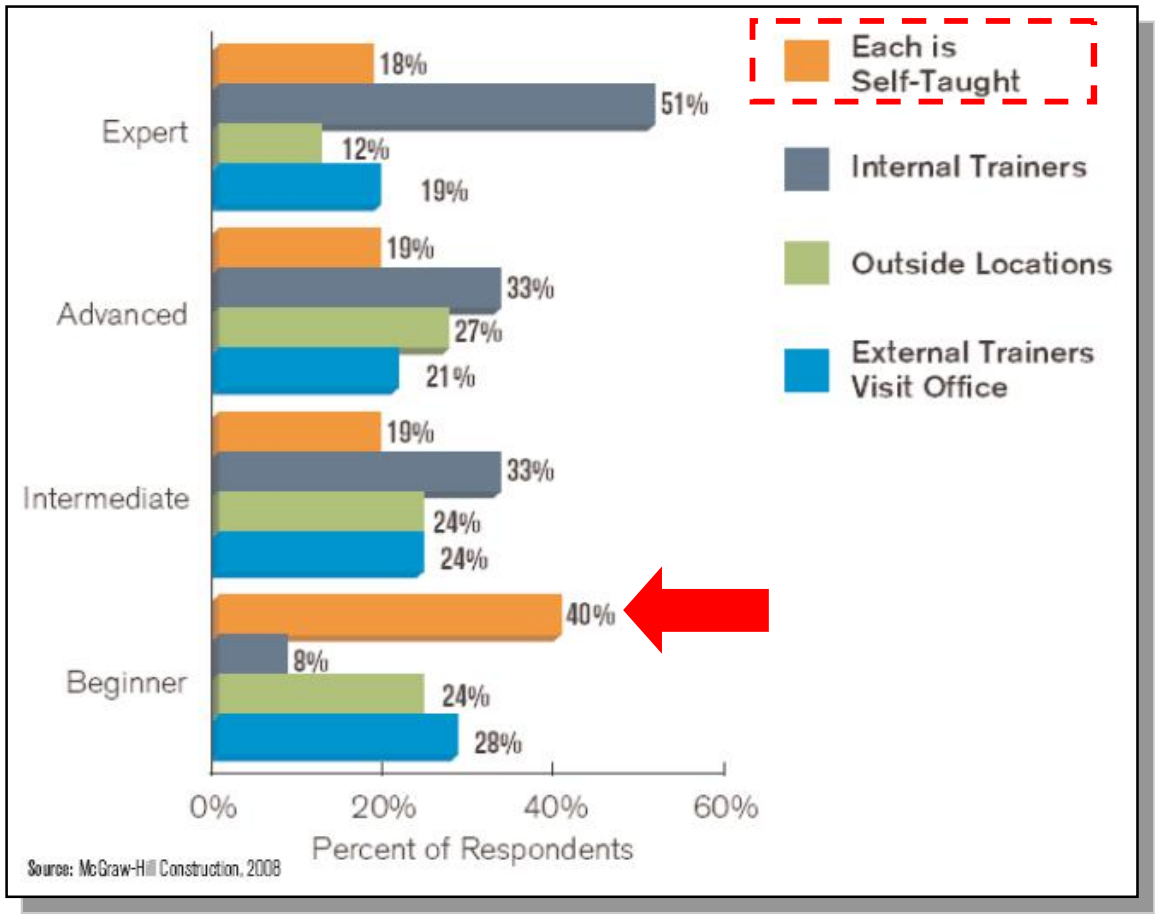
è Contractors leverage internal training resources



Methods of BIM Training – Experience Level

è Beginners mostly self taught or 3rd party trainers

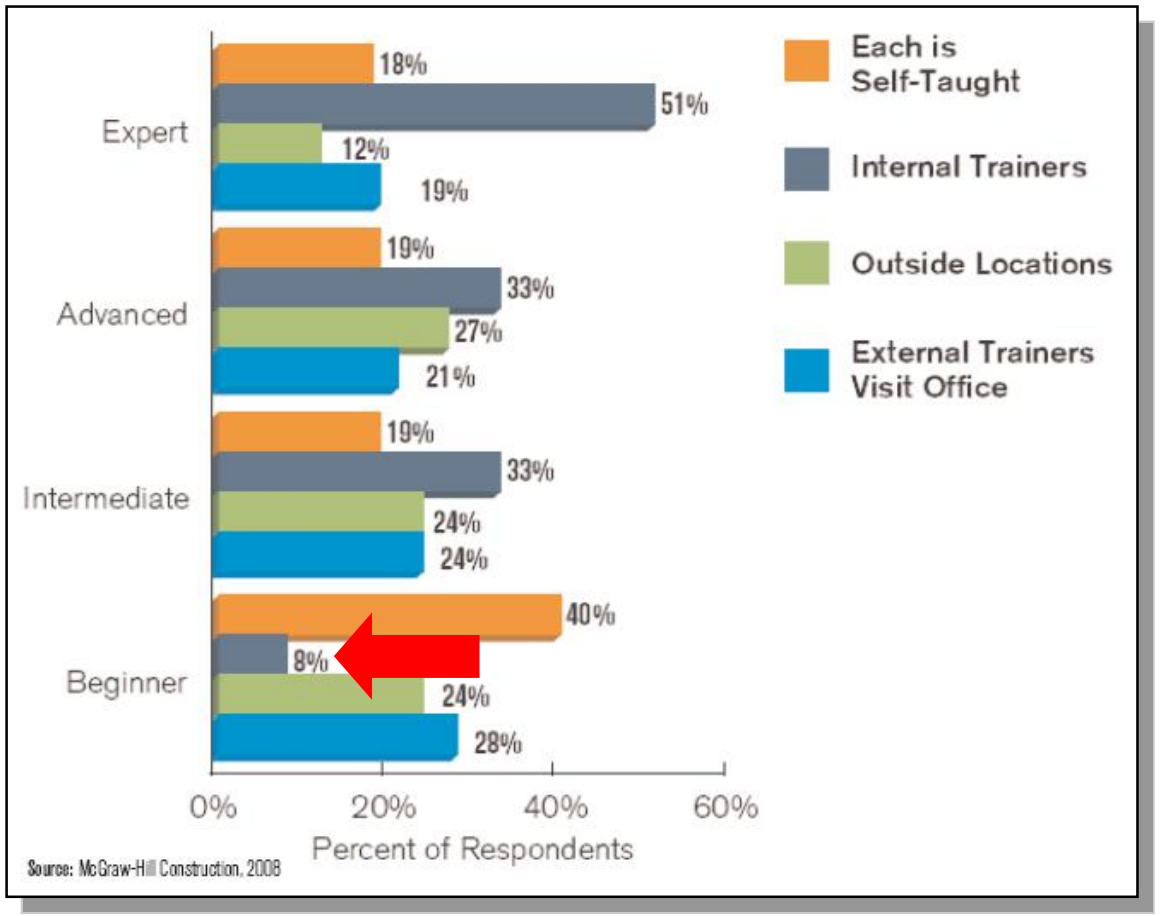
- Decreases directly with level of expertise



Methods of BIM Training – Experience Level

è Internal training (gray line) increases

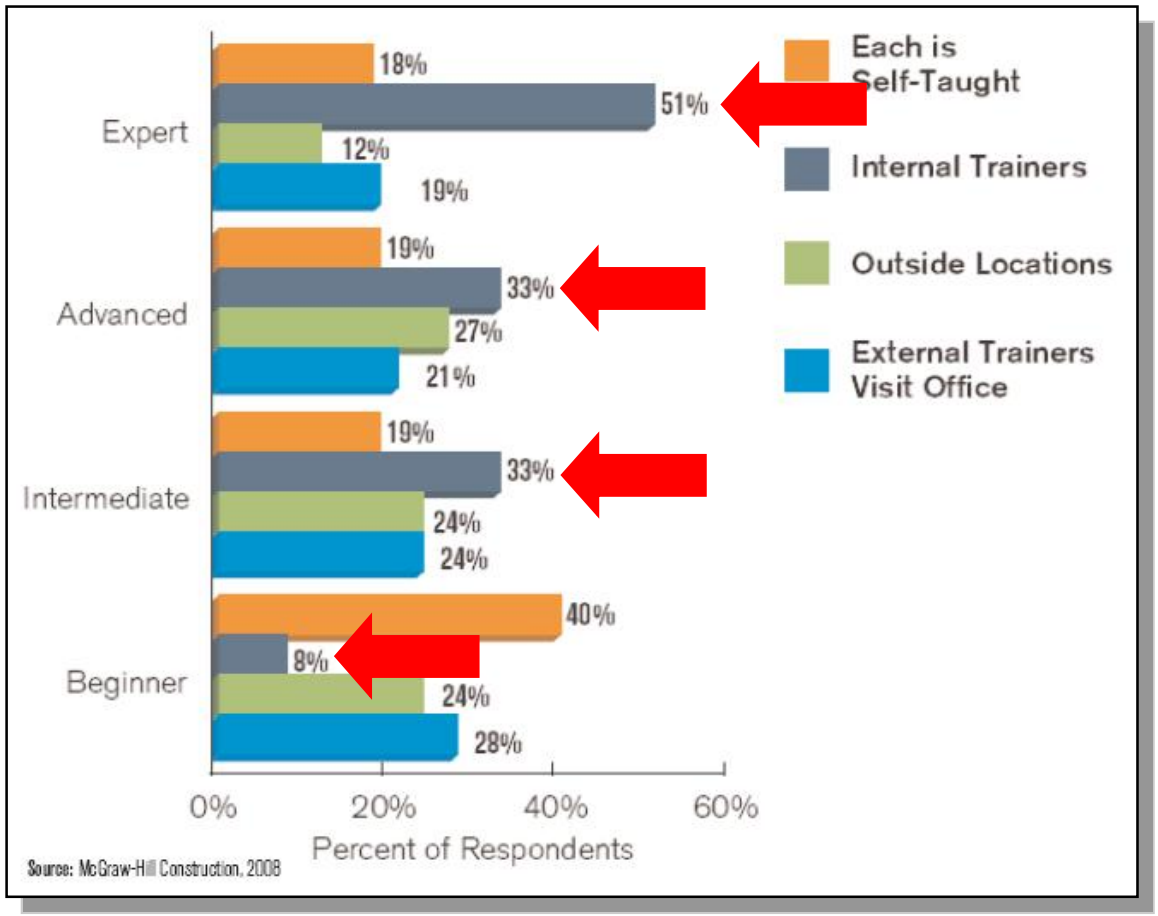
- Tracks directly with level of expertise



Methods of BIM Training – Experience Level

è Internal training (gray line) increases

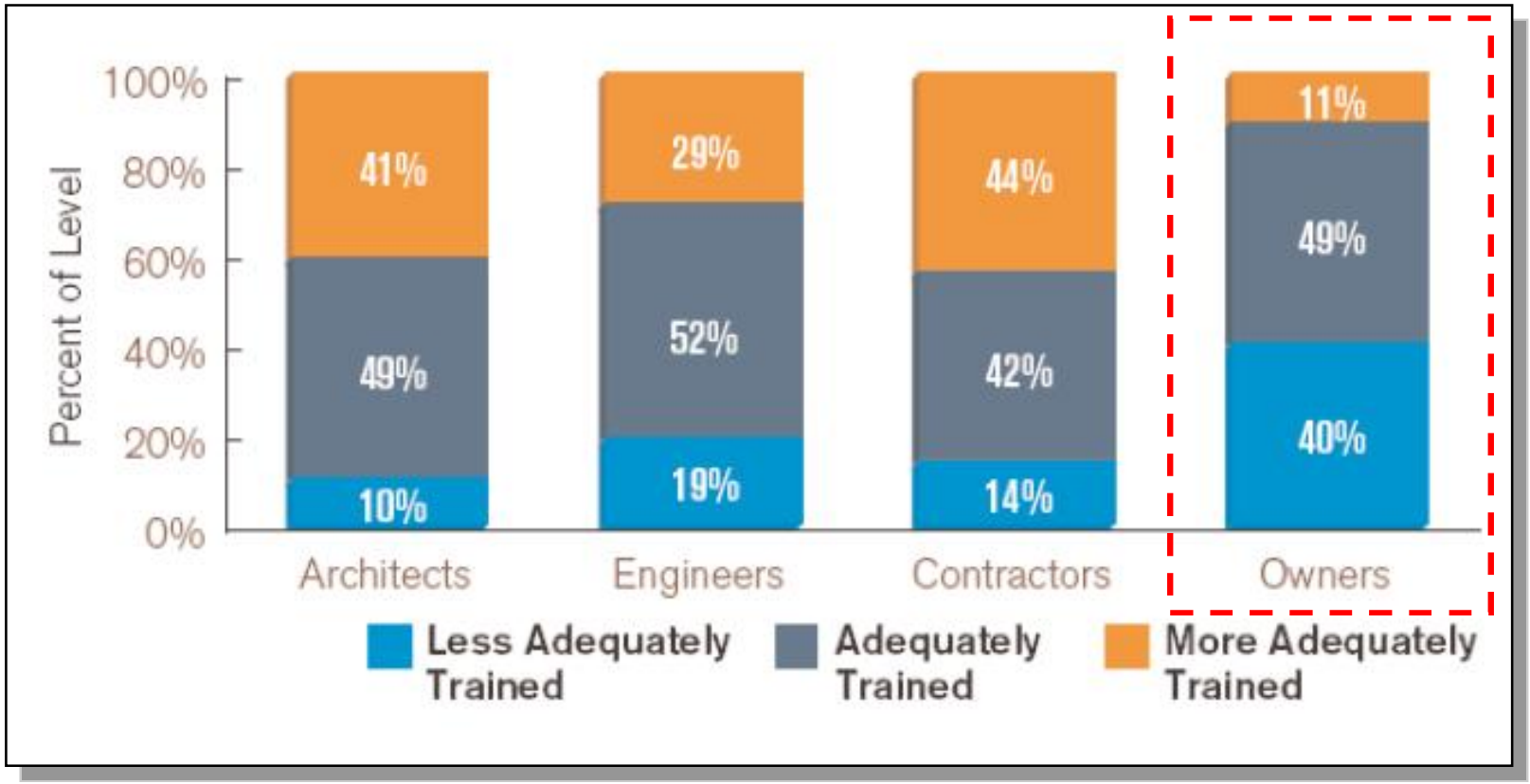
- Tracks directly with level of expertise



Level of BIM Training

è Owners self-assess as least well-trained

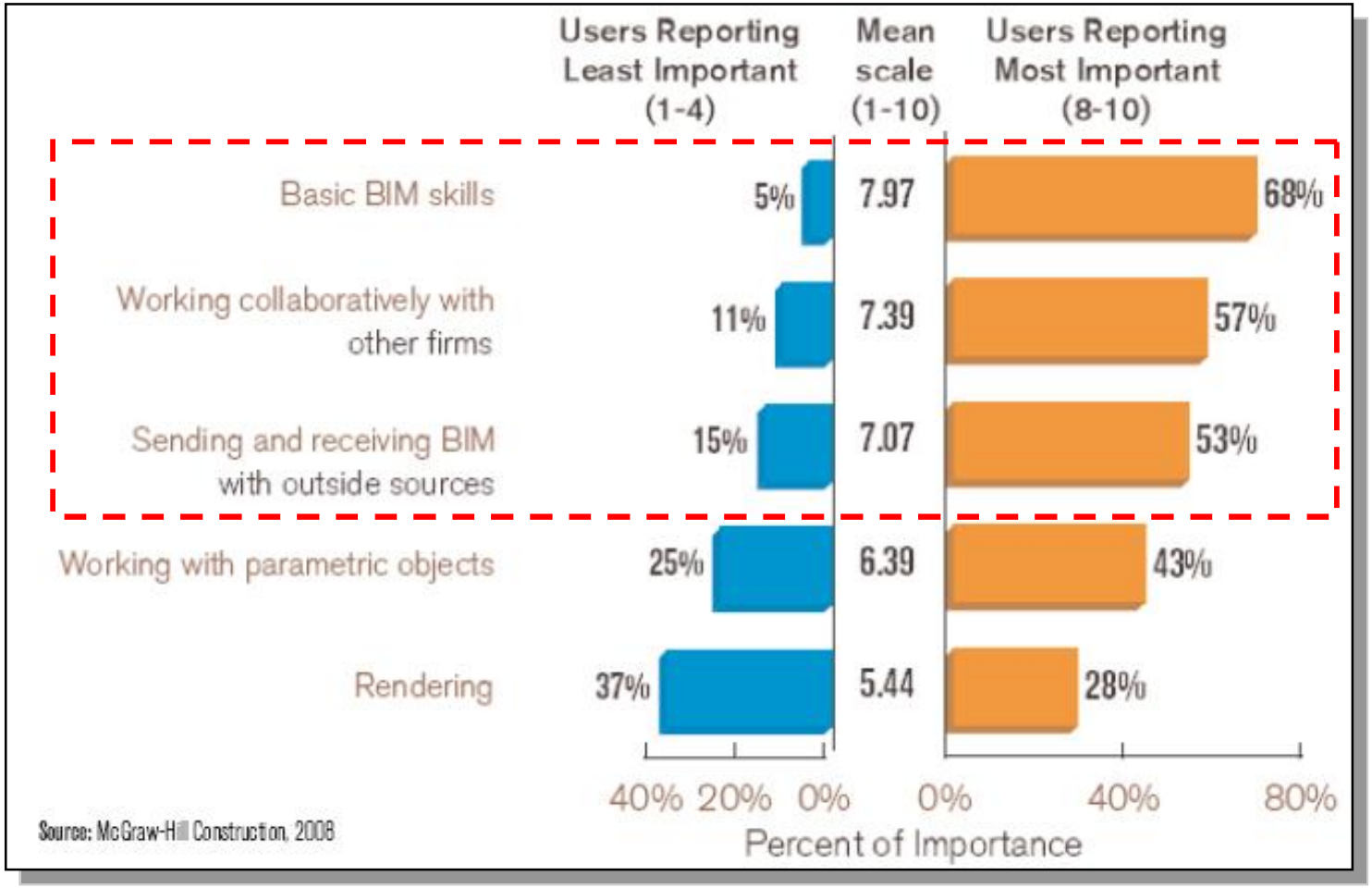
– Architects and Contractors better



Importance of BIM Training Needs

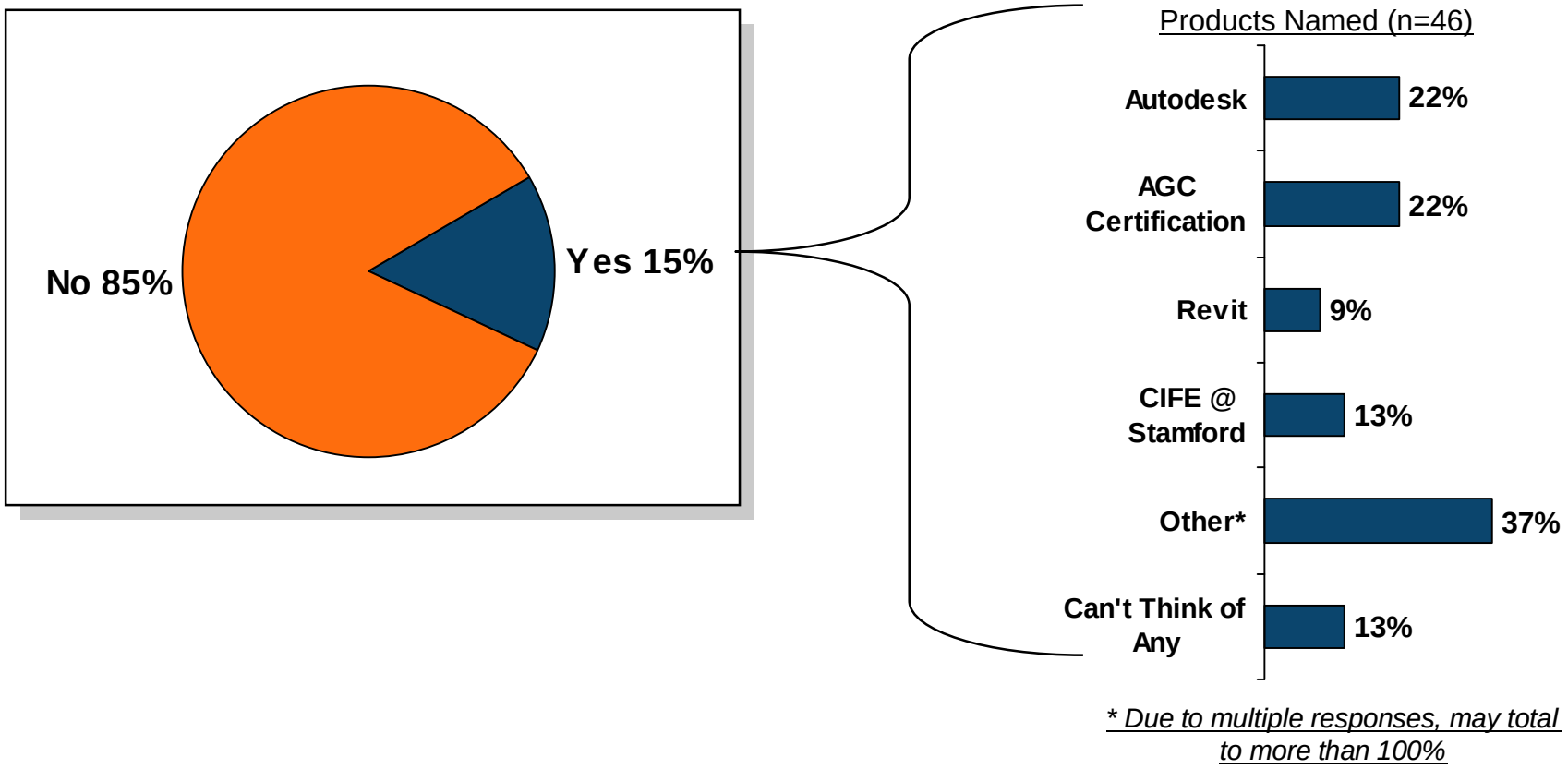
è Basic BIM skills most in demand

- Collaborative skills next most important



Awareness of BIM Certification Organizations

è Low awareness of certification initiatives



** Due to multiple responses, may total to more than 100%*

BIM Infrastructure

è Take-aways

- High demand for wide variety of BIM project elements
  - **A/E want Generic and Proprietary**
  - **GC/Owner want Mfr-specific**
- Homemade content #1, BPM/free sites (e.g. Sweets) #2
- Low awareness of stds initiatives
- Autodesk products highest awareness and usage
- Interoperability #1 demand for improved software
- Beginners self-taught, Experts/C&S leverage internal training
- Basic BIM skills #1 need
- Soft skills collaboration and technical file exchange #2
- Low awareness of certification initiatives

Outlook

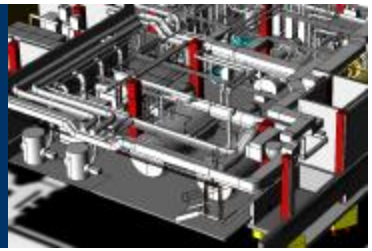


Image: Dunham Engineering

Outlook on Industry Impact

- è Strategic Advantage in a Challenging Economy
- è Owners' Lifecycle Focus Enhanced by BIM
- è Relationship b/ Expertise and Positive Experience
- è Faith-Based BIM Adoption will shift to Metrics/ROI
- è 2009 Will Be the "Year of the Contractor" in BIM
- è 2010 Will Be the "Year of the Owner"
- è Discipline-Specific Evolution Path
- è Federation of Silos of Excellence
- è BIM-Driven Prefabrication on the Horizon
- è Workforce Demographics

Recommendations

Beginners:

- **Momentum is critical.**
- Start small; know what you are trying to achieve; measure the results; and keep your expectations aligned as you move up the learning curve.
- Research shows that positive experience grows in direct relation to expertise. Don't get discouraged — you will overcome initial challenges.
- **Designate BIM champions and devote adequate training and time for them.**

Recommendations

Intermediate Users:

- **Focus on developing best practices and a training program to expand BIM use internally.**
- Decide either to build a team of BIM experts to support multiple projects or to make BIM capability a requirement for everyone.
- Explore the growing universe of analysis tools that work with BIM (e.g. energy analysis).
- Reach out to companies you work with who are also adopting BIM to develop integrated processes for model sharing and analysis.

Recommendations

Advanced and Expert Users: (design professionals and builders)

- **Leverage the competitive advantage of your BIM expertise by exploring 4D (schedule integration) and 5D (cost modeling),** which provide extremely powerful process efficiencies.
- Also, consider forming alliances with other BIM-savvy companies that you work well with to approach clients as an integrated delivery team with established processes and a proven track record. You will rise above the competition as demand for BIM inevitably increases.

Recommendations

Advanced and Expert Users: (owners)

- **Focus on defining specific BIM requirements for your projects so the most qualified providers will be identified.**
- Also, work on migrating your completed BIMs into automated operations and maintenance, and have your teams tailor their deliverables to support that.

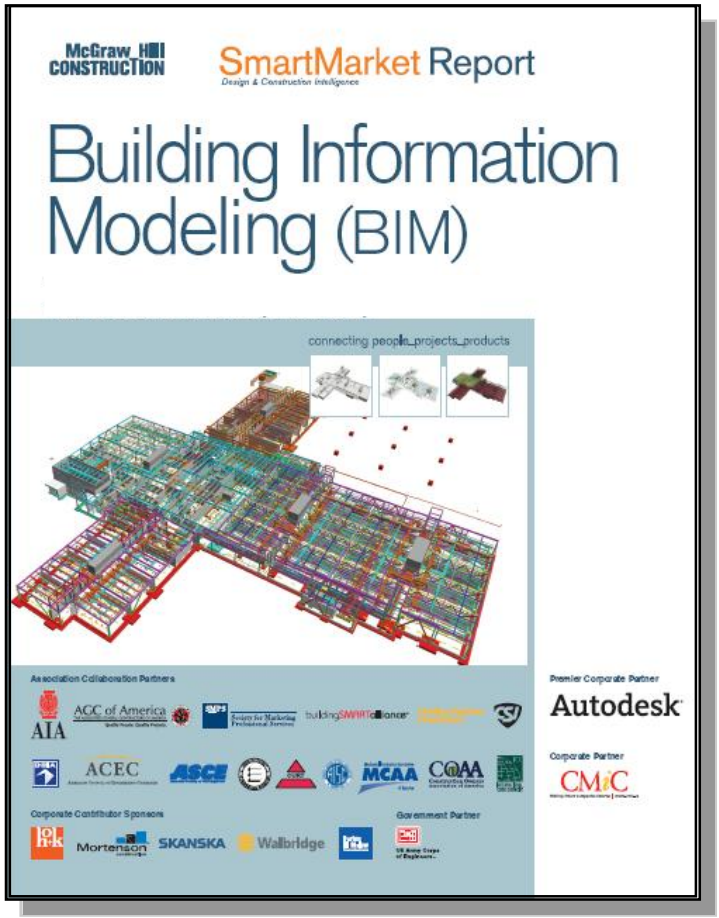
Recommendations

All Users:

- **Leverage resources from professional industry organizations.**

McGraw-Hill Construction SmartMarket Report on BIM

- **Free Download:**
  - Construction.ecnext. com

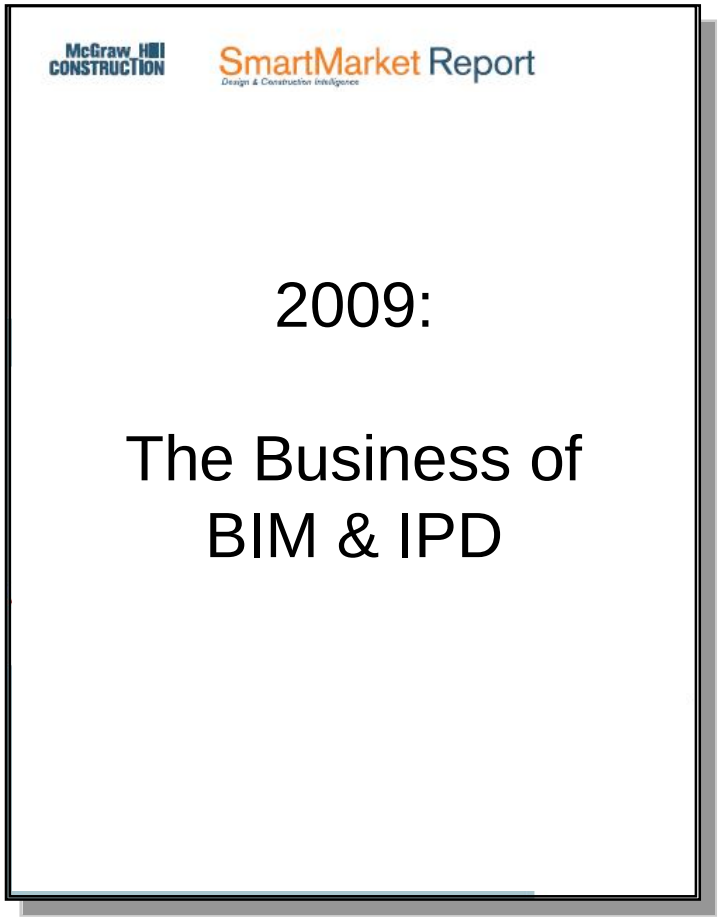


MEMBER CASRO

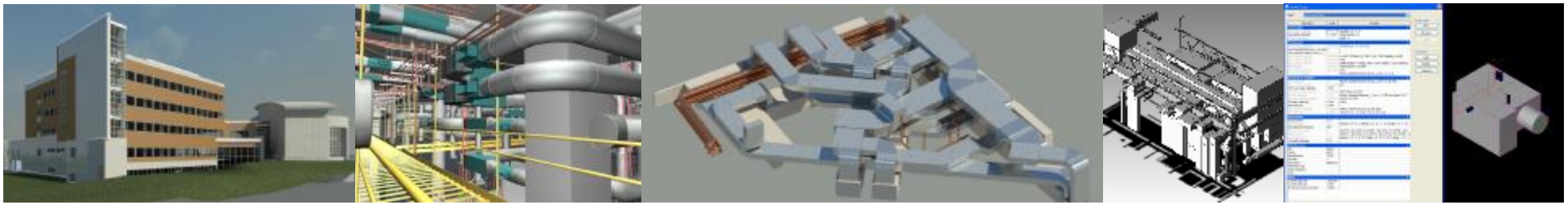
McGraw Hill CONSTRUCTION

McGraw-Hill Construction SmartMarket Report on BIM

- **Next edition Fall 2009:**
  - The business aspects and impact of BIM/IPD
    - **Benefits**
      - Investment and ROI
      - Where users are finding the value
    - **Impact on Business Processes**
      - Agreements
      - Financial structures
      - Risk allocation
  - Survey and Case Studies



McGraw-Hill Construction Research on BIM Users



FEDERAL FACILITIES COUNCIL

Steve Jones
McGraw-Hill Construction

Images: Dunham Engineering, University Mechanical

McGraw Hill CONSTRUCTION