



# **Future Vision: Building Information Modeling, Interoperability and Virtual Design & Construction**

*Norbert W. Young*

*President*

*McGraw-Hill Construction*

# McGraw-Hill Construction

**McGraw\_Hill  
CONSTRUCTION**

- Leading provider of construction information
- Founded over 100 years ago
- 1,200 employees
- Over 1,000,000 customers
- Serving private sector, government, financial community

**McGraw\_Hill  
CONSTRUCTION**

Dodge  
Sweets  
Architectural Record  
ENR  
Regional Publications

## *History*

**Founded by James H. McGraw, Frederick W. Dodge and Clinton Sweet Over 130 Years Ago**

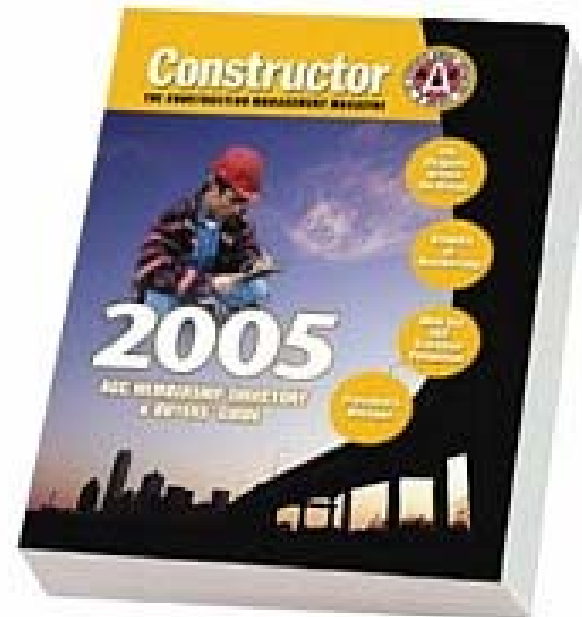
## *Today*

**Serves One Million Customers Within the \$4.6 Trillion Global Construction Community**

**McGraw\_Hill  
CONSTRUCTION**

# AGC & McGraw-Hill Construction *Constructor* Publication Partnership

→ **Constructor** Magazine, Buyers Guide  
and Membership Directory



# Future Vision

*Building Information Modeling (BIM),  
Interoperability, Integrated Processes and  
Virtual Design & Construction*

- State of the AEC/O Industry
- BIM, Interoperability and Integrated Processes
- Research
- McGraw-Hill Construction Vision  
for Virtual Design and Construction

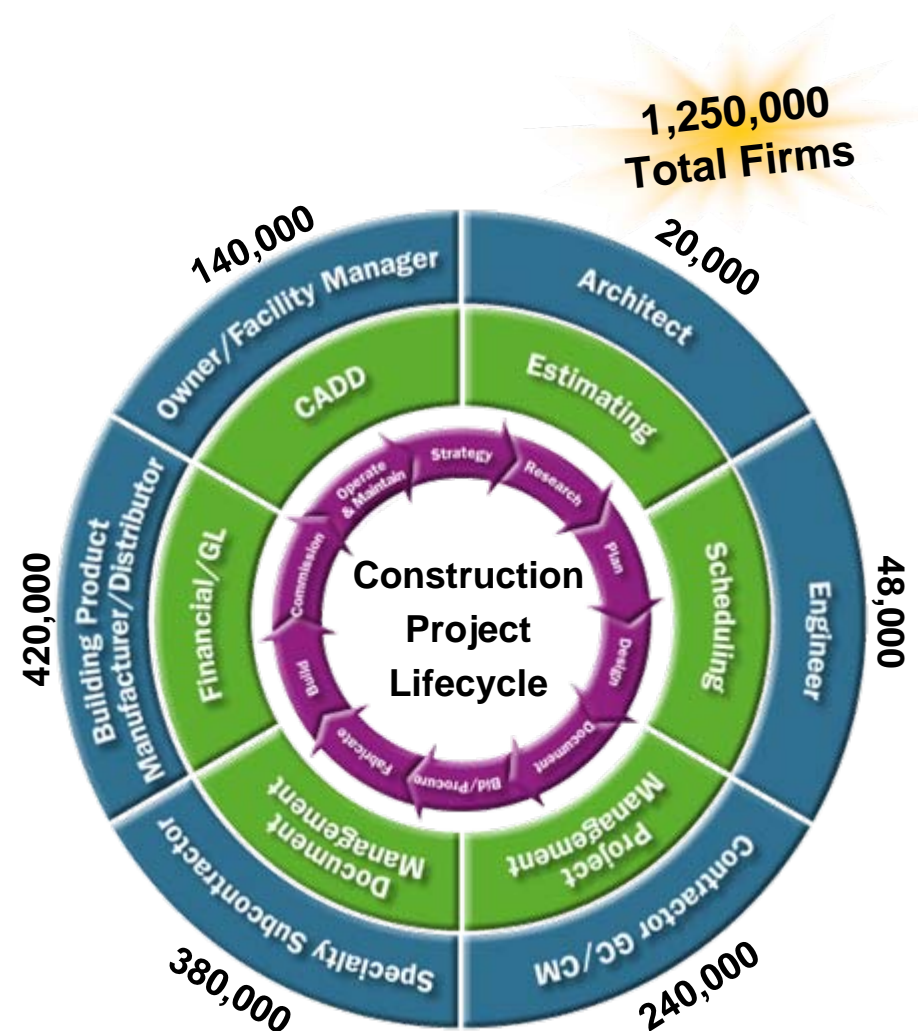
# Implications for McGraw-Hill Construction

## Vision

To Transform the Global Construction Industry by Setting New Standards Through Connecting People, Projects and Products

## Mission

To provide our customers with sales & marketing and workflow solutions that will help them get smarter, get seen, find work, do work.



# State of the AEC Industry

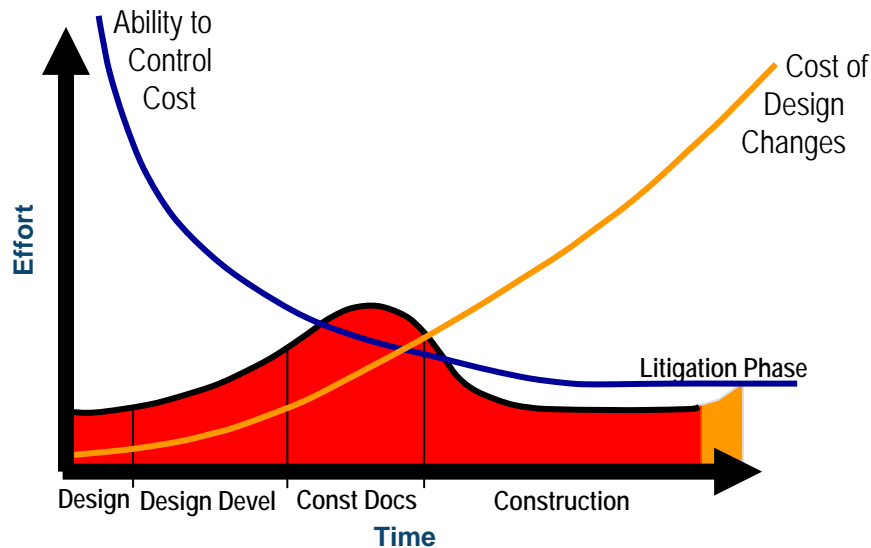
- \$4.6T Industry, >20% Waste
- Creating Assets that Consume 40% World's Energy (Poorly)
- Projects Routinely Exceed Schedule / Budget
- Claims and Litigation
- Low Profit Margins
- Declining Productivity
- Depleting Workforce
- Adversarial Contract Structures
- Non-Collaborative Processes
- IT Tools Lack Interoperability
- Silos of Information



# Traditional Project Delivery and Information Exchange

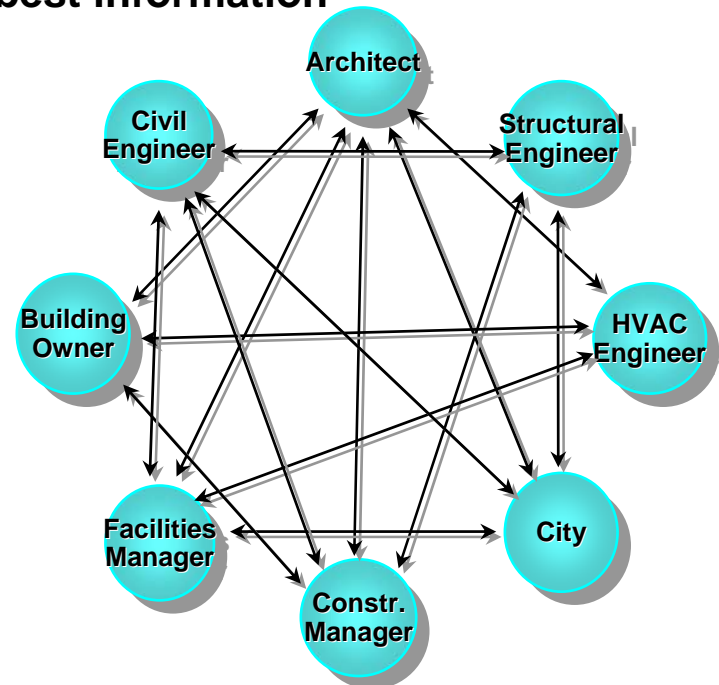
## Traditional Project Delivery

- Majority of design effort focused on documentation
- Construction and marketplace knowledge not involved until after documentation
- Both are too late to affect cost

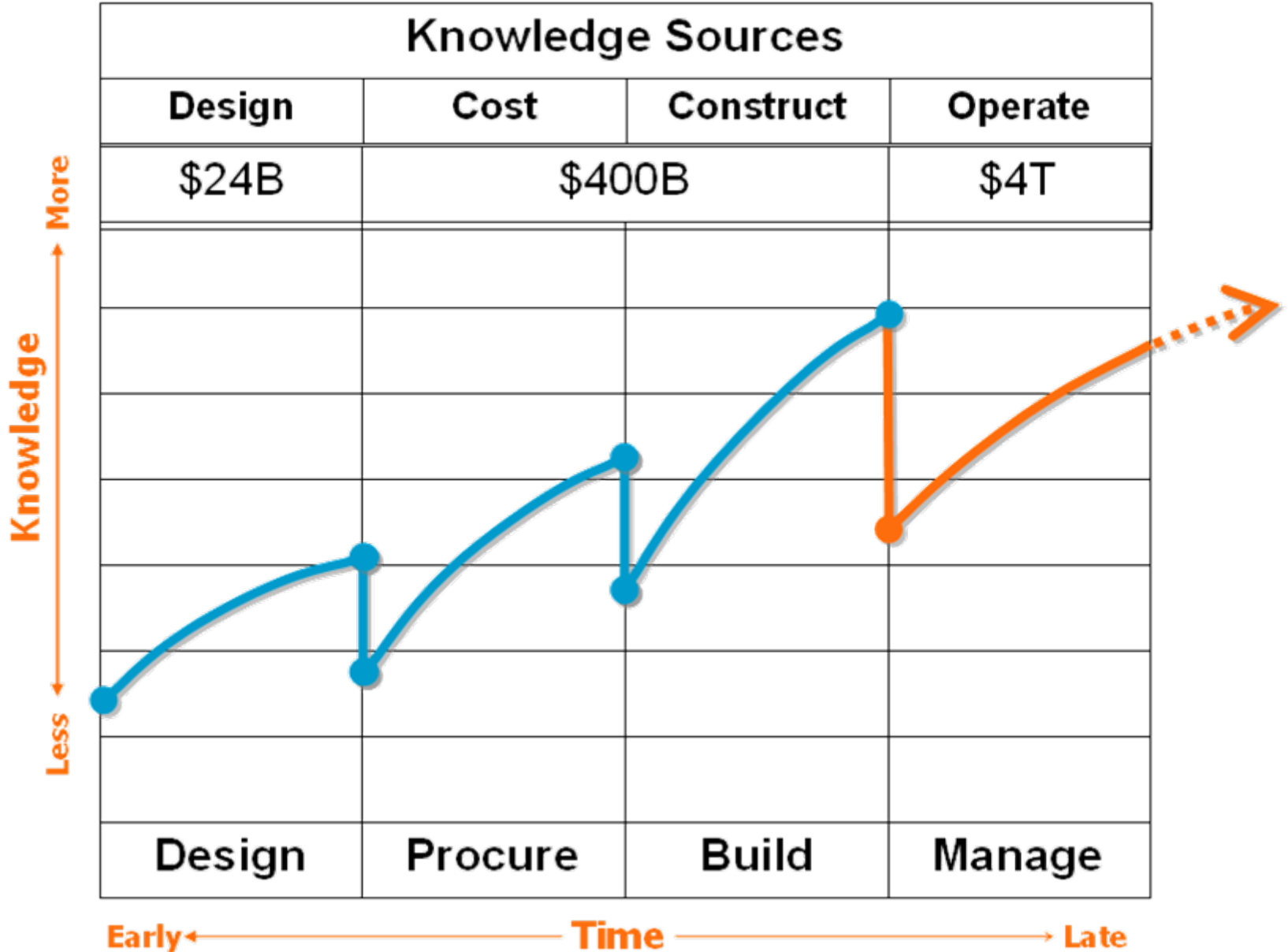


## Traditional Info Exchange

- Asynchronous, 1-to-1 exchanges
- No central database of current "true state"
- Decisions made without the best information



# Knowledge Loss at Hand-Off



# Future State of Industry

## → *Key Trends:*

### → Virtual Design & Construction

- Interoperability, BIM, Collaboration
- International standards initiatives

### → “Green” & Sustainable Development

- Constrained resources – more with less
- Constrained human capital

### → Higher Productivity / Improve Efficiency//Metrics

### → Globalization & Impact of China + India


- Escalation of raw materials costs
- Western companies enter China
- Chinese/Indian companies enter US

### → Safety and Security – Geopolitical Tension

### → Urbanization, Demographic Shifts

## Key Implications:

- Industry **workflows** will change dramatically and content (product data, project data) will be embedded into new IT tools and used in new ways
- “**Open standards**” will emerge allowing content to be shared
- Tacit acceptance that every project will be Green
- Pressure to manage costs and time will intensify need for closer **collaboration** between BPMs, contractors, architects, owners
- **Workforce** development, talent recruitment needed for all AEC



# BIM, Interoperability and Integrated Processes

# Building Information Modeling

## *The Power of a Building I*

### → “DNA”

- Info Backbone

### → Persistent

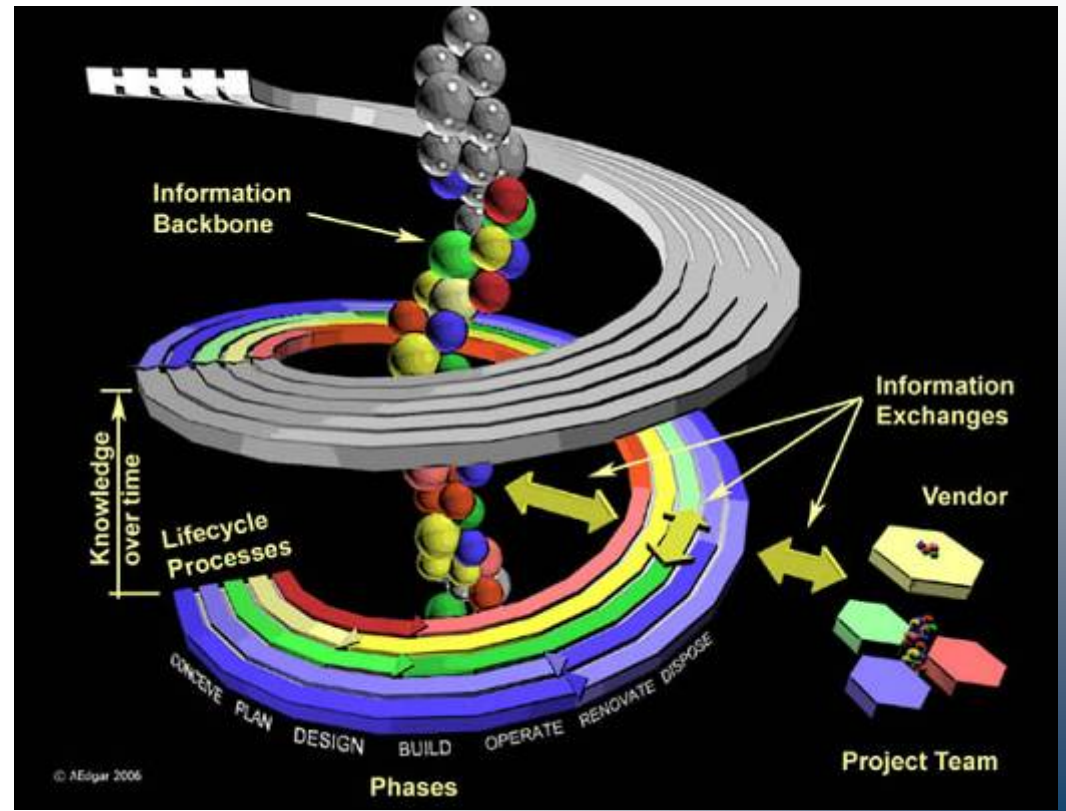
- Thru Lifecycle

### → Accessible

- Tools/Players

### → Organic

- Current
- 2-way



# Interoperability

*Lack of Interoperability Costs the U.S. Construction Industry \$15.8 Billion Every Year*

- **Interoperability: The Ability to Manage and Communicate Electronic Product and Project Data Among Collaborating Firms**
- **Critical to BIM Adoption, Long-Term Industry Success**
- **ENR Editorial**
  - “Owners Need to Demand Greater Interoperability”

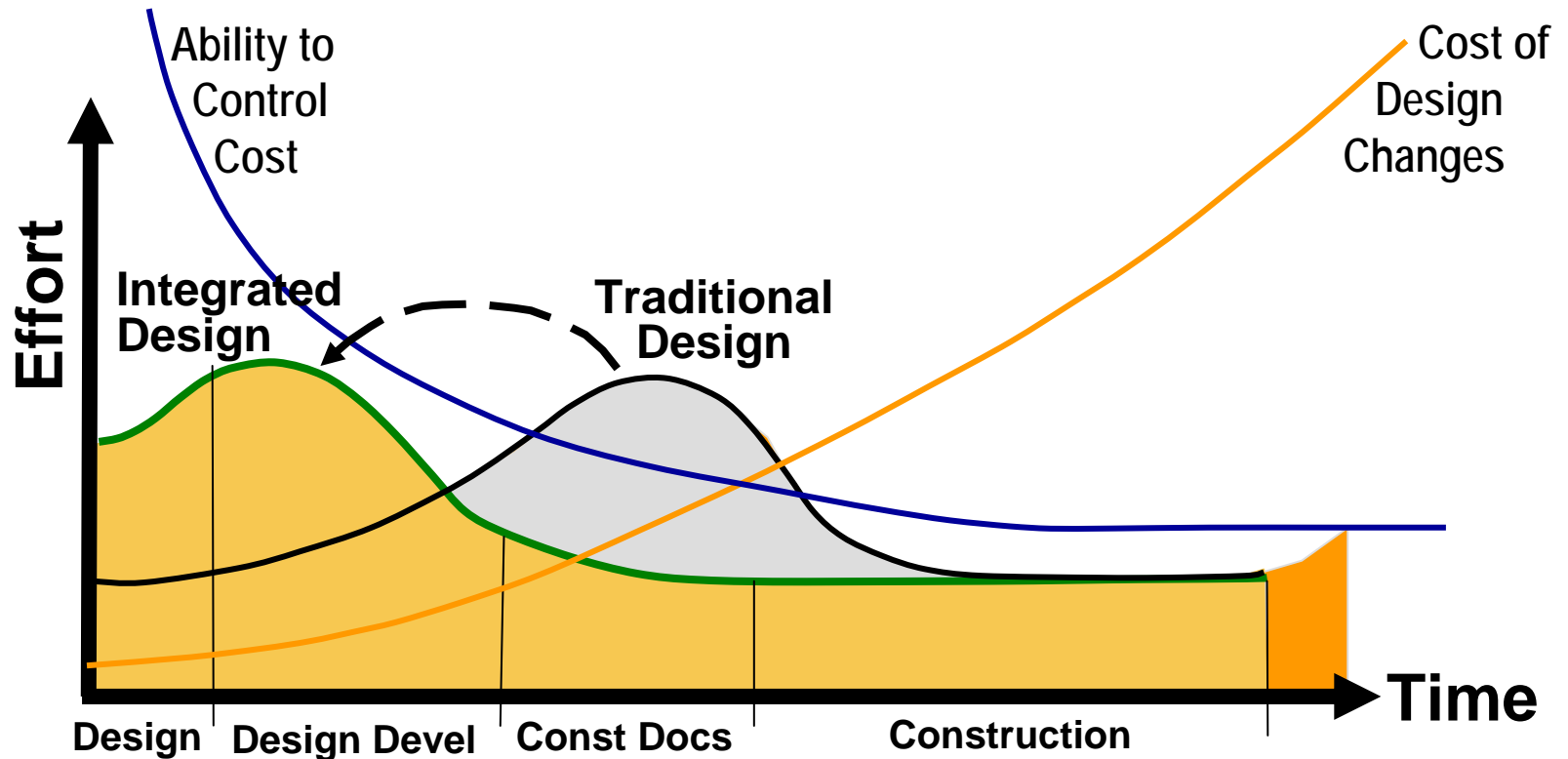


# Integrated Processes

## *Changing Traditional Project Processes*

### → Earlier Input of Construction / Supplier Knowledge

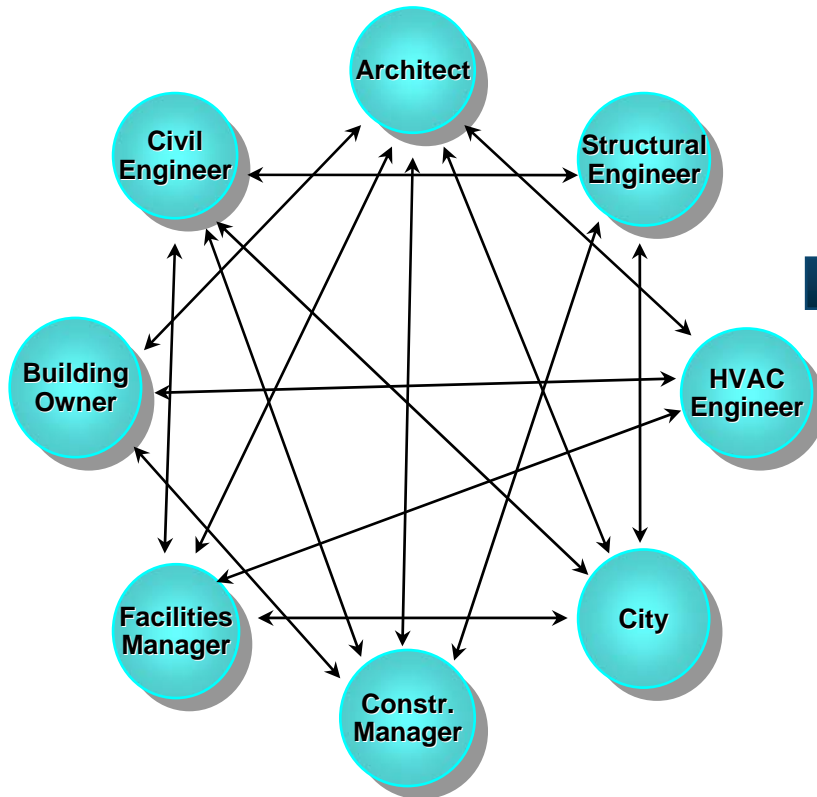
- Avoid system conflicts in design stage
- Inform product & material selections with constructability & market condition knowledge



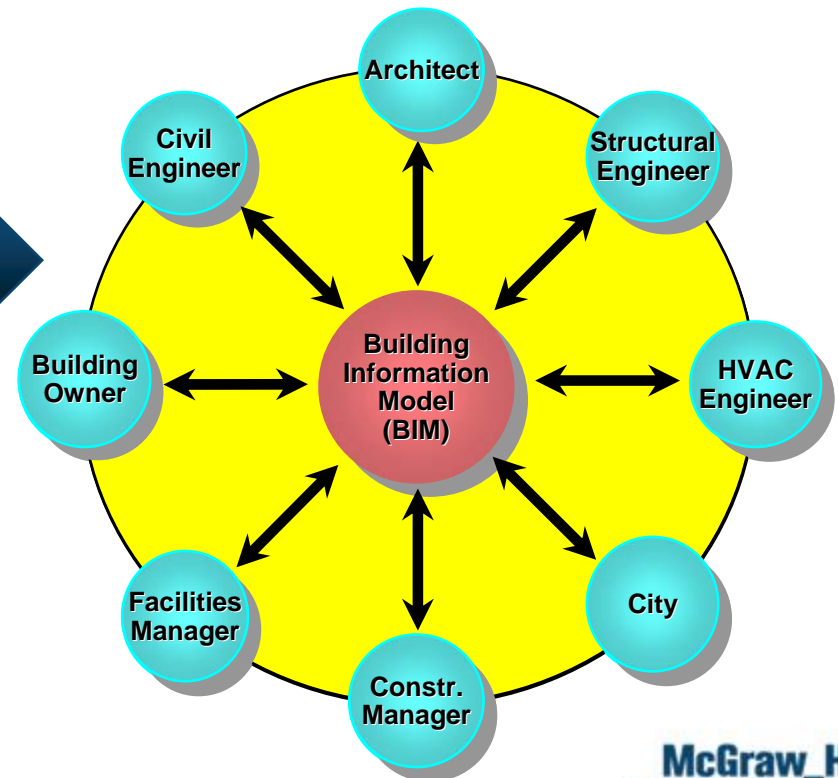
# BIM, Interoperability and Integrated Processes

## *Improving Information Exchange Across AEC/O*

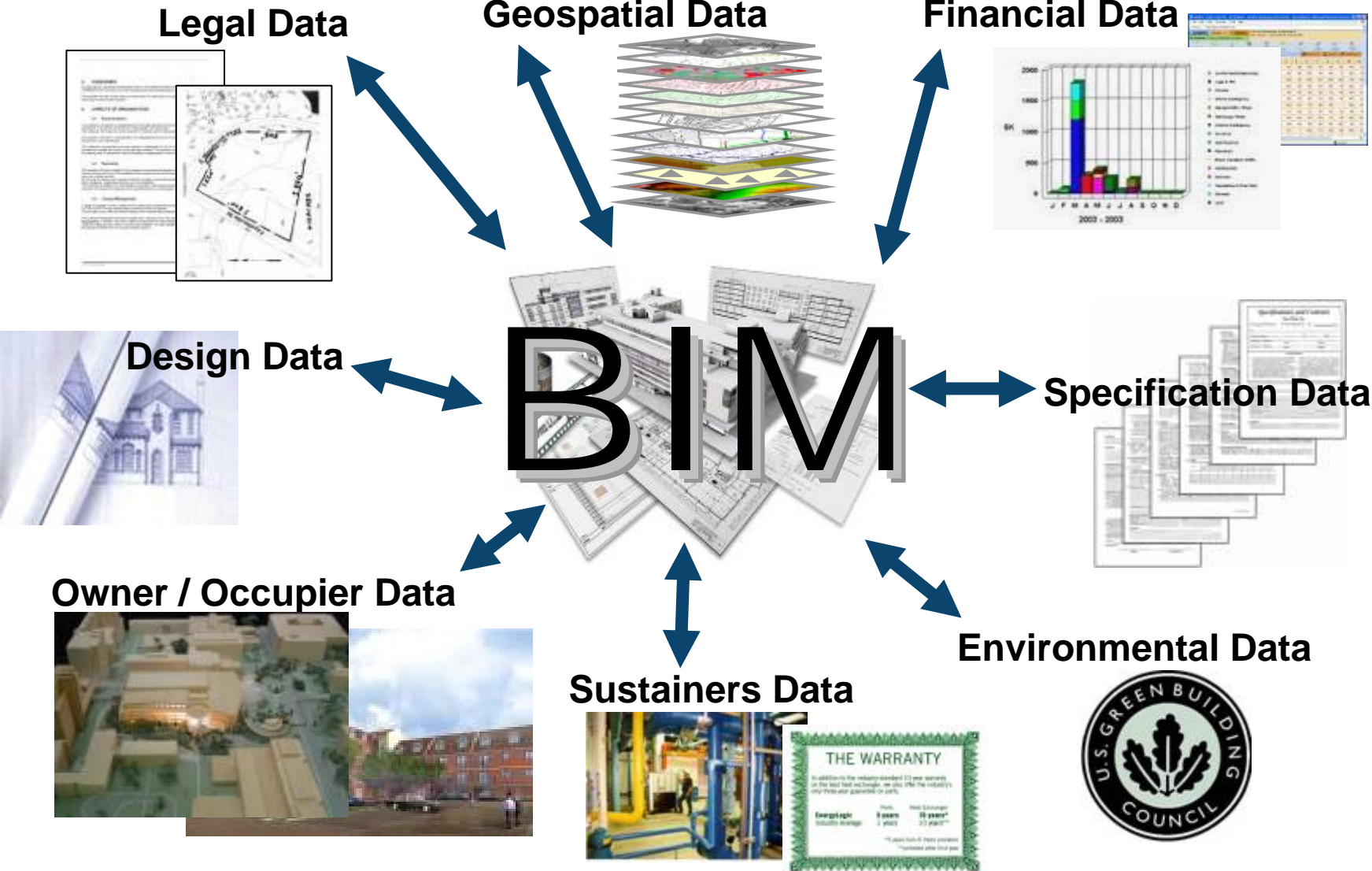
### *Traditional Info Exchange*



### *BIM Info Exchange*



# Exchange/Access for All Relevant Information



The background is a detailed, multi-layered BIM model of a building. It features various rooms and structural elements, including a central atrium, restrooms labeled 'MALE' and 'FEMALE', a 'WAITING ROOM', and an 'ENGINEERING' department. The model is rendered in a blue and purple color scheme, with a semi-transparent dark blue horizontal band across the middle. The text is overlaid on this band.

# **BIM, Interoperability and Integrated Processes**

***When did you first hear any of  
these terms and concepts??***



# McGraw-Hill Construction Research

# McGraw-Hill Construction / Multi-Association Study:

## *Interoperability in the Construction Industry*

### → Research Goal

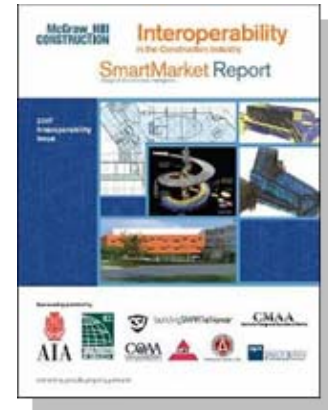
- Identify costs, benefits and importance of interoperability between AEC/O software applications - Assess its impact on BIM adoption

### → Process

- Interviews with 300 AEC/O professionals
  - 75 Architects, 75 Engineers, 75 Contractors, 75 Owners
  - 95% confidence with margin of error +/-5%

### → Results (Published October '07)

- Identified types of software most commonly used by AEC/O team members
- Quantified costs and issues re: AEC/O software interoperability
- Provided case studies of success tied to improved interoperability
- Evaluated impact on adoption/use of advanced software applications that benefit from improved interoperability:
  - BIM, Automated Code-compliance Checking, etc.



### → AGC Was a Sponsor Along with 8 Other Industry Associations



**AGC of America**  
Building Your Quality of Life



The Construction Specifications Institute



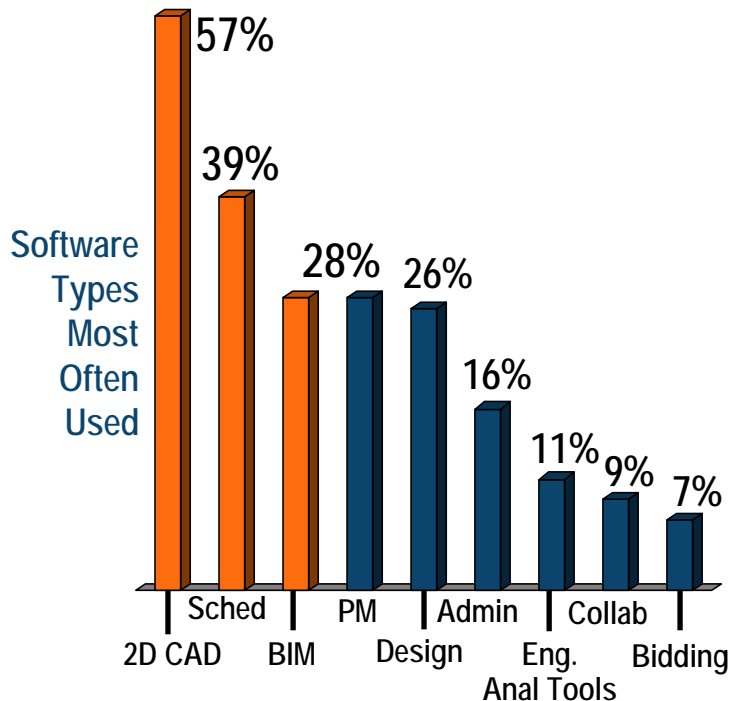
Society for Marketing Professional Services

# Interoperability Study Key Finding

## Software Usage

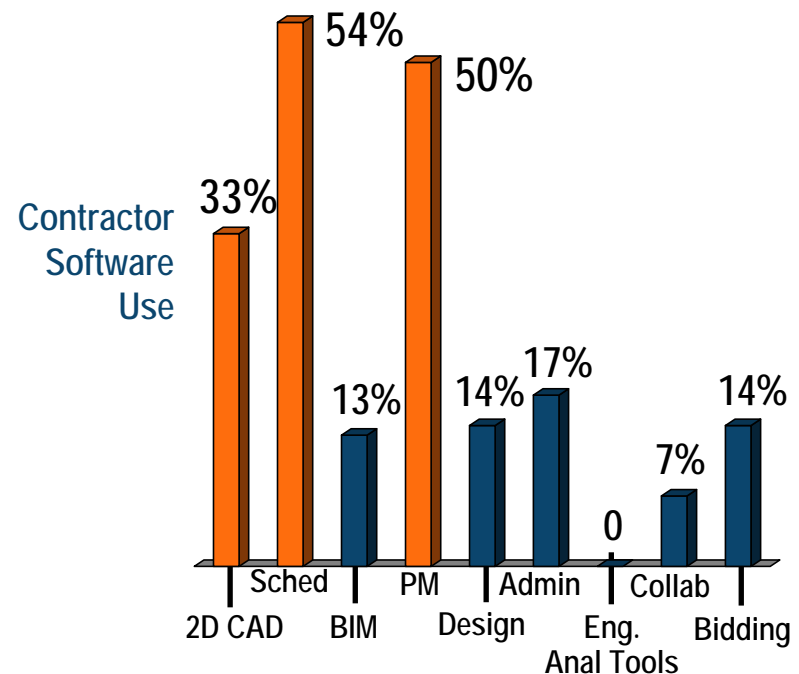
### All AEC/O Respondents

- 2D CAD (57%)
- Scheduling Software (39%)
- BIM (28%)



### Contractors

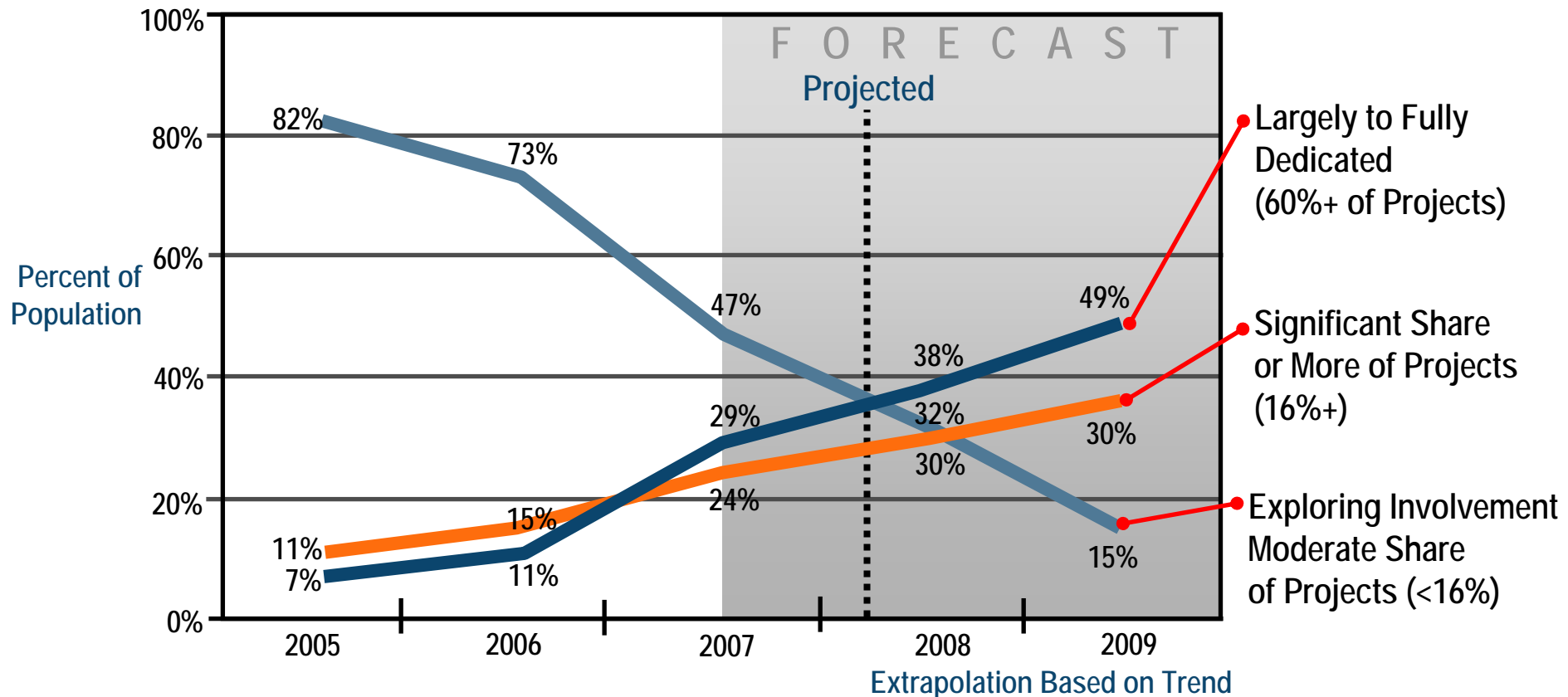
- Scheduling Software (54%)
- Project Management (50%)
- 2D CAD (33%)



# Interoperability Study Key Finding

## *Tipping Point for BIM*

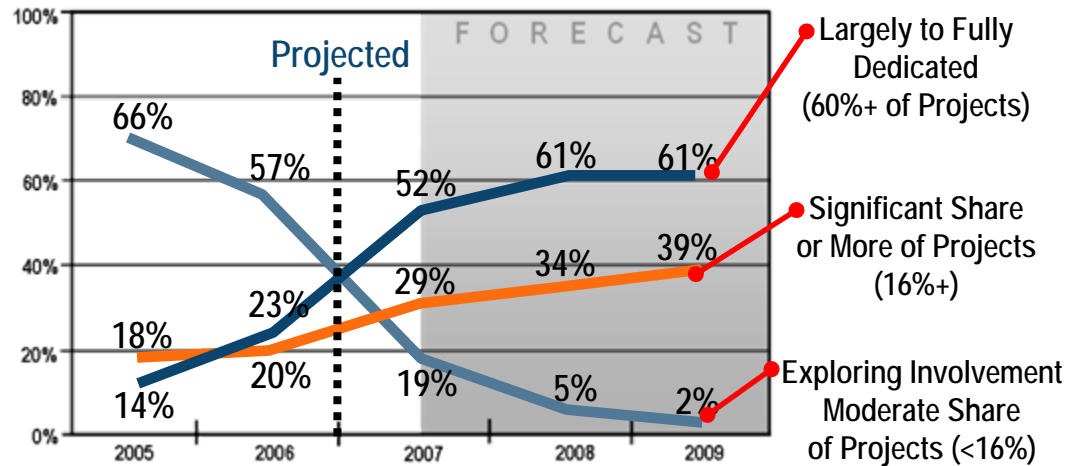
*BIM Will Reach "Tipping Point" in 2008 for Overall AEC/O Community*



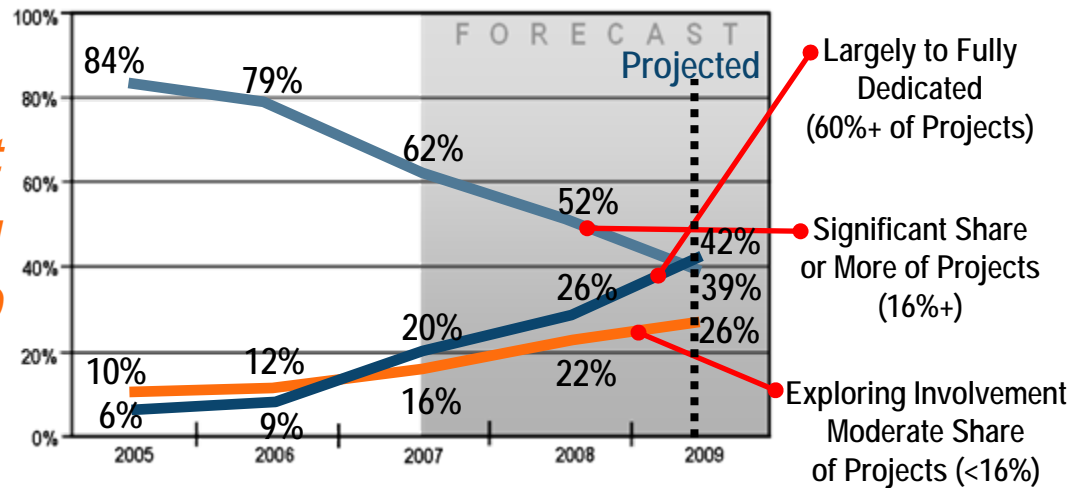
# Interoperability Study Key Finding

## Tipping Point for BIM

Architects Reached  
"Tipping Point"  
in 2007



Contractors Will Not  
Reach the "Tipping  
Point" Until 2009



# Interoperability Study Key Finding

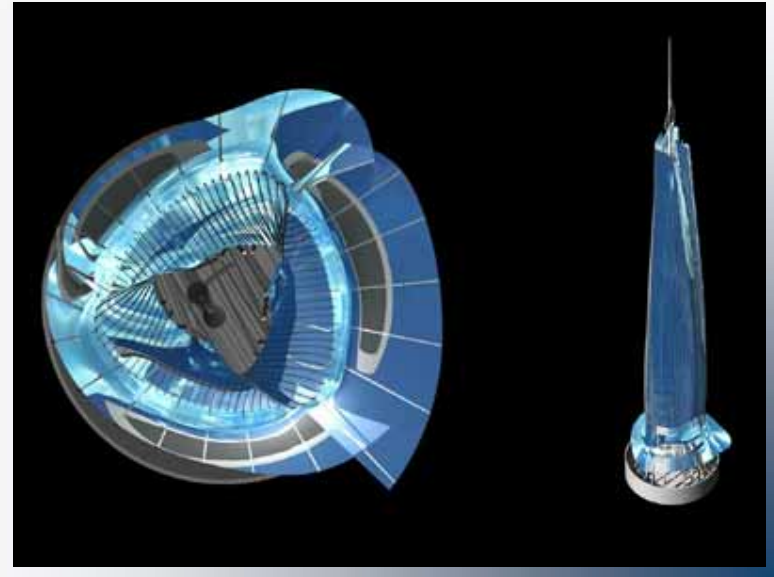
## *Demand for BIM*

### → Primary BIM Usage:

- 3D Rendering & Visualization
- Interference Detection
- Parametric Manipulation
- Quantity Takeoffs

### → Owner Demand is Driving the Growth of BIM

- 49% of responding owners demanding it on their projects
- Key reasons:
  - To improve communication with all parties in design/construction process
  - Opportunity to reduce Construction costs
  - To improve interoperability

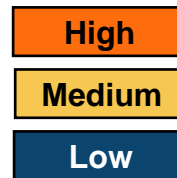
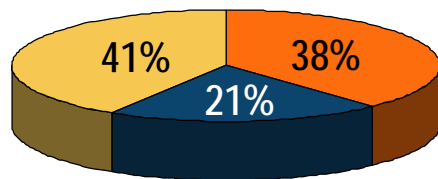


# Interoperability Study Key Finding

## Data Sharing

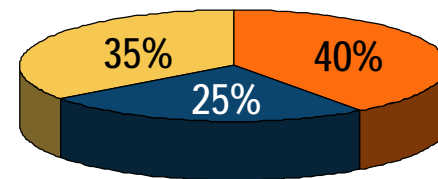
### All AEC/O Respondents

→ 8 of 10 Share Medium to High Amounts of Data on Projects

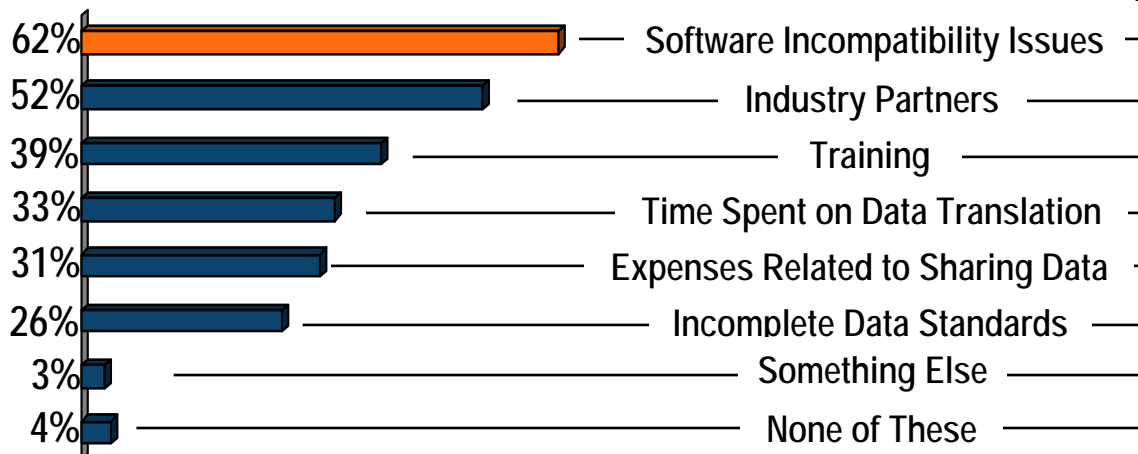


### Contractors

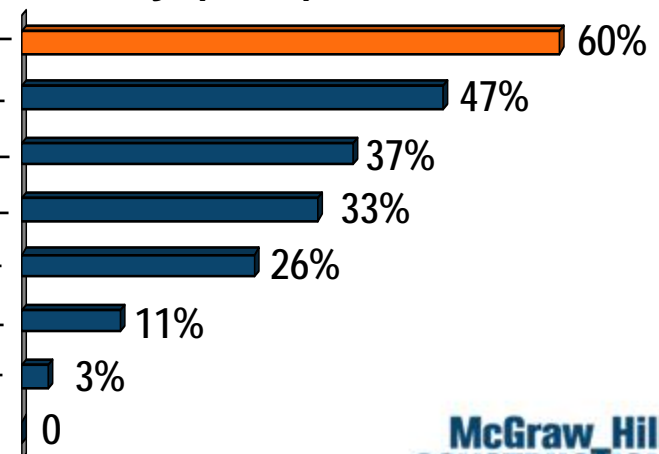
→ 75% Share Medium to High Amounts of Data on Projects



→ Main Factor Impacting Data Sharing is Software Incompatibility (62%)



→ Main Factor Impacting Data Sharing is Software Incompatibility (60%)

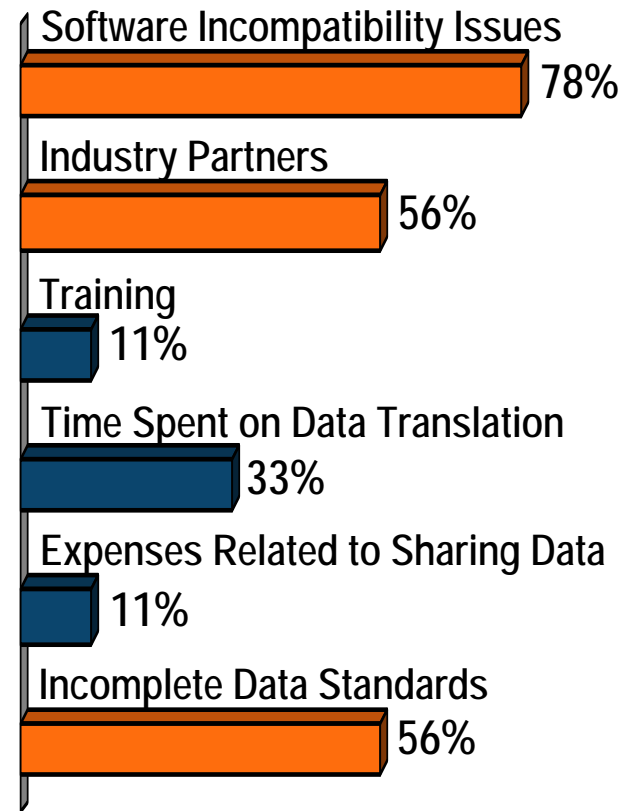


# Interoperability Study Key Finding

## *BIM Experts Realize Importance*

*As Firms Become More Expert in BIM, They Recognize that Non-Interoperability is a Major Impediment to Data Sharing*

- **Software Incompatibility Issues (78%)**
- **Incomplete Data Standards (56%)**



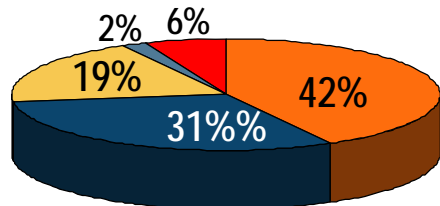
# Interoperability Study Key Finding

## Cost of Non-Interoperability

### All AEC/O Respondents

- Average 3% of Project Budget
- Equals \$150 Billion/Year

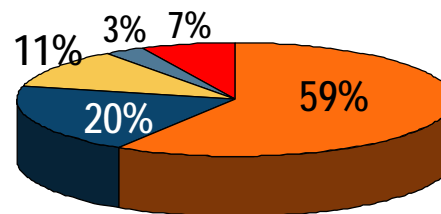
Average:  
3.1%



### Contractors

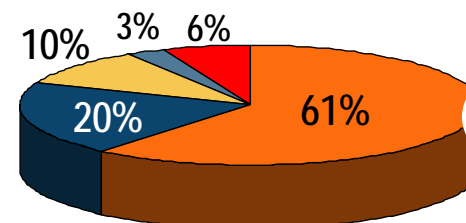
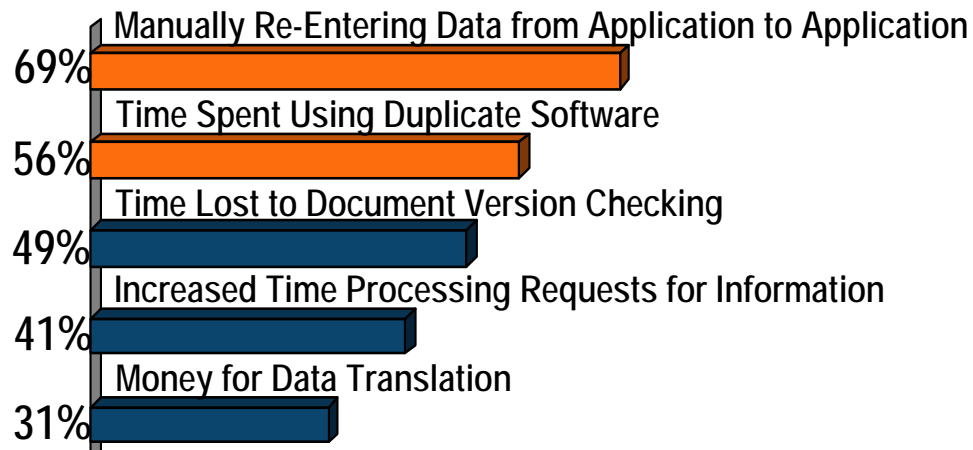
- Average 2.9% of Project Budget

Average:  
2.9%



- Manually Re-entering Data (69%)
- Time Using Duplicate Software (56%)

- Negative Scheduling Impact of Non-Interoperability (2.8%)



Average:  
2.8%

# Interoperability Study

## → Complete Results Published

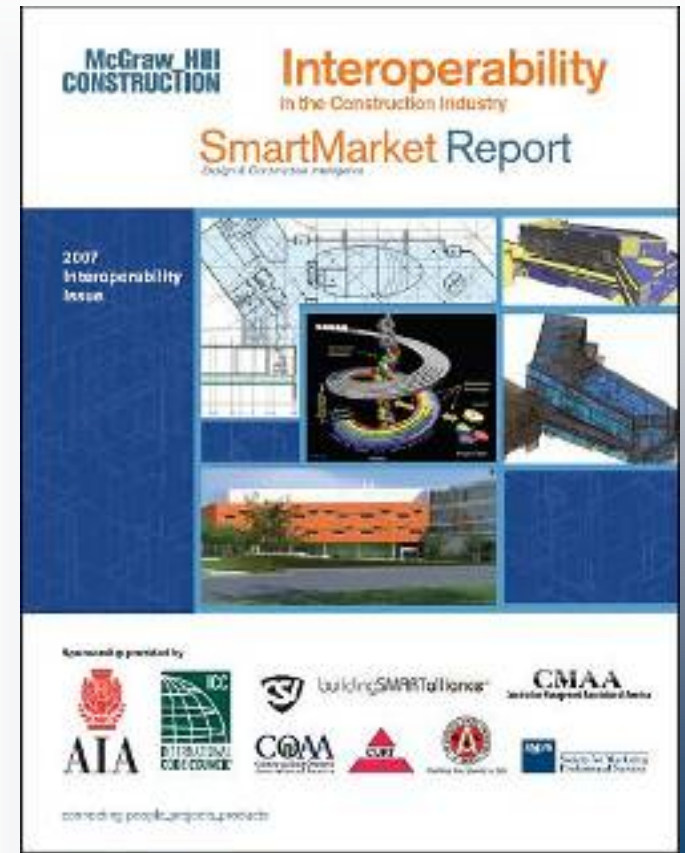
- *Interoperability in the Construction Industry SmartMarket Report*
- October 2007

## → Free PDF Distribution

- Membership of 9 sponsors (AGC website)
- +40 other Associations
- 200,000+ industry professionals

## → Follow-Up Research and New SmartMarket Report on BIM

- Summer 2008
- Now assembling research topics and sponsors





**McGraw-Hill  
Construction Vision  
for Virtual Design  
and Construction**

# Virtual Design & Construction

## *McGraw-Hill Construction Position*

*Our Industry is Experiencing an **Electronic Revolution** that Will Fundamentally Change the Way that Buildings and Other Structures Are Designed, Constructed and Operated*

### **→ This Revolution is Being Driven By**

- Increased understanding and acceptance of tools and processes that support virtual design and construction (VDC), including building information modeling (BIM)
- Recognition by the industry of the need and benefits of sharing knowledge throughout the entire project lifecycle.

# Virtual Design & Construction

## *McGraw-Hill Construction Guiding Principles*

### *Guiding Principle #1*

- The Evolution to VDC Involves Much More than Just Technological Change

### *Guiding Principle #2*

- The Overall AEC/O Industry Has Reached a “Tipping Point” in Its Adoption of BIM

### *Guiding Principle #3*

- Players in the AEC/O Community Are at Widely Different Levels of Both VDC/BIM Use, and an Understanding of How These Changes Will Impact the Ways They Currently Do Business

### *Guiding Principle #4*

- VDC Will Open Up New Business Opportunities to Companies Who Actively Drive This Change

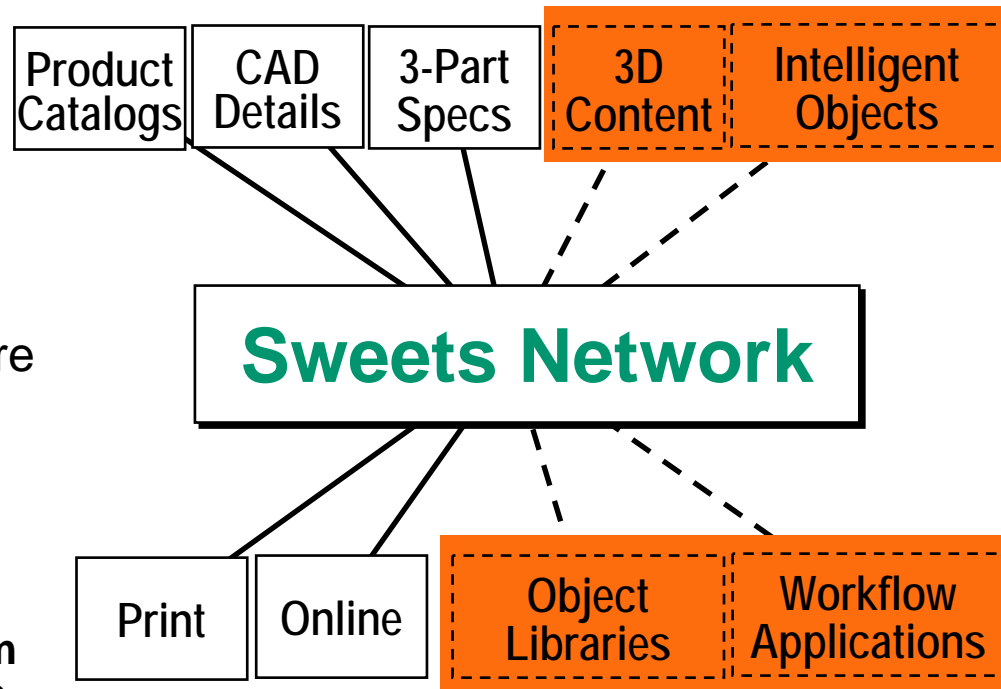
# Virtual Design & Construction

## *What is McGraw-Hill Construction Doing?*

### *Sweets Network – “Virtual Products Program”*

#### → Putting Product Information Into Workflow Tools

- Content
  - Building product content compatible with digital applications via Open Standards
- Applications for users that are integrated with Sweets
  - Desktop product search
  - Product and Assembly Configuration
  - BIM content on-the-fly from Product Attribute database

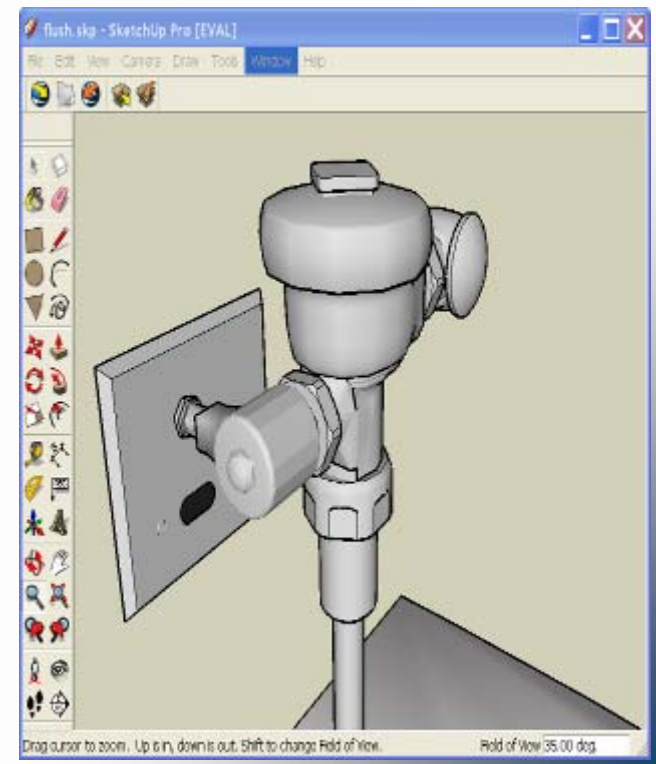
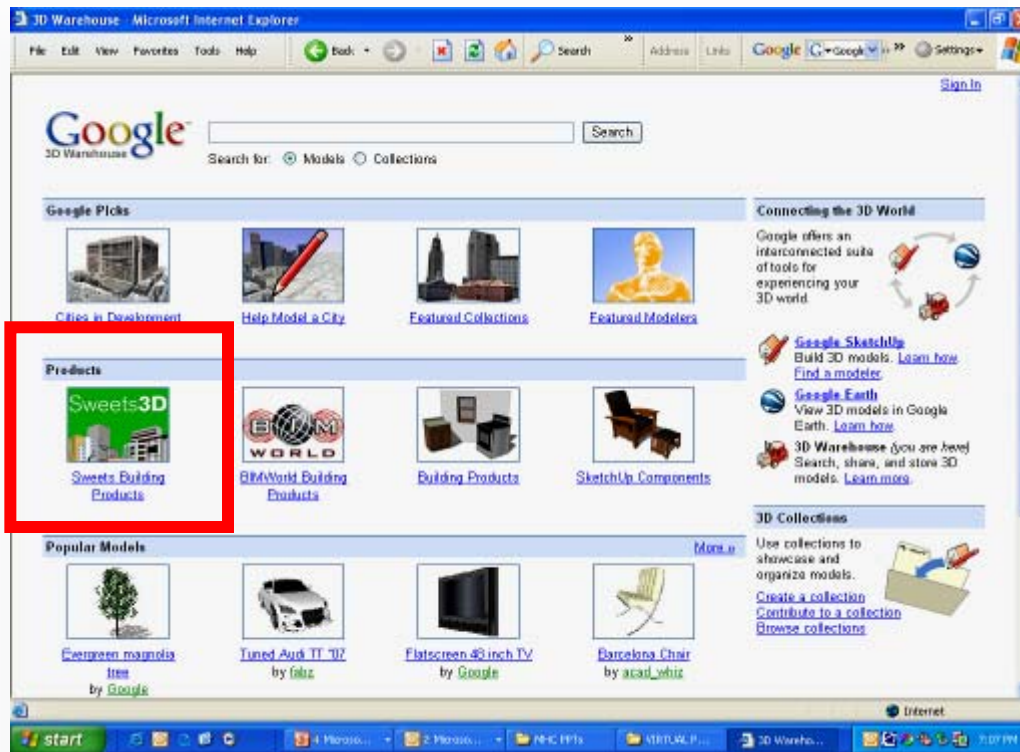


# Virtual Design & Construction

## *What is McGraw-Hill Construction Doing?*

### *Google 3D Warehouse*

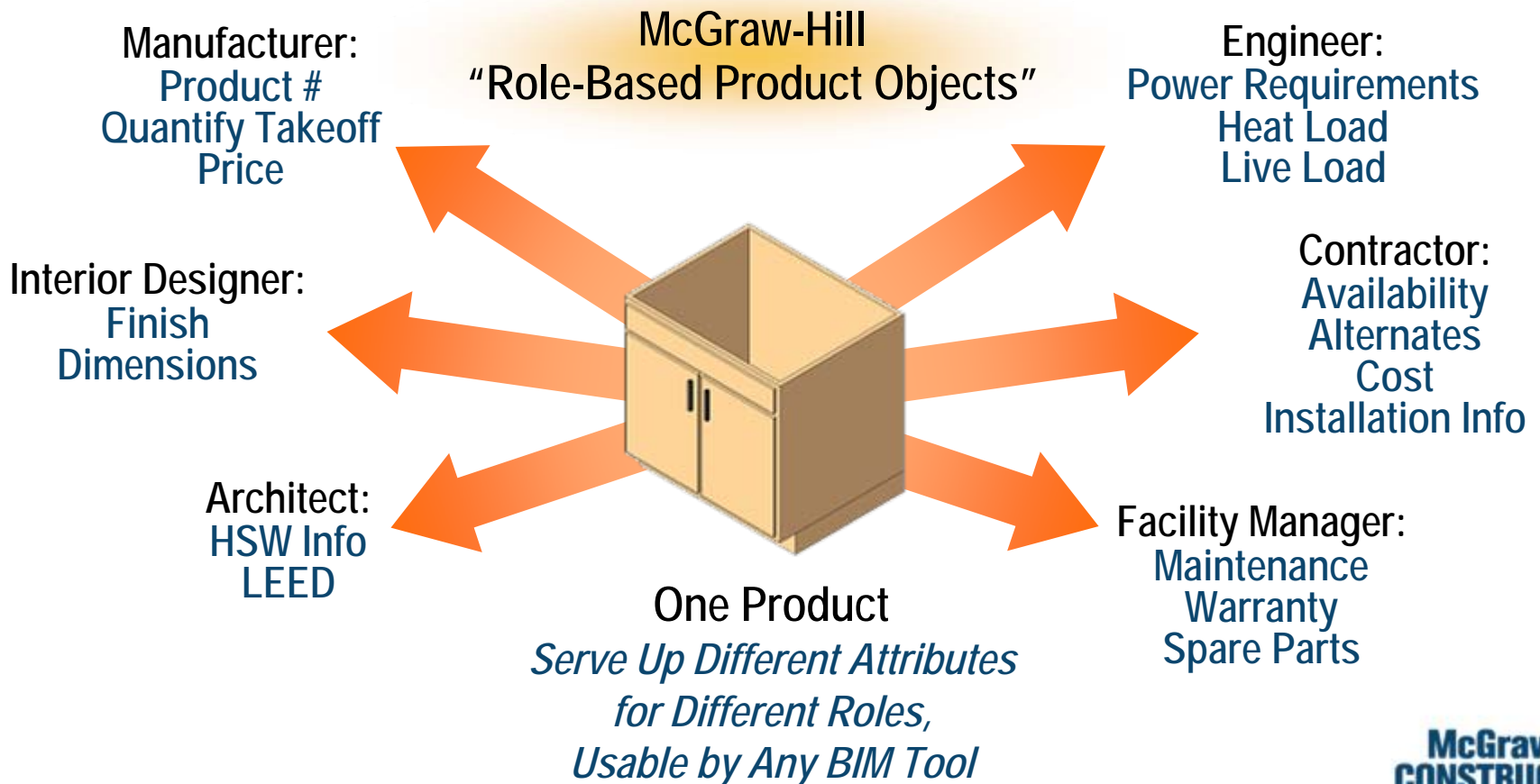
→ >1,000 High Quality Building Product Models for SketchUp



# Virtual Design & Construction

## *What is McGraw-Hill Construction Doing?*

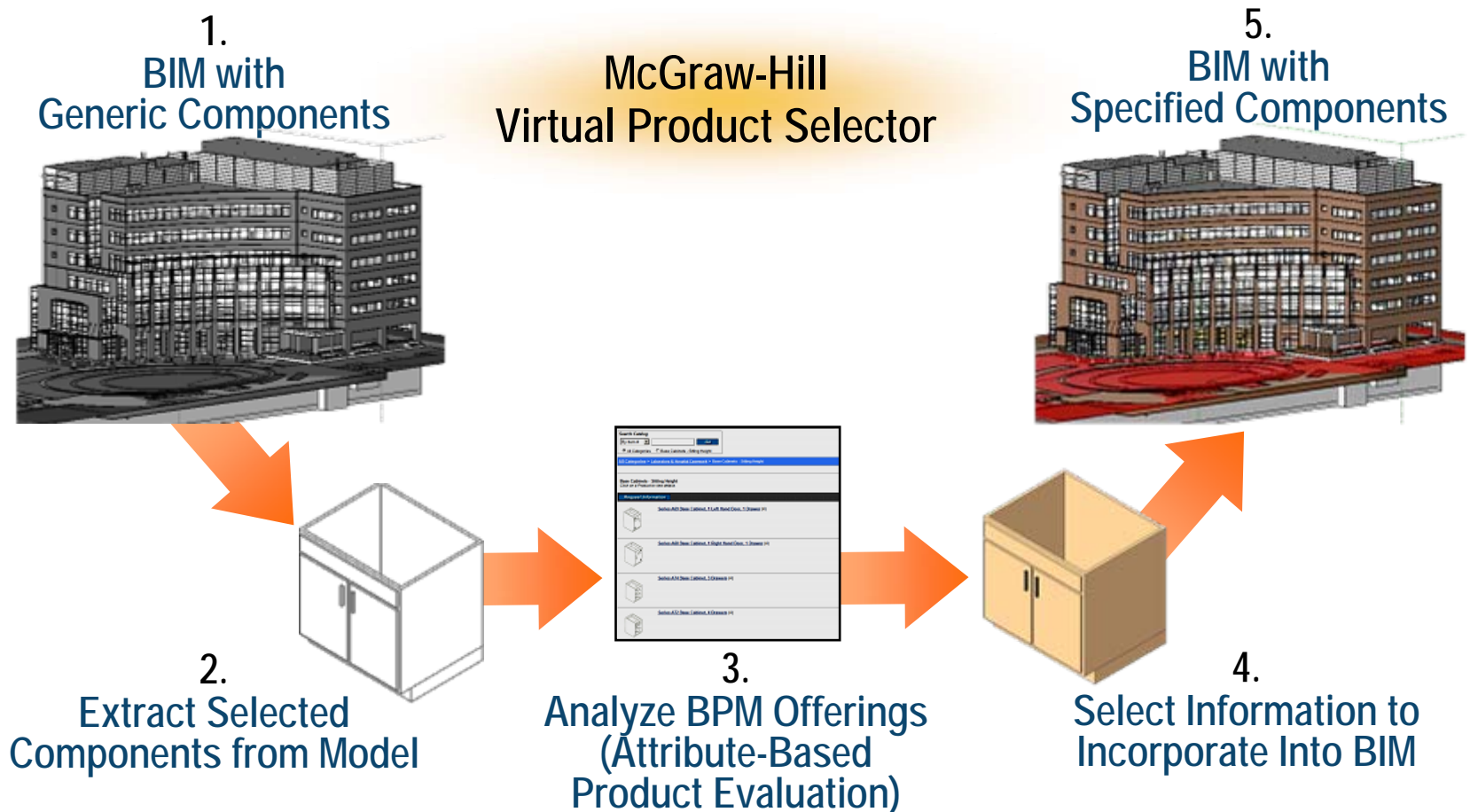
### *BIM Object Library and On-the-Fly Content*



# Virtual Design & Construction

## *What is McGraw-Hill Construction Doing?*

### *BIM Object Library and On-the-Fly Content*



# Virtual Design & Construction

## *Summary:*

- Exciting Transformation to VDC
- Committed to Open Standards
- Need All AEC/O Players Involved, Including Suppliers
- Time to Get Involved is *NOW*

# How will Interoperability change the way we all do business?

→ Only if:

- Owners lead
- Create Collaborative organizational structures
- Information is shared!
- Virtual design and construction becomes the norm

Construction Users Roundtable - 2005



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