Key Trends in the Construction Industry

October 28, 2015

Bill Lindsay, LEED AP
Director of Sales
Dodge Data & Analytics
Agenda

- Research Findings:
  - *Green Design and Construction*
  - *Impact of Technology of Design and Construction*

- U.S. Construction Market (bldgs)
  - *Indicators*
  - *Macro-economic Factors*
  - *Specific Building-type Markets*

- Future of the Industry
Global Green Trends
Firms With More Than 60% Green Projects (2012 and Expected in 2015)

Top Obstacles for Green Building in Select Global Markets

- **Lack of Public Awareness**
  - Global: 29%
  - Top Market: 44%
- **Split Between Capital Budget and Operating Budget**
  - Global: 32%
  - Top Market: 43%
- **Lack of Political Support/Incentives**
  - Global: 36%
  - Top Market: 48%
- **Lack of Market Demand**
  - Global: 38%
  - Top Market: 52%
- **Higher First Costs**
  - Global: 76%
  - Top Market: 83%

Business Benefits Reported for **Green Buildings**

### New Green Building

<table>
<thead>
<tr>
<th>Region</th>
<th>Decreased Operating Costs Over 1 Year</th>
<th>Decreased Operating Costs Over 5 Years</th>
<th>Payback on Green Efforts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global</td>
<td>8%</td>
<td>15%</td>
<td>8%</td>
</tr>
<tr>
<td>Canada</td>
<td>9%</td>
<td>17%</td>
<td>10%</td>
</tr>
<tr>
<td>U.S.</td>
<td>11%</td>
<td>28%</td>
<td>21%</td>
</tr>
<tr>
<td>Europe</td>
<td>6%</td>
<td>13%</td>
<td>27%</td>
</tr>
<tr>
<td>East. Europe</td>
<td>10%</td>
<td>27%</td>
<td>21%</td>
</tr>
<tr>
<td>Asia</td>
<td>10%</td>
<td>21%</td>
<td>14%</td>
</tr>
<tr>
<td>Brazil</td>
<td>8%</td>
<td>14%</td>
<td>8%</td>
</tr>
</tbody>
</table>

### Green Retrofit/Renovation

<table>
<thead>
<tr>
<th>Region</th>
<th>Decreased Operating Costs Over 1 Year</th>
<th>Decreased Operating Costs Over 5 Years</th>
<th>Payback on Green Efforts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global</td>
<td>9%</td>
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<td>11%</td>
<td>14%</td>
<td>28%</td>
</tr>
<tr>
<td>Europe</td>
<td>9%</td>
<td>14%</td>
<td>14%</td>
</tr>
<tr>
<td>Asia</td>
<td>8%</td>
<td>13%</td>
<td>13%</td>
</tr>
<tr>
<td>Brazil</td>
<td>8%</td>
<td>13%</td>
<td>8%</td>
</tr>
</tbody>
</table>

**Source:** McGraw Hill Construction *World Green Building Trends SmartMarket Report, 2013*
Green Building Is Major Part of U.S. Nonresidential Starts

Share of Green Building in U.S. Commercial Construction

Green Products and Practices Used in Retail and Hotel Building Operations and Maintenance

- Occupancy/Lighting Sensors
  - Retail: 81%
  - Hotel: 86%

- Building Controls
  - Retail: 77%
  - Hotel: 72%

- Airflow/IEQ Improvements
  - Retail: 62%
  - Hotel: 52%

- Energy Benchmarking
  - Retail: 43%
  - Hotel: 52%
Share of Green Building in U.S. Institutional Construction

HEALTHCARE

<table>
<thead>
<tr>
<th>Year</th>
<th>Share</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>13%</td>
<td>$4 B</td>
</tr>
<tr>
<td>2013</td>
<td>40%</td>
<td>$9 B</td>
</tr>
<tr>
<td>2014</td>
<td>36%</td>
<td>$8 B</td>
</tr>
</tbody>
</table>

EDUCATION

<table>
<thead>
<tr>
<th>Year</th>
<th>Share</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>15%</td>
<td>$9 B</td>
</tr>
<tr>
<td>2013</td>
<td>51%</td>
<td>$19 B</td>
</tr>
<tr>
<td>2014</td>
<td>61%</td>
<td>$20 B</td>
</tr>
</tbody>
</table>

Source: Green Market Size: Dodge Data & Analytics, 2014; base value of construction market from Dodge Market Forecast, as of November 2014
IEQ Is Considered as Important as Energy in Driving Green School Activity

Most Important Green Building Aspects

- **Energy and Atmosphere**
  - K-12: 86%
  - Higher Education: 92%

- **Indoor Environmental Quality**
  - K-12: 87%
  - Higher Education: 90%

- **Water Efficiency**
  - K-12: 65%
  - Higher Education: 79%

- **Materials and Resources**
  - K-12: 59%
  - Higher Education: 78%

- **Sustainable Sites**
  - K-12: 51%
  - Higher Education: 63%

Green Schools Positively Impact Student Health and Well-Being

Resource Investment Analysis

Return on Investment

Personnel costs significantly outweigh the costs for design and construction and operations and maintenance.

Building Costs

- Design & Construction: 92%
- Operations & Maintenance: 8%
- Personnel: 2%

Medical Professionals:
High Percentage of Doctors Not Making the Connection Between Buildings and Health

- **PEDiatricians**: 47% Not seeing connection, 53% Yes, believe that buildings impact patient health
- **General Practioners**: 68% Not seeing connection, 32% Yes, believe that buildings impact patient health
- **Psychologists/Psychiatrists**: 60% Not seeing connection, 40% Yes, believe that buildings impact patient health
Spaces for Social Interaction Increasing in Importance, Particularly In the Workplace

Spaces for Social Interaction Are Factors Human Resource Executives Use When Selecting Workspaces

► 66% currently consider this in making leasing decisions today
► Even more (up to 75%) expect this will be considered in the future
► Architects are recognizing increased need: 11% more expect to do this activity by 2016 versus today, increasing to 70%

ENGAGEMENT COLLABORATION MOBILE TOOLS
Build Awareness of Owners’ Benefits of Specific Design/Construction Decisions on Occupant Health

**HEALTHCARE COSTS**
47% of owners report cost reductions—ranging anywhere from less than 1% to over 5%, but many (52%) don’t know exactly.

**OCCUPANT PRODUCTIVITY**
21% of owners report improvements of 1% or more, but most (56%) don’t know exactly the impact exactly.

**EMPLOYEE SATISFACTION/ENGAGEMENT**
66% of owners report improvement, with over 34% reporting a high level.

**ABSENTEEISM**
56% of owners report reductions—at varying ranges of employee absenteeism.
## Top Products/Materials Being Used to Address Health in Buildings and Homes Being Used to Achieve LEED Credits

<table>
<thead>
<tr>
<th>Product/Material</th>
<th>Use (%)</th>
<th>Greener Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of Daylighting (Architects only)</td>
<td>89%</td>
<td>96%</td>
</tr>
<tr>
<td>Low-VOC Products</td>
<td>84%</td>
<td>94%</td>
</tr>
<tr>
<td>Non-Toxic Building Materials</td>
<td>80%</td>
<td>91%</td>
</tr>
<tr>
<td>Mechanical Ventilation Strategies</td>
<td>64%</td>
<td></td>
</tr>
<tr>
<td>Acoustic Comfort</td>
<td>61%</td>
<td>76%</td>
</tr>
</tbody>
</table>
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  o Macro-economic Factors
  o Specific Building-type Markets

• Future of the Industry
BIM Adoption

Adoption of BIM in North America
- A,E,C,O experience with BIM has grown strongly since 2007
- In spite of Global Financial Crisis

Percentage of A,E,C and O with BIM experience

Source: Dodge Data & Analytics
Benefits of BIM: All Disciplines

Longer term benefits are fastest growing

(Percentage of respondents that report receiving High or Very High level of each benefit)
Benefits of BIM: All Disciplines

US users doing complex buildings report significant outcome improvements

New study on BIM metrics (released 5/15)

Four Top-Rated Positive Impacts of BIM
(According to the Percentage of High or Very High Impact Ratings by Type of Respondent)

<table>
<thead>
<tr>
<th>Respondent Type</th>
<th>% Rating High or Very High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improved Constructability of Final Design</td>
<td>Contractors 74%</td>
</tr>
<tr>
<td>Increased Owners' Understanding of Proposed Design Solutions</td>
<td>Owners 73%</td>
</tr>
<tr>
<td>Improved Quality/Function of Final Design</td>
<td>Engineers 71%</td>
</tr>
<tr>
<td>Generated Better Construction Documents</td>
<td>Owners 70%</td>
</tr>
<tr>
<td>Improved Ability to Plan Construction Phasing and Logistics</td>
<td>Owners 70%</td>
</tr>
</tbody>
</table>
Benefits of BIM: All Disciplines

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New study on BIM metrics
(released 5/15)

Metrics for the Impact of BIM on Cost, Schedule, RFIs and Safety

- Reduction of Final Construction Cost
  - More Than 10%: 10%
  - 5% to 10%: 29%
  - Less Than 5%: 29%
  - Not Sure: 45%

- Accelerated Project Completion Due to Schedule Compression
  - More Than 10%: 16%
  - 5% to 10%: 23%
  - Less Than 5%: 23%
  - Not Sure: 45%

- RFI Reduction
  - More Than 10%: 13%
  - 5% to 10%: 19%
  - Less Than 5%: 19%
  - Not Sure: 30%

- Reduction in Number of Reportable Safety Incidents
  - More Than 10%: 15%
  - 5% to 10%: 12%
  - Less Than 5%: 12%
  - Not Sure: 25%
  - 5% to 10%: 24%
  - Less Than 5%: 39%
  - Not Sure: 24%
2-D PROJECTS
BASE CONTRACT: $143,969,283
CHANGE ORDERS: $26,512,448

3-D LONELY BIM
BASE CONTRACT: $300,146,875
CHANGE ORDERS: $33,532,497

COLLABORATIVE BIM
BASE CONTRACT: $53,268,301
CHANGE ORDERS: $1,427,170

GOAL
CHANGE ORDERS: $0

Cannistraro
Image: Cannistraro
Average Trade Productivity Metrics

- 143% Increase in Mechanical
- 67% Increase in Electrical
- 36% Increase in Fire Protection
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Both Construction Starts and Construction Spending show that the expansion is continuing, although starts retreated in 2015 Q3.

Construction starts – the full value of a project is entered into the month in which work begins. Comes from actual project report.

Construction put in place or spending – work as it occurs, estimated for a given month from a sample of projects. In effect, the impact of a project is spread out from the project’s start to its completion.
U.S. Construction Sectors (Starts)

The pattern has varied by major sector. Commercial building has already shown moderate gains, while institutional building has just begun to head upward.
## Billions of Dollars

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Construction</td>
<td>435.3</td>
<td>441.3</td>
<td>492.5</td>
<td>545.2</td>
<td>594.7</td>
<td>675.8</td>
<td>711.3</td>
</tr>
<tr>
<td>+2%</td>
<td></td>
<td>+1%</td>
<td>+12%</td>
<td>+11%</td>
<td>+9%</td>
<td>+14%</td>
<td>+5%</td>
</tr>
<tr>
<td>Commercial Bldgs.</td>
<td>42.2</td>
<td>48.3</td>
<td>55.1</td>
<td>67.3</td>
<td>81.2</td>
<td>84.7</td>
<td>94.1</td>
</tr>
<tr>
<td>-11%</td>
<td></td>
<td>+15%</td>
<td>+14%</td>
<td>+22%</td>
<td>+21%</td>
<td>+4%</td>
<td>+11%</td>
</tr>
<tr>
<td>Institutional Bldgs.</td>
<td>112.2</td>
<td>100.3</td>
<td>91.8</td>
<td>92.0</td>
<td>103.6</td>
<td>111.2</td>
<td>120.5</td>
</tr>
<tr>
<td>-0%</td>
<td></td>
<td>-11%</td>
<td>-8%</td>
<td>-0%</td>
<td>+13%</td>
<td>+7%</td>
<td>+8%</td>
</tr>
<tr>
<td>Manufacturing Bldgs.</td>
<td>9.5</td>
<td>17.3</td>
<td>13.1</td>
<td>18.8</td>
<td>35.3</td>
<td>25.3</td>
<td>25.0</td>
</tr>
<tr>
<td>-2%</td>
<td></td>
<td>+82%</td>
<td>-25%</td>
<td>+44%</td>
<td>+88%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single Family Housing</td>
<td>100.0</td>
<td>97.3</td>
<td>125.8</td>
<td>159.2</td>
<td>163.7</td>
<td>187.6</td>
<td>224.9</td>
</tr>
<tr>
<td>+6%</td>
<td></td>
<td>-3%</td>
<td>+29%</td>
<td>+27%</td>
<td>+3%</td>
<td>+15%</td>
<td>+20%</td>
</tr>
<tr>
<td>Multifamily Housing</td>
<td>22.1</td>
<td>29.7</td>
<td>40.6</td>
<td>51.5</td>
<td>67.9</td>
<td>85.1</td>
<td>91.2</td>
</tr>
<tr>
<td>+23%</td>
<td></td>
<td>+34%</td>
<td>+37%</td>
<td>+27%</td>
<td>+32%</td>
<td>+25%</td>
<td>+7%</td>
</tr>
<tr>
<td>Public Works</td>
<td>120.7</td>
<td>106.9</td>
<td>112.3</td>
<td>126.7</td>
<td>119.8</td>
<td>121.9</td>
<td>122.4</td>
</tr>
<tr>
<td>-2%</td>
<td></td>
<td>-11%</td>
<td>+5%</td>
<td>+13%</td>
<td>-5%</td>
<td>+2%</td>
<td>-0%</td>
</tr>
<tr>
<td>Elec. Util. &amp; Gas Plants</td>
<td>28.7</td>
<td>41.5</td>
<td>53.8</td>
<td>29.7</td>
<td>23.2</td>
<td>60.0</td>
<td>33.0</td>
</tr>
<tr>
<td>+36%</td>
<td></td>
<td>+45%</td>
<td>+30%</td>
<td>-45%</td>
<td>-22%</td>
<td>+159%</td>
<td>-45%</td>
</tr>
<tr>
<td>Total Construction</td>
<td>406.7</td>
<td>399.8</td>
<td>438.7</td>
<td>515.5</td>
<td>571.5</td>
<td>615.8</td>
<td>678.3</td>
</tr>
<tr>
<td>Excluding Elec. Util. &amp; Gas Plants</td>
<td>-0%</td>
<td>-2%</td>
<td>+10%</td>
<td>+18%</td>
<td>+11%</td>
<td>+8%</td>
<td>+10%</td>
</tr>
</tbody>
</table>
The Dodge Momentum Index (DMI) tracks the first (or initial) reports for nonresidential building projects at the planning stage.

Some recent points:

- The DMI bottomed out in July 2011, and has been trending upward since then.
- The DMI has picked up some of the timing shown by commercial and institutional starts.

Recent increases for institutional component indicate that the decline for this sector has reached an end, with construction now seeing renewed growth although at a more gradual rate than shown by commercial building.
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• Future of the Industry
Future

Top Future Trend:

• The Industrialization of the Construction Industry
Extending Prefabrication towards Productization

- Contractors prefabricating more extensive modular assemblies
  - Traditionally built onsite…. Now being productized

Prefabricated Corridor Racks

Prefabricated Head Walls

Prefabricated Bathroom Pods

Images: Turner Construction
Extending Prefabrication towards Productization

- Contractors prefabricating more extensive modular assemblies
  - Traditionally built onsite…. Now being productized

Images: Turner Construction
EXAMPLE: Maquet

- Maquet Surgical Workplaces (www.maquet.com)
- Turnkey “Futureproof Modular System” for hospital operating rooms
Future

Top Future Trend:

• **The Industrialization of the Construction Industry**
Post and Panel Construction
Fully Coordinated BIM Spool Sheets

LEVEL 4
POD 401
4411/WEST
ELEV. #26

Images: DPR
Wall by Wall Review

Millworker to comment on supports

Confirm specs and mounting req's for accessories

Move 8"

Confirm ADA reach/height at soap disp.

Final verification of outlet locations

8’ 4 7/8’ to center line

Images: DPR
# The Payback: Productivity!

<table>
<thead>
<tr>
<th>8%</th>
<th>Production Increase Full Height Framing</th>
</tr>
</thead>
<tbody>
<tr>
<td>4%</td>
<td>Production Increase Sheetrock Install</td>
</tr>
<tr>
<td>11%</td>
<td>Production Increase Taping and Finishing</td>
</tr>
<tr>
<td>6%</td>
<td>Decrease Material Waste</td>
</tr>
</tbody>
</table>

Images: DPR
Future

Top Future Trend:
• The Industrialization of the Construction Industry
EXAMPLE: ICA

• Complete System for Manufactured Precast Correctional Facilities
• Can produce 50 cells/day from library of modular designs

Source: ICA
Sistema modular flexible

- Multifamily
- Hotels
- Schools
Top Future Trend:

- The Industrialization of the Construction Industry

DPR Construction  ICA  Aditazz  Broad Industries
Industrialization: Aditazz

Design-to-manufacture for health care facilities

- www.aditazz.com
Library of Manufacturable Building Parts
Library of Interior Elements with Integrated In-wall Systems

The Aditazz Realization Platform (ARP) leverages the best available manufacturing and pre-fabrication methodologies, resulting in a higher quality facility, while achieving it faster, and with less expense.
Faster, Better, Less Expensive Health Care Facilities
Automated On-site Assembly vs. Construction
Automated On-site Assembly vs. Construction

Aditazz claims that by developing flat decks, walls can be treated “like furniture.”

Aditazz developed floor decks as components for use in its modular strategy.
Future

Top Future Trend:

• The Industrialization of the Construction Industry
EXAMPLE: Broad Sustainable Buildings
Top Future Trend:

- The Industrialization of the Construction Industry
- What it means for manufacturers:
  - Who your customer is
    - Another manufacturer
  - How you go to market to reach and serve customers
  - Who you partner with
    - Larger and larger assemblies
  - Who your competitors are

“If you don’t like change… you’ll like irrelevance even less
Dodge Data & Analytics Research

Extensive industry research available for free download (www.analyticsstore.construction.com)