Construction Megatrends

What Every Contractor Must Know
It’s a VUCA World

Volatile
Uncertain
Complex
Ambiguous
Strategy is so complicated, where do we start?

- Setting the long term direction that guides all decisions and provides vision for what the firm is aspiring to be

Success or failure of a strategy rests in its execution

In today’s business environment, action plans alone are often not enough

Successful strategy execution is the result of leaders who are comfortable navigating with only a map and a compass instead of turn-by-turn navigation
2014 Highlights

High-volume nonresidential segments in 2014
- Power ($96.5 billion)
- Highway and Street ($81.3 billion)
- Educational ($78.0 billion)

Strongest percentage gainers in 2014
- Lodging (14.0%)
- Conservation and Development (12.0%)

Weakest segments in 2014
- Health Care (-2.0%)
- Public Safety (-2.0%)
- Educational (0%)

Total Put in Place

<table>
<thead>
<tr>
<th>Year</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>9</td>
</tr>
<tr>
<td>2013</td>
<td>6</td>
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<td>2014</td>
<td>7</td>
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# U.S. Construction Put in Place

<table>
<thead>
<tr>
<th></th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
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<tbody>
<tr>
<td><strong>RESIDENTIAL BUILDINGS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single Family</td>
<td>12%</td>
<td>14%</td>
<td>12%</td>
<td>10%</td>
<td>10%</td>
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<tr>
<td>Multifamily</td>
<td>19%</td>
<td>13%</td>
<td>11%</td>
<td>8%</td>
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<tr>
<td>Improvements*</td>
<td>6%</td>
<td>5%</td>
<td>5%</td>
<td>4%</td>
<td>4%</td>
</tr>
<tr>
<td><strong>Total Residential</strong></td>
<td>11%</td>
<td>10%</td>
<td>9%</td>
<td>8%</td>
<td>7%</td>
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<tr>
<td><strong>NONRESIDENTIAL BUILDINGS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lodging</td>
<td>14%</td>
<td>12%</td>
<td>9%</td>
<td>6%</td>
<td>5%</td>
</tr>
<tr>
<td>Office</td>
<td>8%</td>
<td>7%</td>
<td>6%</td>
<td>5%</td>
<td>4%</td>
</tr>
<tr>
<td>Commercial</td>
<td>6%</td>
<td>6%</td>
<td>5%</td>
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<tr>
<td>Health Care</td>
<td>-2%</td>
<td>4%</td>
<td>5%</td>
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<tr>
<td>Educational</td>
<td>0%</td>
<td>3%</td>
<td>3%</td>
<td>5%</td>
<td>6%</td>
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<tr>
<td>Religious</td>
<td>3%</td>
<td>3%</td>
<td>3%</td>
<td>4%</td>
<td>4%</td>
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<tr>
<td>Public Safety</td>
<td>-2%</td>
<td>2%</td>
<td>3%</td>
<td>4%</td>
<td>4%</td>
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<tr>
<td>Amusement and Recreation</td>
<td>8%</td>
<td>5%</td>
<td>3%</td>
<td>4%</td>
<td>5%</td>
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<tr>
<td>Transportation</td>
<td>7%</td>
<td>8%</td>
<td>6%</td>
<td>5%</td>
<td>5%</td>
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<tr>
<td>Communication</td>
<td>3%</td>
<td>5%</td>
<td>4%</td>
<td>4%</td>
<td>3%</td>
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<tr>
<td>Manufacturing</td>
<td>6%</td>
<td>8%</td>
<td>8%</td>
<td>7%</td>
<td>6%</td>
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<tr>
<td><strong>Total Nonresidential Buildings</strong></td>
<td>4%</td>
<td>6%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
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<tr>
<td><strong>NONBUILDING STRUCTURES</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power</td>
<td>6%</td>
<td>6%</td>
<td>6%</td>
<td>7%</td>
<td>8%</td>
</tr>
<tr>
<td>Highway and Street</td>
<td>1%</td>
<td>2%</td>
<td>2%</td>
<td>3%</td>
<td>3%</td>
</tr>
<tr>
<td>Sewage and Waste Disposal</td>
<td>2%</td>
<td>2%</td>
<td>3%</td>
<td>4%</td>
<td>3%</td>
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<tr>
<td>Water Supply</td>
<td>1%</td>
<td>2%</td>
<td>3%</td>
<td>3%</td>
<td>4%</td>
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<tr>
<td>Conservation and Development</td>
<td>12%</td>
<td>5%</td>
<td>4%</td>
<td>4%</td>
<td>3%</td>
</tr>
<tr>
<td><strong>Total Nonbuilding Structures</strong></td>
<td>4%</td>
<td>4%</td>
<td>4%</td>
<td>5%</td>
<td>6%</td>
</tr>
<tr>
<td><strong>Total Put in Place</strong></td>
<td>7%</td>
<td>7%</td>
<td>7%</td>
<td>6%</td>
<td>6%</td>
</tr>
</tbody>
</table>

*Improvements include additions, alterations and major replacements. They do not include maintenance and repairs.*

Source: Building permits, Construction Put in Place and trade sources. This report is based on multiple sources, prepared and believed accurate by FMI, but accuracy is not guaranteed by FMI nor by its employees.
Overarching Trends

- Global interdependence and repositioning of economic power
- Geopolitical uncertainty – increasing regulation
- Aging population/mobile workforce
- Growth in middle class – one billion by 2020
Issue 1:

“Business” of Construction Evolving Rapidly
Scale Matters

- Access to capital
- Allows diversification
- Large projects = limited competition
- Enables reinvestment
- Larger supply chain
- Allows multiple areas of technical expertise
Foreign Entry Into the U.S. Market – Examples

• WorleyParsons, Ltd.
• Balfour Beatty
• Skanska
• Lend Lease
• Hochtief (ACS)
• Obayashi
• Kajima
• AMEC
• SNC-Lavalin
• Arcadis
• Stantec
Advantages

- Access to global financial markets
- Global procurement/sourcing
- Home government support
- Experience with cross-border activities
- Long-term planning horizon
- Integrated design/build/finance/operate
- Technical/engineering prowess
- Bring different (innovative) practices
International Firm Competitiveness (2 of 2)

**Disadvantages**

- In a foreign land
- Aggressive legal system
- Surety constraints
- More competitive than home markets
- Less integration
- Lack self-perform experience
- Cultural backlash
- Arrogance
Multiplicity of Delivery Systems

- Reflective of market fragmentation
- Public Private Partnerships
- CM/GC
- Design-Build
  - Fell short of forecast as a trend
  - Promise of a more rational process still compelling
  - Integrated business models very few
  - Engineering more “naturally” integrated with construction than architecture
- IPD
  - Today’s version of the compelling promise
  - More symbolic than real
“Virtual” Construction | The Lines are Blurred

- Proliferation of delivery methods – redefinition of roles
- Productivity/Modularization/Manufacturers influence
- Technology/BIM
- 3D Printing

- Engineers → Contractors
- Subcontractors → Generals
- Developers → Generals
Issue 2:
Industrial Revolution?
U.S. Major Oil and Shale Plays Overlaid with Concentrations of Economic Activity

Source: EIA, University of Utah’s Metropolitan Research Center and Brookings Mountain West
U.S. Energy Construction Market Trends

• **Infrastructure Demand is Strong:**
  – International LNG pricing provides export incentives
  – Pricing differentials benefit Gulf Coast refinery complex – incentives for pipeline and refinery development
  – Industrial and commercial demand for gas is strong

• **Labor Markets are Tight:**
  – Overall labor demand is growing – diminishing pool of qualified labor/management
  – Geographic pockets witnessing significant labor-driven inflationary pressures

• **Political Risks Create Some Market Uncertainty:**
  – Keystone decision
  – LNG exports
  – Hydraulic fracturing
### U.S. Energy Construction Market – Capital Expenditures

<table>
<thead>
<tr>
<th></th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Exploration and Production</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drilling/Exploration</td>
<td>$222.9</td>
<td>$239.2</td>
<td>$240.2</td>
</tr>
<tr>
<td>Production</td>
<td>$42.4</td>
<td>$45.5</td>
<td>$45.6</td>
</tr>
<tr>
<td>OCS Lease</td>
<td>$0.3</td>
<td>$1.8</td>
<td>$2.1</td>
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<tr>
<td><strong>Total E&amp;P</strong></td>
<td>$265.6</td>
<td>$286.5</td>
<td>$287.8</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Refining</td>
<td>$12.1</td>
<td>$13.0</td>
<td>$12.7</td>
</tr>
<tr>
<td>Petrochemicals</td>
<td>$0.3</td>
<td>$1.3</td>
<td>$1.8</td>
</tr>
<tr>
<td>Crude Pipelines</td>
<td>$1.4</td>
<td>$4.3</td>
<td>$23.2</td>
</tr>
<tr>
<td>Gas Pipelines</td>
<td>$7.7</td>
<td>$4.3</td>
<td>$15.3</td>
</tr>
<tr>
<td>Other Transportation</td>
<td>$1.1</td>
<td>$1.2</td>
<td>$1.8</td>
</tr>
<tr>
<td>Mining, Other Energy</td>
<td>$1.1</td>
<td>$1.1</td>
<td>$1.1</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>$4.0</td>
<td>$4.2</td>
<td>$4.5</td>
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<tr>
<td><strong>Subtotal</strong></td>
<td>$27.6</td>
<td>$29.5</td>
<td>$60.4</td>
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<tr>
<td><strong>Total</strong></td>
<td>$293.2</td>
<td>$315.9</td>
<td>$348.4</td>
</tr>
</tbody>
</table>

*Source: Oil & Gas Journal*
Downstream industrial construction dwarfs all other energy sectors by 10x.....
Energy Impacted Value Chain

**Oil & Gas**
- Pipelines
  - Upstream gathering
  - Midstream transmission
- Pipeline Facilities
  - Compressor / Pump Stations
  - Dewatering / Odorization
- Storage

**Refinery & Petrochem**
- Petroleum Refineries:
  - Gasoline
  - Diesel
  - Fuel Oils
  - Asphalt
  - Etc.
- Natural Gas Processing:
  - Ethane
  - Propane
  - Butane
- Petrochemical:
  - Ethylene
  - Ammonia
  - Ethanol

**Power Generation**
- Power Plants:
  - Gas Fired Plants
  - Coal Fired Plants
- Environmental Retrofits

**Chemical**
- Commodity Chemicals
- Plastics/Resins/Polymers
- Specialty Chemicals
- Consumer Products
- Pharmaceuticals
- Agricultural / Fertilizers

**Metals & Minerals**
- Steel
- Cement

**Other Raw Materials**
- Metals
- Agricultural
  - Wood Products
  - Corn / Wheat / Barley / Soybeans / Etc.
- Non-Metallic Minerals

**Specialized Processing Capabilities**

**Other**
- Building Products
- Pulp & Paper
- Food & Beverage
- Other
Unstoppable Linear Trends

- China and India accounted for 90% of the growth in global energy consumption in 2012
- Africa’s emerging middle class is larger than the population of both the U.S. and Western Europe
Strategic Question

If the U.S. and Canada remain the largest producers of crude oil, natural gas and petrochemicals, and China, India and Africa continue to develop their middle-class consumer economies, what are the implications for U.S. industry and construction spending?
Issue 3: Role of Technology Shifts
• Most economic benefit was accrued to clients
• As engineering has become more automated, there is less production for which to bill
• Tools and techniques are easily replicable
• Sustainable competitive advantage has proven elusive
Technology | Going Forward

- More focus on business impact
  - Increase revenue – sustainable differentiation
  - Decrease cost – production efficiency that accrues to the service provider
- Mobility and Collaboration
- BIM as a means of forced discipline
- Interoperability – all players
- Automatically generated Construction Documents
- 3D Printing
  - Human organs to jet engine parts
  - Physical structures?
- “Space Age” construction materials
Issue 4: Talent Crisis Looming
Construction Labor Shifts to Energy Sector

‘Hey boss, can I have a $100,000 raise?’

- Contractors across all sectors must upgrade their recruitment, on-boarding, retention and development programs to compete effectively.
- Competitive base wage packages and appropriate variable based incentive compensation plans are critical for retention.

Percentage of Construction Labor Force in Energy

3.8% - 2008
6.4% - 2012
10.0% - 2017

Source: FMI Whitepaper: Labor Shortages Across the Industry
# 1 Million Additional Workers Needed Between Now and 2017

Estimated for the United States Thousands of Full-Time Workers
September 2013

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th>2014e</th>
<th>2015e</th>
<th>2016e</th>
<th>2017e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carpet, Floor and Tile Installers and Finishers</td>
<td>60.6</td>
<td>63.6</td>
<td>66.9</td>
<td>70.2</td>
<td>74.6</td>
</tr>
<tr>
<td>Sheet Metal Workers</td>
<td>85.7</td>
<td>92.1</td>
<td>104.5</td>
<td>113.6</td>
<td>127.7</td>
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<tr>
<td>Brickmasons, Blockmasons and Stonemasons</td>
<td>85.9</td>
<td>89.8</td>
<td>102.1</td>
<td>114.7</td>
<td>121.3</td>
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<tr>
<td>Roofers</td>
<td>99.5</td>
<td>107.2</td>
<td>119.3</td>
<td>130.3</td>
<td>142.4</td>
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<tr>
<td>General and Operations Managers</td>
<td>110.8</td>
<td>119.8</td>
<td>133.3</td>
<td>145.2</td>
<td>153.1</td>
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<tr>
<td>Cost Estimators</td>
<td>107.1</td>
<td>114.2</td>
<td>126.6</td>
<td>137.4</td>
<td>154.6</td>
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<tr>
<td>Construction Managers</td>
<td>150.7</td>
<td>161.9</td>
<td>183.2</td>
<td>195.9</td>
<td>215.0</td>
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<tr>
<td>Cement Masons, Concrete Finishers &amp; Terrazzo Workers</td>
<td>152.0</td>
<td>166.6</td>
<td>182.8</td>
<td>199.2</td>
<td>219.2</td>
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<tr>
<td>Engineering &amp; Design Occupations</td>
<td>219.3</td>
<td>232.8</td>
<td>252.5</td>
<td>272.2</td>
<td>292.5</td>
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<td>Construction Equipment Operators</td>
<td>241.6</td>
<td>253.4</td>
<td>272.1</td>
<td>291.6</td>
<td>315.4</td>
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<tr>
<td>Helpers, Construction Trades</td>
<td>274.5</td>
<td>287.4</td>
<td>304.8</td>
<td>326.3</td>
<td>361.4</td>
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<tr>
<td>Pipelayers, Plumbers, Pipefitters and Steamfitters</td>
<td>330.8</td>
<td>353.3</td>
<td>374.2</td>
<td>399.9</td>
<td>425.9</td>
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<tr>
<td>First-Line Supervisors/Managers</td>
<td>349.5</td>
<td>370.1</td>
<td>398.6</td>
<td>423.4</td>
<td>445.7</td>
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<td>Electricians</td>
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<td>408.0</td>
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<td>Carpenters</td>
<td>530.0</td>
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<td>593.7</td>
<td>616.1</td>
<td>647.2</td>
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<tr>
<td>Construction Laborers</td>
<td>577.4</td>
<td>603.6</td>
<td>628.2</td>
<td>657.9</td>
<td>694.1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>4,041.6</td>
<td>4,283.8</td>
<td>4,598.7</td>
<td>4,907.0</td>
<td>5,263.0</td>
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<tr>
<td><strong>% Change from Prior Year</strong></td>
<td>2%</td>
<td>6%</td>
<td>7%</td>
<td>7%</td>
<td>7%</td>
</tr>
</tbody>
</table>

Source: FMI Projections
Convergence of Trends

- Baby Bust
- Baby Boom
- Immigration

- Command and Control
- Unsophisticated
- Volatility
- Mobility
- Ethics

- Fewer Technical/Science
- Lower Skills
- “Soft” Subjects

- Multiple Market Growth

- Compensation
- Mobility
- Demand
- Opportunity
- Image

Labor Shortage

Education
Quality & Focus

Industry
Culture

Attractive
Alternatives

Market
Demand

Demographics
Some Parting Thoughts About the Industry’s Future

- The climate will continue to be characterized by “VUCA.”
- Rehabilitation of both buildings and infrastructure will comprise significant parts of the market.
- There will be a growth in “smart” buildings and infrastructure.
- More construction will be manufactured.
- Energy will continue to increase as a driver of trends.
- Scarcity of talent will drive many firm’s strategy.
About FMI

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- Strategic Advisory
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- Leadership and Talent Development
- Project and Process Improvement
- Mergers, Acquisitions and Financial Consulting†
- Compensation Benchmarking and Consulting
- Risk Management Consulting

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