MISSION CRITICAL INDUSTRY AND CONSTRUCTION TRENDS

Professionals at the 7x24 Exchange Conference share their views on the state of the U.S. Mission Critical Industry and the outlook for the future.
Foreword

The current dynamics in the U.S. mission critical industry rival that of industries like tablet computers and smart phones. Excitement for the industry could be seen at the Fall 2011 7x24 Exchange Conference where a record-breaking number of data center and facilities professionals gathered at the Arizona Biltmore Hotel.

We gathered feedback from 90 professionals at the conference to conduct this study. Respondents described a market that is strong despite the struggling economy, where transformational changes are taking place across a broad array of operational areas.

Optimism for the future is high, with no obvious end in sight to either the strong expansion of mission critical capacity or the underlying forces necessitating this growth. Indeed, perhaps the greatest challenge facing industry participants is which of the many promising technologies and design trends will define the future of the industry.

The importance of mission critical facilities to corporate and public infrastructure continues to grow, and Mortenson will continue to bring ingenuity, industry knowledge, and technical expertise to bear on advancements shaping the industry. To that end, we are pleased to share with you the following insights and perspective.

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Strong, Shifting Market

Current investment plans of mission critical stakeholders reflect the likely growth of the market.

Will your company make any of the following data center investments in the next 12-24 months?

Colocation provider respondents

- New internal data center: 48% (Definitely will) 24% (Probably will) 5% (Probably will not) 23% (Definitely will not)
- Internal data center retrofit / expansion: 32% (Definitely will) 32% (Probably will) 16% (Probably will not) 21% (Definitely will not)
- Colocation or expansion of third party commitments: 35% (Definitely will) 25% (Probably will) 15% (Probably will not) 25% (Definitely will not)
- At least one of the above: 63% (Definitely will) 20% (Probably will) 17% (Definitely will not)

Corporate and public entity respondents

- New internal data center: 20% (Definitely will) 60% (Probably will) 20% (Definitely will not)
- Internal data center retrofit / expansion: 40% (Definitely will) 40% (Probably will) 20% (Definitely will not)
- Colocation or expansion of third party commitments: 20% (Definitely will) 20% (Probably will) 40% (Definitely will not)
- At least one of the above: 60% (Definitely will) 20% (Probably will) 20% (Definitely will not)

A full 83 percent of colocation provider respondents and 60 percent of corporate and public entity respondents will likely make mission critical investments in the next 12-24 months.

The fact that more colocation respondents are planning new investments than corporate or public entities may indicate a shift away from internal data center ownership toward colocation facilities. Another sign of this potential shift: 33 percent of all corporate and public entity respondents who manage their data center capacity internally are nonetheless planning to make new colocation facility commitments in the next 12-24 months.

Over two-thirds of respondents reported that overall market preference is shifting toward co-location facility capacity, with more than a quarter describing the growth in preference as significant.

Design, engineering, and supplier respondents anticipate healthy volumes of future activity as well. A full 89 percent believe their data center workload will increase over the next two years, with a quarter anticipating substantially higher volumes.
Staying Power

Solid data center growth is seen continuing well into the future.

Eighty-two percent of participants believe the current strong growth of data center construction will continue for at least the next five years, with 25 percent believing the growth will last at least 10 years.

Participants were asked which two sectors of the economy will have the greatest need for new data center investments over the next five years. Healthcare was ranked as one of the top two sectors by nearly every participant (92 percent), receiving significantly more votes than the next highest sectors—technology companies (53 percent) and government (30 percent).

Please select the two sectors you think will have the greatest need for new data center capacity over the next five years:

All respondents
% of Top Two Votes Received

<table>
<thead>
<tr>
<th>Sector</th>
<th>% of Top Two Votes Received</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthcare</td>
<td>92%</td>
</tr>
<tr>
<td>Technology companies</td>
<td>53%</td>
</tr>
<tr>
<td>Government</td>
<td>30%</td>
</tr>
<tr>
<td>Goods companies (e.g. consumer goods, manufacturers)</td>
<td>13%</td>
</tr>
<tr>
<td>Services companies (e.g. law firms, financial organizations)</td>
<td>10%</td>
</tr>
<tr>
<td>Education</td>
<td>7%</td>
</tr>
</tbody>
</table>

Greater digitization of information is seen as the most important factor driving data center growth, followed by growth in cloud-based services and applications (SaaS, IaaS, etc.).

Please rank from one to five the following items in terms of what is driving strong data center growth at this time:

All respondents

<table>
<thead>
<tr>
<th>Factor</th>
<th>Average Ranking Received</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greater digitization of information</td>
<td>2.0</td>
</tr>
<tr>
<td>Growth in cloud-based services / applications</td>
<td>2.2</td>
</tr>
<tr>
<td>Growth of new devices</td>
<td>2.4</td>
</tr>
<tr>
<td>Growth in other applications / services</td>
<td>2.8</td>
</tr>
<tr>
<td>Corporate legal requirements to maintain data</td>
<td>2.9</td>
</tr>
</tbody>
</table>

A 2011 study by Gartner shows that the volume of storage data is growing at a rate of 40 percent to 60 percent each year. Not only is dramatic growth continuing in established mediums such as corporate email, but new media formats such as video recordings are now being stored.

Cisco recently released a study stating that by 2015 data center space devoted to cloud computing will grow an astonishing 12 times from where it was in 2010.
Potential Threats

We asked respondents to write down the one or two biggest threats that could end the data center boom. Their grouped responses are shown below.

What are the one or two greatest threats to the data center market that could end current growth?

<table>
<thead>
<tr>
<th>Response</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recession / economy</td>
<td>27%</td>
</tr>
<tr>
<td>Regulations / government</td>
<td>16%</td>
</tr>
<tr>
<td>Price / cost</td>
<td>11%</td>
</tr>
<tr>
<td>Financing / banking industry problems</td>
<td>11%</td>
</tr>
<tr>
<td>New technologies / designs</td>
<td>8%</td>
</tr>
<tr>
<td>Overbuilding</td>
<td>8%</td>
</tr>
<tr>
<td>Nothing</td>
<td>6%</td>
</tr>
<tr>
<td>The cloud</td>
<td>3%</td>
</tr>
<tr>
<td>Other</td>
<td>10%</td>
</tr>
</tbody>
</table>

Although the weak economy of the past several years has failed to stop the expansion of data centers, the top threat identified by 27 percent of respondents was the economy and the potential for a double dip recession. Likewise, although government policies today do not significantly hinder the market, regulations received the second highest mentions.

These responses suggest that for many it would take a major economic or political event of a scale much greater than exists today—such as a global economic collapse or the passage of sweeping new CO² regulations—to bring down the mission critical market.
Hot and Dense

Corporate, public, and colocation participants were asked whether their current mission critical operations include emerging data center characteristics such as modular data centers. Approximately 30 percent said high-density and high-temperature operations were a major part of their operations, with another 42% reporting these characteristics were a minor part of operations.

Which does your current data center operations include?

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Corporate, public entity, and colocation provider respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment / data centers that can operate at high temperatures</td>
<td>31% Major part of operations</td>
</tr>
<tr>
<td>High-density data centers (&gt;250 watts / square foot)</td>
<td>27% Major part of operations</td>
</tr>
<tr>
<td>Containerized or modular data centers</td>
<td>23% Major part of operations</td>
</tr>
<tr>
<td>Data centers outside of the U.S.</td>
<td>12% Major part of operations</td>
</tr>
<tr>
<td>Remote / non-urban data centers</td>
<td>8% Major part of operations</td>
</tr>
</tbody>
</table>

A high majority of respondents currently utilizing the above features were colocation providers, which suggests these providers are early adopters of new practices.

How much of a future trend will the following be?

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>All respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment / data centers that can operate at high temperatures</td>
<td>70% Major future trend</td>
</tr>
<tr>
<td>High-density data centers (&gt;250 watts / square foot)</td>
<td>68% Major future trend</td>
</tr>
<tr>
<td>Containerized or modular data centers</td>
<td>43% Major future trend</td>
</tr>
<tr>
<td>Remote / non-urban data centers</td>
<td>34% Major future trend</td>
</tr>
<tr>
<td>Data centers outside of the U.S.</td>
<td>33% Major future trend</td>
</tr>
</tbody>
</table>

Similar to current operations, more participants see high-temperature and high-density data centers as playing a major role in the future than other characteristics such as remote, containerized, or renewable energy data centers.
Cool and Efficient

Energy and cooling costs receive top consideration when making data center location decisions, which is understandable given the cost of these factors to facilities that operate 7x24x365.

Rank the following factors in terms of which most influence where you locate new data center investments:

- Cost of energy (2.0)
- Cost of cooling/potential for free cooling (2.2)
- Proximity to fiber (2.3)
- Little or no threat of natural disasters (3.3)
- Cost of real estate (3.4)
- Proximity to transportation (4.4)
- Proximity to your existing business (4.9)

Respondents did not consider proximity to their existing business to be one of the top five factors driving new data center location decisions. However, respondents participating in this survey also have not rushed outside of cities to construct mission critical facilities. Only eight percent of participants stated that remote or non-urban data centers were a major part of their operations.

Respondents were asked to write down the most promising new technologies they see for data centers. Their grouped responses are shown below.

The large number of promising technologies and areas participants identified reflects the tremendous advancements currently taking place, and also suggests a lack of agreement as to which offer the most promise.

What are the most promising new technologies you see for data centers?

- Alternative energy / on-site energy (15%)
- Higher operating temperatures (13%)
- Higher energy efficiency (13%)
- Modular / flexible designs (10%)
- Airside economizing / better use of air (8%)
- New cloud services / applications (8%)
- Evaporative cooling (6%)
- Other cooling technologies (6%)
- High density data centers (6%)
- Better voltage distribution (4%)
- Other (12%)

Many technologies/areas mentioned relate directly to energy and energy efficiency. The number one response of alternative, on-site energy generation is promising to many even though certain challenges—such as initial build cost premiums—remain to making on-site generation a reality. Many responses also relate to reducing cooling costs, including higher operating temperatures, designs that optimize the use of ventilation and evaporative cooling techniques.
Better and Faster

In your opinion, what data center efficiency level will be considered average over the next five years?

Power Usage Efficiency (PUE) Level
All respondents

- 1.2 PUE: 4%
- 1.2 - 1.3 PUE: 54%
- 1.4 - 1.5 PUE: 26%
- 1.6 - 1.8 PUE: 15%
- >1.8 PUE: 1%

Participants were optimistic that the efficiency of mission critical facilities would continue to improve.

Fifty-eight percent of participants believe an average PUE level of at least 1.3 is achievable over the next five years, which is a 30 percent improvement over the 1.8 average PUE level reported in May by the Uptime Institute.

When asked to write down the factors that will drive greater data center efficiency, higher operating temperatures and better cooling technologies were mentioned the most. Several others mentioned their belief that external factors will force data efficiencies, such as higher energy prices and potential government policy actions. A few participants even expressed a belief that a new carbon tax will be implemented in the future.

Respondents were also asked what future speed to market is achievable over the next five years.

About half of participants believe a 10-12 month speed to market can be achieved for a new Tier III, two megawatt data center, with another 38 percent believing a six to nine month timeframe—or even shorter—is possible.

This represents a significant improvement from today, where Tier III data centers can often take well over a year to construct.

What will drive greater data center efficiency?
All respondents

- Higher operating temperatures: 21%
- Better cooling technologies (airside economizing was 7% of the 21%)
- Pressure / actions from government and utilities: 16%
- Energy costs: 12%
- R&D / better designs / people: 5%
- Better understanding / education: 5%
- Sustainability concerns: 3%
- Other: 17%

What speed to market is reasonably achievable over the next five years for a new Tier III, two megawatt data center?

Speed to Market in Months
All respondents

- < 6 months: 2%
- 6 - 9 months: 36%
- 10 - 12 months: 49%
- 13 - 18 months: 13%
Traditional vs. Collaborative Delivery

What is the trend in preference across the industry for the following project delivery methods?

### Corporate, Public Entity, and Colocation Provider Respondents

<table>
<thead>
<tr>
<th>Delivery Method</th>
<th>Growing significantly</th>
<th>Growing</th>
<th>Staying the same</th>
<th>Shrinking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design-Bid-Build</td>
<td>15%</td>
<td>56%</td>
<td>22%</td>
<td>7%</td>
</tr>
<tr>
<td>CM at Risk</td>
<td>12%</td>
<td>12%</td>
<td>73%</td>
<td>3%</td>
</tr>
<tr>
<td>Design-Build</td>
<td>8%</td>
<td>35%</td>
<td>54%</td>
<td>3%</td>
</tr>
<tr>
<td>Integrated Project Delivery (IPD)</td>
<td>21%</td>
<td>25%</td>
<td>46%</td>
<td>8%</td>
</tr>
</tbody>
</table>

### Engineering, Design, and Supplier Respondents

<table>
<thead>
<tr>
<th>Delivery Method</th>
<th>Growing significantly</th>
<th>Growing</th>
<th>Staying the same</th>
<th>Shrinking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design-Bid-Build</td>
<td>8%</td>
<td>28%</td>
<td>35%</td>
<td>31%</td>
</tr>
<tr>
<td>CM at Risk</td>
<td>3%</td>
<td>32%</td>
<td>53%</td>
<td>12%</td>
</tr>
<tr>
<td>Design-Build</td>
<td>18%</td>
<td>48%</td>
<td>23%</td>
<td>11%</td>
</tr>
<tr>
<td>Integrated Project Delivery (IPD)</td>
<td>15%</td>
<td>57%</td>
<td>20%</td>
<td>8%</td>
</tr>
</tbody>
</table>

A number of delivery methods are utilized to construct new mission critical facilities, ranging from the traditional design-bid-build approach to collaborative solutions such as design-build and integrated project delivery (IPD).

The majority of corporate, public entity, and colocation providers believe that preference for design-bid-build is growing at this time. A couple of respondents stated that the current economy has made this approach more attractive from an overall cost standpoint.

These sentiments contrast with the majority of engineering, design, and supplier respondents, who believe preference in design-build and integrated project delivery is growing. It was not clear from the written responses why A/E and supplier respondents would perceive more growth in collaborative solutions than owner respondents do.

Integrated approaches can ensure desired results when executing complex projects. The growing sophistication of mission critical facilities may be driving greater interest in design-build and IPD within design and contractor communities. Owners who are less familiar with these methodologies may still need more information regarding their advantages.

It should be noted that only a small minority of respondents felt preference for any particular delivery method was growing significantly, suggesting relative stability in delivery preferences at this time.
Where Can Contractors Help?

Participants wrote down the ways they felt builders can most help new mission critical projects be successful. Their grouped responses can be seen to the right.

Owners of data centers such as corporations and colocation providers emphasized the importance of builders to effectively educate, listen, and communicate with them.

“Educate and help the client understand the impacts of their decisions,” said one respondent.

Owner responses point to a potential larger role for alternative delivery methods such as design-build. Alternative methods afford builders the opportunity to advise owners early in the process before key design and investment decisions are finalized.

Engineering and design respondents focused on the need for builders to be involved early in the process, collaborate with others, and bring a strong team to the project.

“What is the most important thing(s) a builder can do to ensure a successful mission critical project?”

<table>
<thead>
<tr>
<th>Corporate, public entity, and colocation provider respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educate and inform 34%</td>
</tr>
<tr>
<td>Listen / understand customer needs 23%</td>
</tr>
<tr>
<td>Communicate 11%</td>
</tr>
<tr>
<td>Be involved early in the process 11%</td>
</tr>
<tr>
<td>Ensure the best price 11%</td>
</tr>
<tr>
<td>Other 10%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Engineering and designer respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Be involved early 26%</td>
</tr>
<tr>
<td>Collaborate, integrate 22%</td>
</tr>
<tr>
<td>Have a great team 12%</td>
</tr>
<tr>
<td>Support design-build 8%</td>
</tr>
<tr>
<td>Accurate pricing 6%</td>
</tr>
<tr>
<td>Communicate 6%</td>
</tr>
<tr>
<td>Listen / understand needs 6%</td>
</tr>
<tr>
<td>Other 14%</td>
</tr>
</tbody>
</table>

One important way contractors can help clients understand the impact of their decisions is through the use of advanced technologies such as BIM/VDC. These technologies improve the coordination and exchange of information between project stakeholders and allow for the early identification of issues that could prove to be costly during the construction phase.

“Engage early to ensure that designs and speed to market demands can be achieved,” said one A/E respondent. “GCs who bring the best collaboration and communication skills ensure the most successful project,” stated another.
We sincerely thank the professionals who offered their time to participate in this study. Input from studies like this and active listening to our customers and business partners in day-to-day dialogue form the basis for the strategic direction of Mortenson Construction. Our aim is to be in lockstep with our customers and partners, resulting in a construction experience that’s second-to-none.

In today’s dynamic mission critical industry, we are continually examining our procedures with an eye to streamlining processes and creating efficiencies. Our goal is to deliver efficient, high quality structures that provide our customers the lowest lifecycle cost of ownership. We invite our customers to explore our industry-leading alternative energy solutions and sustainability capabilities. We are dedicated to working in an open and integrated manner with all of our business partners and customers.

We welcome the opportunity to share more with you about Mortenson’s mission critical expertise, delivery methods and unique capabilities to provide world-class quality, innovation, and service to our customers.
To learn more about Mortenson’s mission critical capabilities, contact the office nearest to you:

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A U.S.-based, family-owned business since 1954, Mortenson Construction is a leading builder in North America and one of the only domestic builders with capabilities in Asia. Mortenson has more than 11 million square feet of mission critical construction and renovations nationwide on our resume. Eighty percent of our mission critical experience is with repeat customers.

With services in general contracting, construction management, design-build, EPC/BOP and project development, Mortenson is capable of delivering projects of any scope and size in North America and abroad. From cutting-edge stadiums and state-of-the-art, LEED-certified mission critical projects to some of the most innovative renewable energy projects on the planet, Mortenson is building structures and facilities for the advancement of modern society. With offices across the U.S. and operations in Canada and China, Mortenson is a global company poised to continue building what’s next.