Developing Strategies for the Effective Delivery of Capital Projects

Accenture global survey of the utilities industry
## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction and executive summary</td>
<td>04</td>
</tr>
<tr>
<td>Research methodology</td>
<td>07</td>
</tr>
<tr>
<td>Overview of key findings and implications</td>
<td>09</td>
</tr>
<tr>
<td>Key findings</td>
<td>10</td>
</tr>
<tr>
<td>Implications and recommendations</td>
<td>22</td>
</tr>
<tr>
<td>Conclusion</td>
<td>34</td>
</tr>
</tbody>
</table>
Introduction and executive summary

The unprecedented scale and complexity of capital projects on the horizon prompted Accenture to undertake research into the delivery of projects throughout the world.

The International Energy Agency (IEA) forecasts nearly $38 trillion in investments in energy-related projects in the next quarter-century. Energy demand is expected to rise by 51 percent by 2035, assuming maintenance of current policies throughout the world.

Investments in power (electricity industry) take the largest share ($16.9 trillion) of the total, followed by oil ($10 trillion) and gas ($9.5 trillion). New generating capacity accounts for 58 percent of the nearly $17 trillion power total, with transmission and distribution making up the remainder.

Investments in new power generation are forecast at nearly $10 trillion up to 2035. The largest share will occur in non-Organisation for Economic Cooperation and Development (OECD) countries, with China accounting for $2 trillion and the rest of Asia at $1.7 trillion. In comparison, European Union investments are estimated at $1.8 trillion with North America at $1.7 trillion for the same time period. Latin American nations are expected to invest between $300 billion and $400 billion, an amount roughly matched by spending in the Middle East as well as in Africa.

Primary investment drivers

Investments are being driven by two interrelated requirements: the need to maintain security of supply as demand rises and older plants require replacement, and the need to meet environmental targets for local pollution and global warming gases.

In emerging economies, power investments are expected to be especially high due to rapid urbanization and economic growth. Energy infrastructure is a key component of national policy because it can serve as a powerful engine of economic growth. Analysis of the IEA data shows that more than two-thirds (68 percent) of China’s projects in energy infrastructure are expected to be in the power sector, and the ratio (74 percent) in India is higher. While the global recession has moderated demand, usage is expected to continue rising in these and other emerging economies.

For developed economies, the most frequent driver is replacement of old plants. Increasingly, new projects are needed due to shutdowns of conventional and nuclear power plants, especially in Europe and North America, where much of the power-plant fleet and transmission infrastructure are operating beyond the anticipated life span. Policies and economics are causing early closure of coal and oil-fired capacity, resulting in further reductions in the portfolio with system capacity already tight. Investments are also being made to upgrade and extend the life of power plants.

Investments are also being driven by targets to reduce local and global pollution in most countries. Renewable sources—including wind, solar photovoltaic and hydro—account for 60 percent of the investments in new generating capacity in forecasts to 2035 (see Figure 1). In addition, considerable investment will be required to enable this additional renewable capacity, such as backing up (peaking) conventional generation plants and networks through smart grid deployment and new connections.

Statistics show new investments in coal, oil, lignite and nuclear plants have waned in recent years compared to natural gas-fired plants across Europe largely driven by the low cost of natural gas (see Figure 2).

The challenges are rising

As the capital projects pipeline fills with power-related projects, the challenges mount.

Many new conventional power plants have been announced, but delays are likely. Barriers include access to financing, regulatory uncertainty in many countries, lack of sufficient price signals and public opposition. Complex supply chains, in some cases, have not been well utilized for decades. In addition, many utility companies in Europe and North America have limited recent experience delivering major capital projects, such as building nuclear plants and major transmission networks. This is a concern given there are more projects than ever.

With these challenges in mind, Accenture conducted global research, Developing Strategies for the Effective Delivery of Capital Projects, interviewing executives to investigate key challenges and methods to improve delivery.
Figure 1. Expected investments in new generation capacity worldwide through 2035.

Total expected investment = $9.8 trillion


Figure 2. Generation asset age across Europe.

This report is based on primary research conducted by an independent international agency on behalf of Accenture. The research involved interviews with executives in the energy and utilities sectors between November 2011 and February 2012.

Interviewers conducted a phone survey with executives in Brazil, Canada, China, Denmark, Finland, Germany, Greece, Hong Kong, Hungary, India, Ireland, Italy, the Netherlands, Portugal, Saudi Arabia, Singapore, South Africa, Spain, Switzerland, United Arab Emirates, the United Kingdom and the United States (see Figure 3). All respondents were C-level executives and decision makers or influencers regarding decisions related to management of capital projects in their organizations.

In general, analysis of data in this report focuses on responses from utilities industry participants (31), slightly more than half of the total sample of 61.

Analysis of the combined survey sample (energy and utilities) focuses on attributes of leading performers. See the next page for a high-level summary, and pages 18-21 for greater detail.

A capital project in this study is defined as a long-term investment to build or improve an asset. Capital projects in the utilities sector span generation and transmission and distribution networks (see Figure 4). In this survey, projects eligible for consideration involve operating assets costing at least $1 billion and taking more than one year to deliver.

This study was directed by the Accenture Innovation Center for Energy and Utilities (see back cover for more details). The center is guided by a steering committee of leading industry executives.

Figure 4. Scope of capital projects among utilities in sample.

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmission and distribution networks</td>
<td>74%</td>
</tr>
<tr>
<td>Generation – renewables</td>
<td>52%</td>
</tr>
<tr>
<td>Generation – conventional</td>
<td>39%</td>
</tr>
<tr>
<td>Generation – nuclear</td>
<td>26%</td>
</tr>
</tbody>
</table>

Base: All utilities respondents, n = 31.
Attributes of leading performers in capital project delivery

This study shows that a group in the sample significantly outperforms others in terms of meeting internal targets for cost, schedule, quality and delivery of reliable production capacity.

Accenture analysis indicates the leading group—which includes utilities as well as energy companies—is more likely to have the following attributes and capabilities:

• Significantly lower numbers of changes introduced during the construction phase

• Effective management of the transition from a capital project to an operating asset

• A highly developed culture of project delivery excellence

• Efficient and timely decision making

• An integrated project management methodology, including guidelines and tools

• Systematic use of key performance indicators (KPIs) to monitor the delivery of capital projects

• Increased access to performance data on projects
Overview of key findings and implications

The report includes three themes in the key findings section: challenges in effective delivery, top priorities identified by respondents, and ways in which leading performers excel. After the key findings section, Accenture discusses implications and provides recommendations.

Key findings
Major survey findings described in the report include:

- **Effective project delivery is “critical” to high performance**, as indicated by 84 percent of respondents.
- **Utility companies, however, are not meeting their own targets for project delivery.** Only 39 percent of utilities respondents have delivered to the approved budget for all projects, and 47 percent to the approved schedule for all projects.
- **Size and complexity of projects are growing,** with nearly two-thirds of respondents expecting that the portfolio size and complexity of projects will continue to increase in the next five years.
- **Delays and revisions are frequently caused by regulatory demands.** More than half of respondents cite regulatory requirements as the most common challenge to getting projects launched and also as the major cause of delays.
- **Value is lost due to lack of integration from planning through delivery.** Only half of the respondents report extensive involvement from operations in project design and delivery.
- **Talent tops the list of priorities to optimize capital project management.** Sixty-one percent of respondents mention access to talent as a major priority in the next three years.
- **Leading performers in capital project delivery exhibit a common set of attributes and capabilities.**

Implications and recommendations

**Comprehensive approaches are needed to cope with the increasing scale and complexity of capital projects.** Based on survey findings, Accenture offers recommendations for improved up-front planning, developing and retaining talent, and improving the transition from the construction phase to a producing asset.

**Comprehensive and rigorous up-front planning.** Also known as front-end loading, helps to reduce scope change. Utilities have been doing a great deal of up-front planning, but respondents recognize the need to improve. High-quality up-front planning includes improved:

- **Risk management.** Risks typically do not act independently but interact, which is why having extensive cross-functional input is crucial. Organizations need a rigorous approach to capture and assess risks, processes for monitoring risks and mitigating them, and for managing aggregated risks across the portfolio of investments.

- **Contributions from suppliers.** Rising asset-construction costs increase the pressure for operational excellence. Improved contracting strategies have become more relevant as an increasing number of utilities transition to an engineering, procurement, construction (EPC) model for project delivery. As part of this effort, better methods of supplier collaboration and data transfer need to be agreed upon in the planning phase.

- **Data and analytics.** Improved planning requires knowledge of what has happened before to avoid repeating past mistakes and to capture best practices. Data and analytics are needed to compare estimates on past projects, review variances and analyze causes.

**Developing and retaining talent** is especially difficult due to competing demand for project management talent from inside and outside the industry, for major projects in the oil, gas, mining, chemicals and other industries.

**Developing a talent strategy early on is essential, and there are multiple factors to consider, including leadership, talent and culture, and organizational structure.** A chronic shortage of talent is speeding the uptake of technologies that make the most of experienced, well-paid resources. Technology can be leveraged to improve design validation, construction and verification. In addition, knowledge management systems enable greater continuity, helping to bring new people up to speed faster.

**Improving the transition from the construction phase to a producing asset** requires maintaining an “operator’s mind-set” throughout the project life cycle—from planning and building to commissioning and start-up. Working closely with operations improves the likelihood of comprehensive and effective operational and maintenance programs existing at commissioning. Mastering configuration management ensures that the as-built asset matches the as-designed and licensed configuration. Integrated IT systems provide the operating asset with the data and information necessary to operate the asset at planned levels. Expertly managing the supply chain allows for the right spares and replacement parts to be available at commissioning. Behavioral change management programs help strengthen teamwork, particularly as more business partners and suppliers join together to execute and operate major projects.

A holistic, end-to-end approach is warranted to streamline the transition from construction to start-up. Capital projects need to be run as high-stakes businesses, with clear, targeted outcomes and metrics relevant to delivering high performance.
Key findings

This section is divided into three themes:

1. Challenges in effective delivery of capital projects
2. Top priorities in the next three years
3. Ways in which leading performers excel

The global survey included interviews with executives in utilities and energy companies. This report focuses on responses from utilities executives.
1. Challenges in effective delivery of capital projects

Effective delivery is “critical” to high performance ...

When asked about the importance of capital project delivery, 84 percent of utilities respondents indicated effective delivery is “critical” and belongs among the top three drivers for superior performance in the next five years (see Figure 5).

... but companies are not meeting their own targets for project delivery.

The majority of organizations surveyed are not consistently meeting their own delivery targets (see Figure 6). Only thirty nine percent of utilities respondents have delivered to the approved budget for all projects, and 47 percent to the approved schedule for all projects.

These difficulties in meeting targets can be traced to gaps in project delivery capabilities. More than a quarter of utilities (29 percent) report not having a well-developed culture of project delivery excellence. As well, fewer than a quarter (23 percent) of respondents say that major decision making in their companies is excellent, with the vast majority (77 percent) evaluating it as only medium.

Projects are growing in size and complexity.

The characteristics of today’s large projects have added new challenges to delivery.

The utilities industry is entering an era of complexity dominated by new and emerging technologies. The breadth of demands placed on capital project leadership is increasing due to demand for cleaner and renewable supplies of energy, greater regulatory scrutiny and focus on asset protection (i.e., plant and supply safety and security).
As a result, planning and risk assessment are more difficult. A greater range of actions is needed to align projects with organizational and business strategies throughout the project life cycle. Stakeholder engagement also becomes more difficult with increasing numbers of components, business partners and requirements.

**Regulatory demands and ineffective up-front planning stall project start-up and cause revisions.**

Fifty-four percent of respondents cite regulatory requirements as the most common challenge to getting projects launched (see Figure 7). Nineteen percent say access to financing and local joint venture partners is a challenge, while an additional 15 percent cite special-interest opposition.

As illustrated in Figure 8, a host of factors can lead to plan revisions. More than half of respondents (55 percent) said new or unconsidered regulatory requirements were a primary cause for changes to the project schedule, followed closely by insufficient detail during planning (48 percent), and original assumptions on the project schedule were proved incorrect or incomplete (45 percent).

The transition from project delivery to operating asset is when projects frequently fall short of expectations. Problems commonly arise due to operational information not being turned over, a lack of operational and maintenance programs being in place prior to commissioning, and because of design changes being made during construction. When problems such as these arise, significant time can be spent fixing things that do not work as designed.

**Figure 7. In which of the following areas do you most commonly have the greatest challenges in getting projects started?**

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regulatory requirements</td>
<td>54%</td>
</tr>
<tr>
<td>Access to financing/local joint venture partners</td>
<td>19%</td>
</tr>
<tr>
<td>Special-interest opposition</td>
<td>15%</td>
</tr>
<tr>
<td>Workforce/skills availability</td>
<td>12%</td>
</tr>
</tbody>
</table>

Base: All utilities respondents, n = 31.

**Figure 8. What drives/typically causes changes to the project schedule?**

<table>
<thead>
<tr>
<th>Change in the project schedule</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>New or unconsidered regulatory requirements</td>
<td>55%</td>
</tr>
<tr>
<td>Insufficient detail during the planning stage</td>
<td>48%</td>
</tr>
<tr>
<td>Original assumptions prove to be incorrect or incomplete</td>
<td>45%</td>
</tr>
<tr>
<td>Changes in asset scoping/specifications—design changes driven by new requirements</td>
<td>35%</td>
</tr>
<tr>
<td>Unforeseen contractor and supplier constraints</td>
<td>16%</td>
</tr>
<tr>
<td>Availability of resources/talent</td>
<td>16%</td>
</tr>
<tr>
<td>Poor controlling/management</td>
<td>16%</td>
</tr>
<tr>
<td>Changes to budget</td>
<td>6%</td>
</tr>
<tr>
<td>Changes in asset scoping/specifications driven by new technology</td>
<td>6%</td>
</tr>
<tr>
<td>Poor productivity</td>
<td>3%</td>
</tr>
</tbody>
</table>

Top three mentions

Base: All utilities respondents, n = 31.
From planning through delivery, projects lack integration.

Another common reason for missing delivery targets is the lack of integration of operations in project planning through to delivery. Embedding operations into the project improves the likelihood of designing and building an asset that can be operated efficiently but only 52 percent of the respondents extensively involve operations in project design and delivery (see Figure 9).

Another constraint on effective project delivery can be the quality of the IT systems that support areas such as data capture, reporting and workflow. Nearly three in 10 respondents (29 percent) consider IT capabilities to be poor at supporting project delivery (see Figure 10).

Regardless of where in the project life cycle failures or shortcomings occur, the consequences are much the same: Projects are delayed, plans and schedules have to be revised and re-benchmarked, and budgets need to be increased.

Figure 9. To what extent are members of operations involved during the capital project design and delivery phases?

Extensive – detailed operational requirement input is provided during project design, and as-required during delivery

Moderate – operational requirement input is provided; however, direction and priority setting is the responsibility of the project manager

Limited – little or no operational requirement input is provided

Base: All utilities respondents, n = 31.

Figure 10. What is the level of contribution of your IT capabilities on effective project delivery?

Poor (1-3) 29%
Average (4-7) 42%
Excellent (8-10) 29%

Mean: 5.5
Base: All utilities respondents, n = 31.
2. Top priorities in the next three years

Respondents were asked about their organizations’ top priorities in the next three years. As illustrated in Figure 11, the highest-ranking priorities among utilities respondents are ensuring availability of the right leaders and talent for project delivery (61 percent), improving front-end loaded planning and scheduling (52 percent), and improving contracting strategies (52 percent).

Struggling to find the right leaders and talent

Sixty-one percent of respondents cite availability of the right leaders and talent as their highest priority in the next three years. Companies in general are struggling to find enough people with “STEM” skills—advanced knowledge of science, technology, engineering and mathematics. An aging workforce makes the talent shortage even more critical for many utilities. Additionally, the long duration of projects (some capital programs can span decades) can result in significant turnover of people on projects, leading to new requirements for data and information management, knowledge transfer and leadership development.

Respondents indicate their organizations plan to address talent-shortage concerns through various measures (see Figure 12), including turnkey contracts to EPC partners (79 percent) and through tactical sourcing with staff augmentation partners (71 percent).

Figure 11. What are the top three priorities for your company to optimize capital project management in the next three years?

<table>
<thead>
<tr>
<th>Priority</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ensuring availability of the right leaders and talent for project delivery</td>
<td>61%</td>
</tr>
<tr>
<td>Improved front-end loaded planning and scheduling</td>
<td>52%</td>
</tr>
<tr>
<td>Improved contracting strategies</td>
<td>52%</td>
</tr>
<tr>
<td>Ensuring effective stakeholder engagement</td>
<td>35%</td>
</tr>
<tr>
<td>Safety management</td>
<td>35%</td>
</tr>
<tr>
<td>Implementing the correct organizational design</td>
<td>16%</td>
</tr>
<tr>
<td>Ensuring readiness for start-up/management of handover process from projects to operations</td>
<td>10%</td>
</tr>
<tr>
<td>Improved alignment to organization strategy</td>
<td>10%</td>
</tr>
<tr>
<td>More effective change management</td>
<td>10%</td>
</tr>
</tbody>
</table>

Base: All utilities respondents, n = 31.

Figure 12. Over the next five years, increasing scales of projects and a shortage of talent is expected to put a lot of pressure on capital project processes.

<table>
<thead>
<tr>
<th>Question</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is this area a cause of concern for your organization?</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>77%</td>
</tr>
<tr>
<td>No</td>
<td>23%</td>
</tr>
</tbody>
</table>

Base: All utilities respondents, n = 31.

If yes, how do you plan to address these concerns?

<table>
<thead>
<tr>
<th>Method</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turnkey contracts to EPC (engineering, procurement and construction) partners</td>
<td>79%</td>
</tr>
<tr>
<td>Tactical sourcing through staff augmentation partners</td>
<td>71%</td>
</tr>
<tr>
<td>Existing internal resources/organization can address these issues</td>
<td>50%</td>
</tr>
<tr>
<td>Building a shared service organization to address these issues</td>
<td>46%</td>
</tr>
</tbody>
</table>

Base: Utilities respondents who indicated that increasing scales of projects and shortage of talent is a concern.
The need to deliver to schedule

More than half of respondents (52 percent) indicate only an average performance in delivering on large projects to the original schedule. An additional 19 percent indicate poor performance (see Figure 13).

Greater value from contractors

As shown in Figure 14, more than two-thirds of companies interviewed (68 percent) think contractors add moderate value in project delivery. Contracting strategies become more important as companies look outside their organizations for talent to augment project teams and provide essential delivery services. Companies would like to find ways to increase the value provided by contractors and third-party suppliers. The industry trend of working with EPC firms reflects the survey finding.

Ensuring effective stakeholder engagement

Stakeholder engagement becomes more complex as project size and perceived risks increase. Respondents indicate approaches are in place to enable effective management of stakeholder requirements, yet nearly a quarter of respondents (23 percent) say governance structure poorly supports management of internal and external stakeholders (see Figure 15).

Safety management remains a priority

High risks and the scope of liabilities require companies to invest heavily in compliance and safety management. In fact, the vast majority of respondents incorporate safety (e.g., frequency of near misses, work days lost) in the key performance indicators used to monitor project delivery in the construction phase. Technology advances can enable more effective capture and analysis of these KPIs to increase visibility and improve management reporting.
Methodology for segmenting leading performers

Among the criteria used to identify leading performers were their abilities to deliver to cost and to schedule (both within 25 percent), and deliver reliable production capabilities as well as quality requirements.

The segmentation methodology awarded three points to companies meeting the above targets for all projects. One point was given for not meeting targets on all projects but for the majority of projects. Companies did not receive any points if they did not meet any targets or did not monitor the information.

The 25 percent to 35 percent of utility and energy companies with the highest aggregate score in their respective industries were considered leading companies.
3. Ways in which leading performers excel

Analysis of the survey data reveals a group outperforming the rest in meeting their project targets of cost, schedule, quality and delivery of reliable production capacity. Twenty-one companies were identified as leading in capital project delivery, roughly a third of all survey respondents.

Attributes of leading performers

No single attribute or capability sets leading performers apart from other organizations. The leaders excel in multiple capabilities across people, processes and technology. The group of leaders shares distinctive capabilities and demonstrates the following attributes:

- **Significantly fewer changes in the approved schedule.** The performance spread between leading and the rest of the sample is 42 percent.

- **Better management in the transition from capital project to the operating assets.** Leading performers (67 percent) outpace the rest of the sample (30 percent) by a large margin.

- **A well-developed culture of project delivery excellence.** Eighty-six percent of leading companies indicate having a well-developed project delivery culture, as compared to 70 percent in the rest of the sample.

- **Efficient and timely decision making.** A 15 percentage-point spread separates leading companies (48 percent) from the others (33 percent).

- **Systematic use of KPIs to monitor the delivery of capital projects.** The spread of KPI use between leading performers and the rest of the sample is illustrated in Figure 16.

- **An integrated project management methodology, including guidelines and tools.** Slightly more than half of leading companies (52 percent) have mature project management delivery (i.e., a single project management methodology with guidelines and tools), as compared to 33 percent of the rest of the sample.

- **Better access to performance data on projects.** The difference between leading performers and the rest of the sample is illustrated in Figure 17.
Figure 16. Indicate the types of KPIs used to monitor the delivery of capital projects.

<table>
<thead>
<tr>
<th>KPI Type</th>
<th>Leading Performers*</th>
<th>Rest of Sample*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety KPIs</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td>Delivery output KPIs</td>
<td>10%</td>
<td>2%</td>
</tr>
<tr>
<td>Portfolio KPIs</td>
<td>5% 24%</td>
<td>7% 30%</td>
</tr>
<tr>
<td>Process KPIs</td>
<td>5% 33%</td>
<td>25% 40%</td>
</tr>
<tr>
<td>Contractor and employee KPIs</td>
<td>48% 52%</td>
<td>5% 10%</td>
</tr>
<tr>
<td>External stakeholder KPIs</td>
<td>4% 29% 29% 38%</td>
<td>10% 50% 23% 17%</td>
</tr>
</tbody>
</table>

- **Never used**
- **Used for a minority of projects**
- **Used for the majority of projects**
- **Used for all projects**

Base: All respondents, n = 61 (leading performers, n = 21; rest of the sample, n = 40).

*Analysis based on total sample

Figure 17. How is your organization performing regarding the availability of performance data on projects?

<table>
<thead>
<tr>
<th>Performance Level</th>
<th>Range of Data Available</th>
<th>Quality/Accuracy of Data</th>
<th>Timely Availability of Data</th>
<th>Integrated/Consolidated Data Coming from Different Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leading Performers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Top/at level</td>
<td>47%</td>
<td>43%</td>
<td>38%</td>
<td>24%</td>
</tr>
<tr>
<td>No need for improvement</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td>47%</td>
<td>57%</td>
<td>52%</td>
<td>62%</td>
</tr>
<tr>
<td>Slight improvement required</td>
<td>6%</td>
<td></td>
<td>10%</td>
<td>14%</td>
</tr>
<tr>
<td>Low</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Significant improvement required</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rest of the Sample</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Top/at level</td>
<td>25%</td>
<td>32%</td>
<td>23%</td>
<td>25%</td>
</tr>
<tr>
<td>No need for improvement</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td>63%</td>
<td>58%</td>
<td>65%</td>
<td>48%</td>
</tr>
<tr>
<td>Slight improvement required</td>
<td>12%</td>
<td>10%</td>
<td>12%</td>
<td>27%</td>
</tr>
<tr>
<td>Low</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Significant improvement required</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Base: All respondents, n = 61 (leading performers, n = 21; rest of the sample, n = 40).

*Analysis based on total sample
Implications and recommendations

With a projected $16.9 trillion in investments anticipated worldwide for utilities projects through 2035, developing and sustaining project delivery excellence should prove to be a huge advantage.

Accenture analysis of survey responses shows that returns on capital projects are likely to be improved through:

1. **Comprehensive and rigorous up-front planning**, also known as front-end loading.

2. **Developing and retaining talent**, which will help leaders win the war for talent and improve the prospect of timely delivery.

3. **Improving the transition from the construction phase to a producing asset**—in effect, ensuring that all requirements for effective operation are available for handover at project completion to commissioning and start-up.

From start to finish on capital projects, shared knowledge and continuously updated data enable effective collaboration among business partners, suppliers and project teams.
1. Comprehensive and rigorous up-front planning

The survey results clearly indicate challenges in building a robust and stable plan against which utilities can deliver. Up-front planning, or front-end loading, is hardly a new concept. Project managers have been striving for years to reduce the risks of expensive changes during delivery.

Nearly two-thirds of survey respondents (65 percent) indicate the complexity and overall size of project portfolios will increase in the next five years, and 58 percent say the size of new projects will grow (see Figure 18). These trends are likely to escalate the pressure to improve front-end planning capabilities.

Due to the increasing complexity of projects, the scope of planning is necessarily wide-ranging. Obtaining finance is a challenge to many utilities companies (see Figure 19). Major projects in early stages of development may not see a return for 5 to 10 years, and it is necessary for financiers to have confidence that the project can be delivered to the plan.

Establishing a project vision, strategy and approach to stakeholder engagement is vital for success, particularly on multiyear projects. The approach should include all significant stakeholders, such as regulators, workforce, suppliers, local communities and financial backers, such as bond holders and partners.

Figure 18. How will the size of your new projects, as well as the size and complexity of your portfolio of projects, change in the next five years compared to the last five years?

<table>
<thead>
<tr>
<th>Will increase</th>
<th>Will remain the same</th>
<th>Will decrease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complexity of new projects</td>
<td>65%</td>
<td>29%</td>
</tr>
<tr>
<td>Overall size of project portfolio</td>
<td>65%</td>
<td>26%</td>
</tr>
<tr>
<td>Size of new projects</td>
<td>58%</td>
<td>29%</td>
</tr>
</tbody>
</table>

Base: All utilities respondents, n = 31.

Figure 19. How has securing financing of projects changed in the past two years?

<table>
<thead>
<tr>
<th>Increased</th>
<th>Remained the same</th>
<th>Decreased</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financing costs</td>
<td>61%</td>
<td>26%</td>
</tr>
<tr>
<td>Complexity of financing agreements</td>
<td>52%</td>
<td>45%</td>
</tr>
<tr>
<td>Number of co-investors on projects</td>
<td>26%</td>
<td>71%</td>
</tr>
<tr>
<td>Degree of leverage</td>
<td>10%</td>
<td>61%</td>
</tr>
</tbody>
</table>

Base: All utilities respondents, n = 31.
Some utilities companies are creating project or program management offices (PMOs), some of which evolve into their own businesses for the purposes of a dedicated focus on capital projects. Building standard processes on leading practices increases the chance of repeating successes across the portfolio.

In front-end loading, Accenture analysis of the survey findings shows that areas needing greater attention are risk management, supplier collaboration, and data and analytics for improved decision making.

**Risk management and project delays**

The complexity of large projects necessitates a rigorous approach for capturing and assessing risks, as well as robust processes for monitoring risks and ensuring mitigating actions are undertaken. Risks typically do not act independently but interact with each other, which is why having extensive cross-functional input is crucial in up-front planning. To understand corporate exposure, risks need to be managed and aggregated both at the project and the portfolio levels.

A broad cross-section of key business and project representatives needs to participate in envisioning “what-if” scenarios to anticipate risks and the likelihood of adverse events, and to quantify the ramifications. The scope needs to be broad, incorporating ways an adverse event might affect other risks, such as operational, regulatory, counterparty credit and stakeholder risks.

Risk registers are standard for documenting risks, but they can fail to adequately map interactions among risks. Comprehensive risk maps, using an approach such as system dynamics to show possible interactions, can help people see how unwanted events impact each other. This type of approach also provides excellent input for defining metrics to monitor risks.

For example, the impacts of counterparty credit risks are well-known. A contractor might run out of money or go bankrupt, causing the project to slow down or halt depending on the contractor’s role. Mapping this risk to areas such as the delay caused by regulatory approval of new contractors can inform a business about the development of the most appropriate contracting strategy.

An era of heightened corporate responsibility and environmental awareness can put pressure on governments to tighten regulations at short notice. The regulatory risks are increasing worldwide—particularly after the March 2011 nuclear incident in Fukushima, Japan—with mandates for additional safety and contingency planning.

Projects involve a greater number of stakeholders than a decade or two ago, making stakeholder engagement critical early on and throughout the project. Governance of capital projects becomes increasingly difficult with a high number of business partners and interactions. A shared approach to risk management across parties improves communications and decision making during the project.

**Front-end loading recommendations**

- Perform an up-front diagnostic to help determine whether risk management capability meets requirements given the level of complexity and scale of forthcoming projects.
- Spend more time up front with a cross-functional group to anticipate the broad range of risk categorizations, and discuss how they have the potential to affect each other across the project and portfolio.
- Develop collaborative relationships with suppliers to reduce risks and spur greater efficiency through technology tools and continuous data exchange.
- Define data needs up front, and use analytics to supply hard data for better decision making.
- Plan to avoid the complex and time-consuming challenge of data migration from projects to operations. Design systems that can record the correct information at the start, and be easily shared with and transitioned to people operating the asset.
Enhancing collaboration and contributions from suppliers

The rising cost of construction increases the pressure for operational excellence, calling for improved collaboration and productivity. Role definition and accountability are vital and should be established at the front end. Utilities and their contractors need to be aware of how risks will affect each other.

Contracting strategies become more important as companies look outside their organizations for talent to augment teams and provide delivery services.

Improved contracting strategies have become more relevant as an increasing number of utilities transition to an EPC project-delivery model, especially for large and complex projects. A number of EPC firms are reluctant to accept fixed-price contracts, thereby complicating this strategy. Establishing win-win relationships benefiting all parties tends to build long-term cooperation, which is vital for projects with multiyear horizons. Utilities also need to review availability and quality issues with Tier 2 suppliers.

Utilities can demand increased innovation in cost and quality from project partners, but this demand has to be reciprocated with mutual benefits. Looking outside the industry yields innovative approaches. For example, in the automobile industry, the degree of supplier innovation is high due to long-term relationships between major car manufacturers and networks of suppliers. In many cases, the suppliers’ revenue models are linked to the contributions they make to the long-term profitability of the vehicle.

While this model could not be transferred directly to an entire power-plant project, adaptation of components might help improve project effectiveness, reduce risk and boost performance post-commissioning. Technology tools, for example, can improve supplier collaboration with online design reviews and approvals, and, rather than having large event turnovers, electronic data can be exchanged on a continuous basis. Problem identification and resolution programs across the supplier ecosystem can be used to target problematic issues, leading to root cause analysis and implementation of corrective action.

Some EPC vendors have developed new technologies and have made substantial investments in capital projects. With smart grid investments, for example, vendors are becoming more strategic in developing projects with utilities. Greater collaboration can result in suppliers co-designing project modules. This trend, however, is being driven largely from the provider side, with less impetus from utilities.

Project teams need to spend time up front discussing information requirements and data design, considering handoffs throughout the length of the project. A broad framework with a greater range of KPIs is needed to monitor progress from start to finish. An effective KPI framework needs to be both status-oriented (e.g., cost, schedule, completion status) and prospective (e.g., trends, leading indicators).

Project teams can consider establishing KPIs to monitor performance in stakeholder and supplier relations and governance, as well as defining, monitoring and measuring success. KPIs also need to be linked to the risk management system, so project leaders can interpret interaction among risks and overall risk of the project at any time during construction.

Improving data and use of analytics for up-front planning

At the least, improved planning requires knowledge of what has previously happened to avoid repeating past mistakes and capture good practices. This speaks to the need for a data repository related to capital project planning and management.

Data and analytics are needed to compare estimates on past projects, review variances and analyze causes. An understanding of past issues, backed by solid data rather than hunches, enables better up-front planning and estimates.
High quality, experienced talent for capital project delivery is scarce and varies. Talent required for capital project delivery can take many forms including talent sourced through the EPC, talent needed to manage and deliver the project, and talent required for future operations. Consequently, while a project might be ready to begin, critical positions—from the overall program manager to the tactical estimator—might still be open, delaying project commencement and increasing costs.

Due to the highly competitive labor market, companies are poaching talent and managers, who are moving more frequently for higher pay. There is competition for capital project talent from many other industries such as mining, chemicals and energy. These challenges come at a time when many utilities are grappling with the risks of an aging workforce and difficulties in attracting talent to the rest of the business.

High employee turnover amplifies the need to transfer knowledge to new people while trying to keep projects on schedule. More than four in 10 companies surveyed, however, do not have specific processes in place to support knowledge capture and dissemination.

Achieving high performance in the coming years will mean large and diverse groups of people need to be recruited, mobilized and managed. Accenture believes developing a talent strategy early on is essential, and there are multiple elements to consider, including leadership, talent and culture, and organizational structure.

Creating career tracks and nurturing project leaders

Given the importance of project delivery to company performance, lacking an effective talent strategy—particularly in the leadership area—is risky. Career paths and leader training programs are needed to ensure that senior personnel have the appropriate blend of project management, technical and operations experience. Utilities companies stand to gain by identifying leadership candidates, nurturing them and exposing them to complexity at the right times to help them become strong leaders.

Companies are also facing the challenge of building cultures across a diverse team composed of both internal and external workers. Just as safety has become part of the DNA of utilities, talent retention and project delivery excellence can be built into company culture—but it will take years of work. The industry as a whole needs to find ways to attract and retain engineers, as well as project managers and skilled laborers. Some initiatives, such as vocational, university and intern programs, are under way but more are needed.

Due to high turnover, knowledge management systems are essential. Formal processes need to be implemented, rather than continuing to rely on the internal knowledge of people who are nearing retirement age. Assumptions and variances on estimates, for example, need to be well documented and stored, along with lessons learned from past projects. Knowledge management systems help people more rapidly understand the extent of identified problems, and draw links between the sources of operational issues to design.

A comprehensive system for performance management, including defining relevant KPIs and monitoring, helps to promote desired behaviors and provide appropriate rewards.

Workforce availability is by far the biggest problem highlighted by survey participants, yet organizations tend to lack KPIs for project talent. Companies can add indicators for attracting talent (time to fill internal positions, number of candidates with skills to match), engaging talent (engagement scores from employee surveys, uptake of internal training courses), retaining talent (average time at company, employee turnover and reasons for attrition), and managing talent (including those related to the contract basis, the role of owner/operator, and partnership with other parties (e.g., IT, procurement and sourcing)). In terms of developing future leaders, companies can also gauge progress by monitoring KPIs for individual performers.

By identifying targets and monitoring progress, KPIs enable organizations to improve focus, extract greater value from limited resources and build talent for future projects.

Emerging IT tools, including next-generation portals, bring project teams closer together, enabling collaboration, knowledge management and learning. Well-designed communications promote change management, and in-person and virtual channels also help team members raise concerns that have ripple effects on other functions throughout the project and on operations.

Utilities also need to provide paths in and out of capital projects to the core business to make project work appealing to larger numbers of people.
Improving organizational structure to maximize talent

Making the most of scarce talent also calls for smart organizational design. Utilities should consider improving cross-functional coordination and centralizing functions for improved quality and productivity.

It is important to break down functional and communication barriers that block progress. Simple and effective information flows can support collaboration, problem-solving and effective decision making among various functions and partners.

Central skill pools, particularly in large organizations, can be used to leverage scarce talent and improve quality. Centers of excellence and program management offices (PMOs) can manage multiple projects from a single location and extend leading practices throughout a widely dispersed company. In addition, low-value-added activities can be taken out of certain jobs and sourced from a service provider, thereby enabling a scarce resource to focus on higher-value tasks.

Organizations are finding that centralizing core skills or activities supports the efficiencies they need to meet their growth targets. Centralizing supply chain and materials management functions can also improve the handover of inventory and documentation (including specifications, instructions and certificates) from project teams to operations.

Talent recommendations

• Develop a talent strategy during front-end loading.

• Improve systems to capture and share knowledge, particularly in light of high turnover.

• Nurture promising leaders, and promote a culture of project delivery excellence.

• Create appealing career tracks for managers of capital projects.

• Provide technology tools to improve the productivity of human resources and to share leading practices.

• Use a performance management system to provide rewards to encourage retention.

• Develop organizational structure to maximize the effectiveness of scarce talent.
Labor shortages drive automation and analytics

Talent shortages are speeding the uptake of technologies that make the most of experienced, well-paid resources.

**Automated solutions and analytics**

Innovations with fairly simple tool sets and logic can alleviate chronic talent gaps. In an example from the mining industry, a company that found itself short of geologists at remote locations developed automated systems that detected varying grades of uranium loaded onto trucks and routed the trucks accordingly. This approach lessened the need for geologists to constantly assess the ore body by ensuring that only higher grade ore was processed.

**Decision support**

As this report’s key findings show, respondents believe decision making in their companies is inefficient. This problem can arise due to insufficient front-end loading, a fragmented project team structure, or a lack of decision-support tools. These tools leverage the expertise of a relatively small number of experienced people, enabling their knowledge to be used on multiple projects. For example, if a craftsman at a construction site needs to replace a pipe or has a question about a work practice, a decision-support tool can guide him or her through the approved process, ensuring that only workers with approved skills undertake the work. Decision-support tools and automation also can help maintain safety and quality standards.

**Planning and scheduling solutions**

These solutions help project managers know where and when specialized welders or electrical contractors need to be positioned. In a similar vein of making the best use of highly skilled resources, utilities can collaborate with contractors to find ways to leverage scarce talent across projects.
3. Improving the transition from the construction phase to a producing asset

The pressures to complete projects on schedule can sometimes result in insufficient time to fully consider the effect on operations, particularly when there have been design changes. This can impact the readiness of maintenance programs, documentation handover, the adequacy of spare and replacement parts, and understanding of the design and license basis of the plant.

Consequently, the transition phase is especially important for improved capital projects delivery. As the key findings demonstrate, leading performers surpass average performers by nearly 40 percentage points when it comes to effectively managing the transition from capital projects to operating assets. Leaders also possess significantly lower numbers of changes introduced in the construction phase, which is crucial because changes need to be fully rationalized against the design and license basis.

**Work more closely with operations**

The survey results show that only half of the utilities (52 percent) extensively involve operations in project design and delivery (see Figure 9).

The earlier and more consistently that operations is involved, the better chance of building assets that can be operated as planned. Operations people need to be involved in determining which assets and what kinds of skills will be needed. In addition, operations people need the latest information on the asset under construction, rather than the original plan, which might be outdated.

**Improve configuration management**

Configuration management is the process of ensuring consistency across three areas: the as-built physical plant, the design and license basis, and the drawings, documents and procedures that describe the plant. Any change in design, construction or operations must be reconciled across these three areas.

Configuration management continues to be a huge challenge in the utilities industry, especially during construction. Managing changes to the design is a complex task and is required for handover to operations.

The original designs for components may change well before a project is completed and transitioned to operations. Any changes need to be logged, with information properly structured. Data should be captured and verified at the first point during the build process and not left to be captured by the operations team as part of the start-up process.

With increasing regulation, high-quality configuration management becomes even more essential. Inadequacy undermines quality, increases costs and delays commissioning of new assets. It is necessary to prove compliance to regulators as designs change.

As new assets are constructed, there are opportunities to leverage configuration management tools and methods that have been highly refined in the aerospace and defense industries, where companies have undertaken huge, highly complex projects. Among companies that are leaders in configuration management, the practice covers all aspects of the build: design, materials and labor, as well as future operations and maintenance requirements, documentation and plans. Additional leading practices include thorough integration into overall project-delivery processes, technology support for workflow and data requirements, and, when feasible, unified systems across all parties.

Historically, utilities have worked on systems using two-dimensional approaches. EPC firms, however, are increasingly using 3-D tools for conceptual and detailed design. Data integration has become a large, complex issue. Bridging the gap requires clear planning and identifying which 3-D capabilities will be transitioned to operations. The process also requires defining an interoperability model to be used across the design, construction, commissioning and operations phases.

Analytics can be useful for impact assessments in regard to change management. Seemingly minor changes that one group undertakes on its own might be done with the best intentions, but can have a huge impact on the delivery of complex projects. To avoid rework and delays, organizations need to assess, approve and communicate changes to relevant parties before proceeding with changes.
Integrate IT as a means of delivering improved capital project performance

Most organizations surveyed realize they could gain with improved IT for project delivery. Only 29 percent consider their IT capabilities for project delivery to be "excellent," while 29 percent rate them as "poor," with the remainder falling in the middle ground (see Figure 10).

Ideally, many of the IT systems used during the build are subsequently used for operations. In the past, there has been too much handoff in systems. Data needs to be captured at the first point by the most appropriate person, updated and shared in forms that work for project teams as well as operations people. An end-to-end approach avoids unnecessary data migration headaches and speeds delivery of assets.

In terms of streamlining regulatory compliance, systems need to store all relevant data during the project life cycle to speed commissioning of a new asset. IT systems can help avert project delays, reduce costs and support effective project delivery. Rather than having to go back and retest construction details, relevant data can be captured live and stored, with an audit trail to record changes to data.

Transition recommendations

- Leading performers favor an integrated/unified project methodology, have better availability of performance data and experience fewer project revisions.
- Involving operations people builds in the "human factor" and helps increase the likelihood of delivering productive assets.
- Configuration management, which takes a life-cycle perspective, can streamline the complex transition to operations.
- Analytics can be used for managing change by keeping multiple parties apprised of changes and their impact on the overall project, thus enabling the team to work together more effectively to keep the project on target.
- Well-integrated IT systems provide reliable data to drive the project and help people make informed decisions.
Managing major projects for high performance

Comprehensive approaches are required to cope with the increasing scale and complexity of capital projects. This report, Developing Strategies for the Effective Delivery of Capital Projects: Accenture global survey of the utilities industry, demonstrates myriad challenges utilities companies face in delivering major projects.

The traditional planning and management focus needs to be broadened well beyond aspects of engineering and procurement. Utilities projects call for increased focus on human capital strategy, stakeholder and supplier relations, governance, and defining measuring and monitoring success. These are business issues with a wider scope than what many people think of as capital project management.

The findings of this global survey show the availability of the right leaders, talent and contractors is among the top priorities for successful project delivery. The utilities industry will need to work diligently to develop talent, increase the labor pool and build skills in project leadership, construction and managing assets.

A holistic, end-to-end approach is warranted to streamline the transition from construction to production. Continuous innovation throughout the project life cycle will be critical to deliver improved returns from large capital projects. Capital projects need to be run as high-stakes businesses with targeted objectives, clear delivery strategies and metrics relevant to delivering high performance.

Conclusion
References

1 Figures in this report are in US dollars unless otherwise noted.


3 “Where Will All the STEM Talent Come From?” Accenture 2012.


Contacts

Matias Alonso
Managing director, Utilities
Accenture
matias.alonso@accenture.com

Miguel Zweig
Managing director, Chemicals and Natural Resources Capital Projects Lead
Accenture
miguel.d.zweig@accenture.com

Daniel Krueger
Managing director, Power Generation
Accenture
daniel.p.krueger@accenture.com

Terry Maxey
Executive director, Utilities
Accenture
terry.m.maxey@accenture.com

Research team

Antony Brania
Jonathan Burton
José R. Gómez Herrera
Miguel Gonzalez-Torreira
Keith Kowal
Cristina Matisz
Charlotte Raut
Carmen Uys

About the Innovation Center for Energy and Utilities

The Accenture Innovation Center for Energy and Utilities is a research entity focused on facilitating industry dialogue and thought leadership development across key industry areas—policy and sustainability, customer influence, technology, innovation, capital, talent and resources.

www.accenture.com/innovation-center

About Accenture Research

Accenture Research is Accenture’s global organization devoted to economic and strategic studies. The staff consists of 160 experts in economics, sociology and survey research from Accenture’s principal offices in America, Europe and Asia/Pacific.

About Accenture

Accenture is a global management consulting, technology services and outsourcing company, with more than 246,000 people serving clients in more than 120 countries. Combining unparalleled experience, comprehensive capabilities across all industries and business functions, and extensive research on the world’s most successful companies, Accenture collaborates with clients to help them become high-performance businesses and governments. The company generated net revenues of US$25.5 billion for the fiscal year ended Aug. 31, 2011. Its home page is www.accenture.com.