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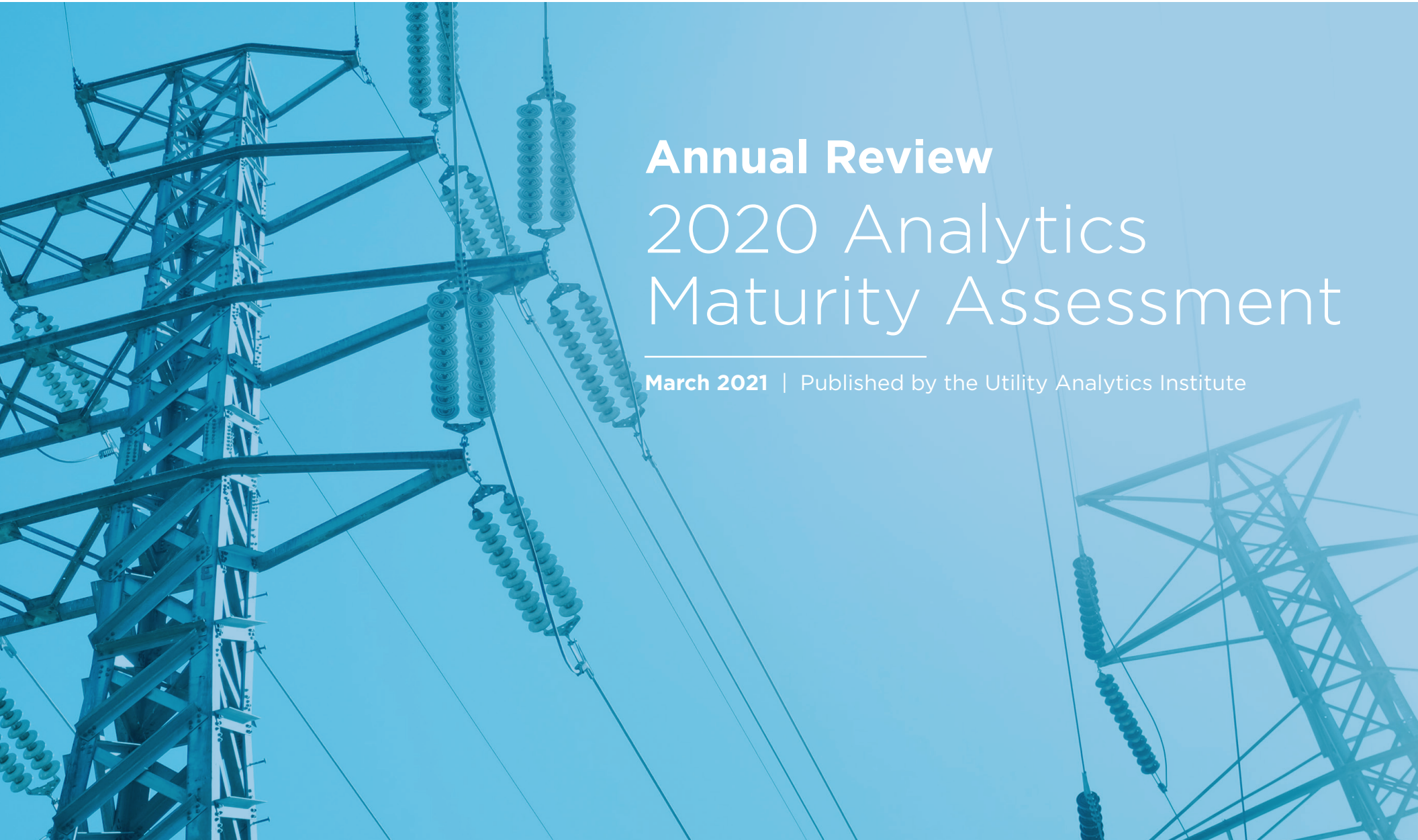

Annual Review

2020 Analytics Maturity Assessment

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Table of Contents

Strategy 5

People 8

Analytics Governance 11

Data Governance 13

Business Process Integration 15

Analytics Capabilities 17

Technology & Tools 18

Appendix 21

Overview

With a foundation of basic analytics, some utilities have started to pursue more advanced applications while others estimate they may take five years to do so.

Although utilities continue to move along the analytics maturity curve, the latest Analytics Maturity Assessment (AMA) shows they still have work to do. If grades were given for this self-assessment, the top-scoring utility would have earned a B- overall, with a total score of 6,091 out of 7,000 points (87%). In contrast, the lowest score was 1,670 (24%).

However, even the lowest-scoring utility is making inroads when it comes to data analytics. Its highest number of points came from the strategy dimension of the assessment, and the utility currently is defining analytics-specific job roles and responsibilities. Three years from now, it expects to be developing models to optimize business processes and decisions.

Utilities are overcoming some of the challenges of foundational analytics, allowing them to focus on more advanced applications. Many of them currently are developing or implementing strategies and plans in key areas of analytics to continue their advancement along the maturity curve.

Methodology

The Executive Advisory Council (EAC) of the Utility Analytics Institute (UAI) worked with UAI staff to develop and conduct the AMA for member utilities. This 2020 report is the third update to the original, and 34 UAI member utilities participated in the assessment. Data gathering occurred between 2Q 2019 and 1Q 2020, over a span of approximately 11 months.

The AMA is a self-assessment tool developed by the EAC. UAI completes an annual review of respondents' scores, catalogued during each calendar year. The design of the AMA survey relied heavily on input from UAI EAC members, UAI staff, and secondary research into analytics and maturity assessment methodologies.

Participating utilities assessed themselves across UAI's seven dimensions of analytics maturity:

1. Strategy
2. People
3. Analytics Governance
4. Data Governance
5. Business Process Integration
6. Analytics Capabilities
7. Technology and Tools

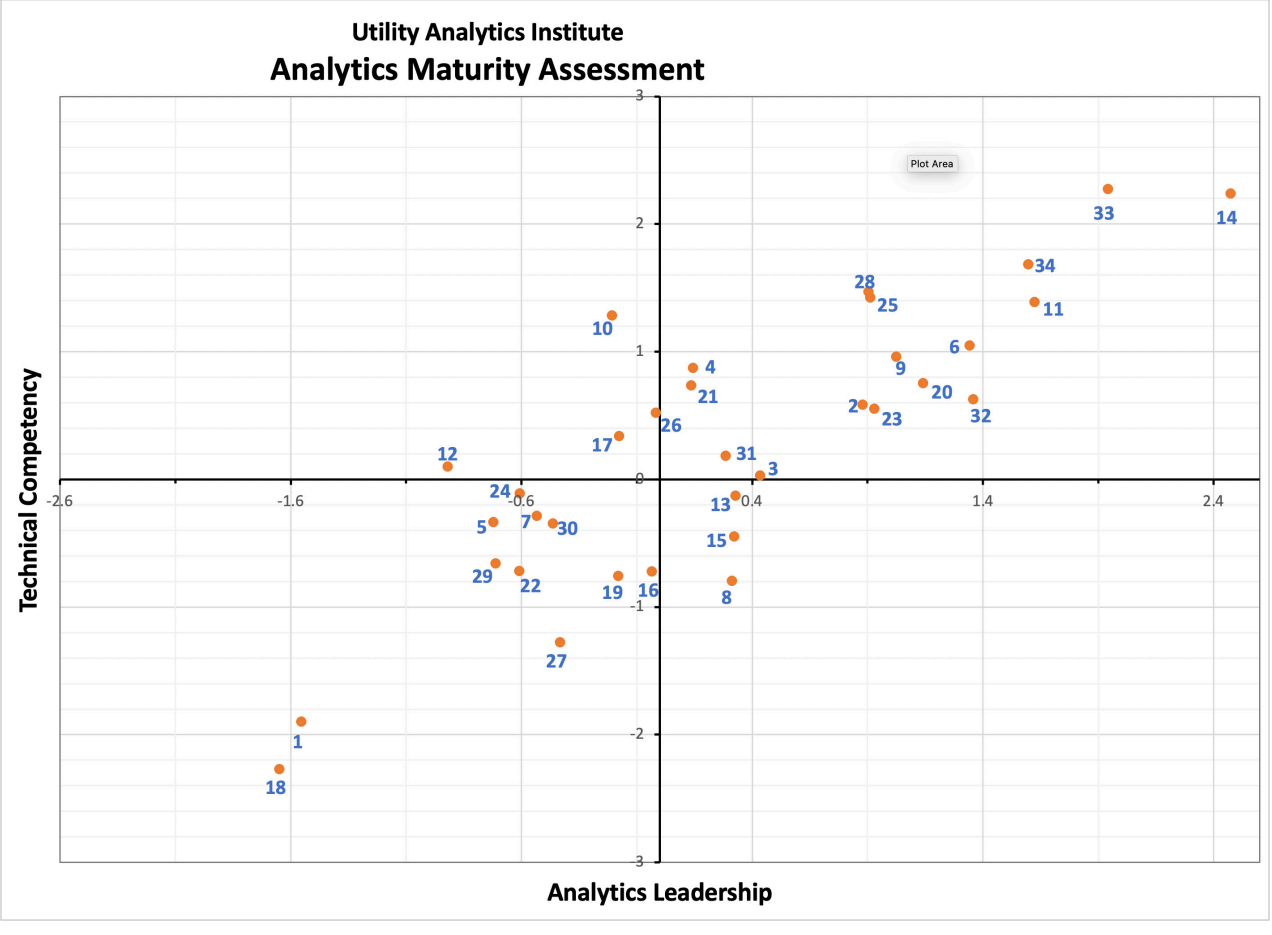
Overview

Scoring

Each dimension was valued at 1,000 points, resulting in a maximum total score of 7,000. A set of questions were developed for each dimension, primarily consisting of multiple-choice answers. A scoring model allocated points to each question. The points assigned to each question were distributed across the response options.

A four-quadrant model (Figure 1 – AMA Z-scores) depicts the AMA scores of participating utilities across two domains: the analytics leadership domain and the technical competency domain. The composite analytics leadership score is based on scores from the strategy, people, analytics governance and business process integration dimensions. The composite technical competency score is based on scores from the data governance, analytics capabilities and technology and tools dimensions.

FIGURE 1 – AMA Z-SCORES



Overview

This self-assessment enables each participating utility to compare its current level of analytics maturity — across each of the seven dimensions and overall — with other UAI member utilities participating in the AMA.

As with any self-assessment, the results reflect the judgment and opinions of the individuals completing the assessment. In some instances, respondents may have relied on incomplete or inaccurate information when answering a question, and some respondents are likely harder graders than others.

Confidentiality

All survey information is confidential and will be shared only with the explicit permission of each utility's EAC representative(s) on a case-by-case basis. All other shared information will be aggregated, and the identity of individual utilities will remain anonymous.

Results Overview and Commentary

Each section within this report examines the survey results for each of the seven analytics maturity dimensions measured.

The average score and range of scores for each dimension are provided along with the survey results for key questions within the dimension. A summary of respondents' comments (paraphrased when needed) also is included for each question.

Now, let's review how the participating utilities rate themselves when it comes to their level of analytics maturity in 2020.

Strategy

The degree to which utilities have defined, developed and implemented an enterprise analytics strategy varies broadly. Scores from this dimension averaged 456, ranging from a high of 933 to a low of 67. More than half of the utilities (53%) currently are developing an enterprise-wide analytics strategy. In comparison, only 9% of utilities responded that they already have a robust strategy in place.

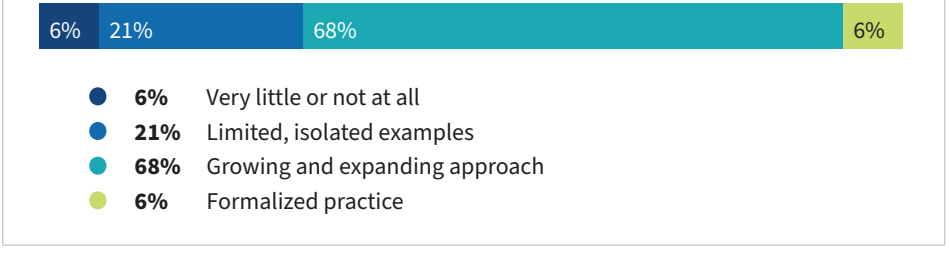
Notably, only one of these utilities — a large investor-owned utility (IOU) — said it developed and implemented a robust strategy over five years ago. This large IOU further explained it has "very good people and talent, a good vision that is supported at the enterprise level and a systematic approach to achieving [its] strategic objectives."

A well-defined strategy is a critical enabler for developing and nurturing a mature enterprise-wide analytics function, as reflected by the relationship between the strategy score and those from the other dimensions. For example, respondents in the top half of all strategy scores performed 26% better in the analytics capabilities dimension, 35% better in the people dimension and 43% better in the business process integration dimension than those with strategy scores in the bottom half. It also is noteworthy that top-scoring utilities in the strategy dimension have an overall average AMA score that is 43% higher than their peers.

To what degree does your utility treat, manage and value data as a strategic corporate asset?

More and more utilities are working toward developing a formalized practice for how they treat, manage and value data. In fact, 68% indicated they are growing and expanding their approach to data as a strategic asset. This is up from 40% in the 2018 AMA report. However, the number of utilities that have a formalized practice in place remains minimal in 2020 at only 6% of respondents.

TO WHAT DEGREE DOES YOUR UTILITY TREAT, MANAGE AND VALUE DATA AS A STRATEGIC CORPORATE ASSET?



Comments:

- **Utility #5 –** We use SAP as an asset management repository; however, it is leveraged inconsistently.
- **Utility #11 –** We have assigned data stewards and data sponsors as well as a data classification operation.
- **Utility #23 –** We have invested in a big-data analytics platform. Although in its infancy, our data strategy is definitely moving forward.

To what degree has your utility developed/ defined an enterprise-wide data and analytics strategy?

Many of the utilities (79%) are actively planning or developing an enterprise-wide strategy. However, only 9% have a robust strategy while, on the other end of the spectrum, 12% said nothing exists at their utility on this front.

TO WHAT DEGREE HAS YOUR UTILITY DEVELOPED/DEFINED AN ENTERPRISE-WIDE DATA AND ANALYTICS STRATEGY?

- **12%** Does not exist
- **26%** In the planning phases
- **53%** Development underway
- **9%** Robust enterprise-wide data and analytics strategy developed

Comments:

- **Utility #2 –** Our development efforts are 2 years old as of June 1, 2020.
- **Utility #11 –** We have had a robust strategy since 2014.
- **Utility #24 –** We are in the early stages of modernizing our data and analytics platform. This is in scope for 2020.

To what degree has your utility implemented an enterprise-wide data and analytics strategy?

Developing and defining an enterprise-wide data and analytics strategy can be quite challenging for organizations. Implementing the strategy can be even more difficult. Of the three utilities that have developed a robust strategy, all of them indicated they are well underway with implementation. This small group of utilities has not only focused on defining the strategic drivers, putting resources in place and determining the impact of data and analytics on their organization but also has invested time in fostering alignment and adoption across their enterprise.

TO WHAT DEGREE HAS YOUR UTILITY IMPLEMENTED AN ENTERPRISE-WIDE DATA AND ANALYTICS STRATEGY?

- **0%** Have not yet developed implementation plan
- **0%** Implementation in the early stages
- **100%** Implementation well underway
- **0%** Full strategy implemented

Comments:

- **Utility #14 –** Our remaining component is understanding how to consolidate implementation across the enterprise versus our operating companies.

What are the top three drivers of your analytics initiatives?

Not surprisingly, 47% of the utilities selected internal cost drivers and increases in data as two of their top three drivers of analytics initiatives. These responses align with the traditional utility challenges of managing operating costs while supporting growing demand. The utilities aim to use analytics to reduce costs and improve performance.

Although diversification of earnings and disruption are emerging themes in the utility industry, less than one-fourth (24%) of the utilities cited increasing revenue streams or developing new ones as a top three driver of their analytics initiatives.

WHAT ARE THE TOP THREE DRIVERS OF YOUR ANALYTICS INITIATIVES?

Internal cost drivers	76%
Increase existing revenue streams	12%
Develop new revenue streams	12%
Regulatory drivers	26%
Environmental drivers	9%
Population and/or demographic changes	18%
Increase in data	62%
Part of corporate strategy	56%
Other	21%
N/A	3%

Comments:

- **Utility #14 –** Digital transformation would be our fourth top driver.
- **Utility #18 –** There is no firm commitment to analytics at this time.
- **Utility #24 –** C-level now recognizes the importance and need for quality data and analytics to reduce risk.
- **Utility #26 –** Part of the corporate strategy involves the need to stay relevant with respect to disruptive new technologies (like distributed energy resources). We've had a great increase in AMA data, which has triggered growth in our analytics infrastructure and objectives.

People

To cultivate a culture of data and analytics, the people in an organization are a critical success factor. Participants in this study considered culture and organizational structure, decision-making protocols and the availability of resources as the most important components in building a data and analytics program.

The people dimension had an average score of 831, ranging from 319 to 1,294. Still, the utilities see an opportunity to enhance the skill sets of their employees' analytics capabilities, with half reporting the skill levels at their utility as fair and somewhat lacking (47%) or poor and severely lacking (3%).

"Our biggest challenge is that the culture does not support building a more robust analytics group," explained one large utility that delivers both gas and electricity to more than 1 million customers.

Who is responsible for your analytics organization?

Nearly half of the utilities (48%) identified their structure as a combination of IT and decentralized leadership. In comparison, 31% said they have a purely centralized and consolidated group who is responsible for their analytics organization.

WHO IS RESPONSIBLE FOR YOUR ANALYTICS ORGANIZATION?

Centralized leadership (e.g., Chief Analytics Officer, VP Analytics, Director of analytics, etc.)	31%
IT Management	14%
Decentralized leadership (e.g., Director of Customer Analytics)	0%
Combination of IT and decentralized leadership	48%
Combination of centralized and decentralized leadership	3%
Other	3%

Comments:

- **Utility #14 –** We have a formalized vice president and chief analytics officer role.
- **Utility #24 –** The analytics platform, tools and consulting are centralized.

To what degree does your utility have a defined process for identifying necessary roles for each analytics project (e.g., solution architects, data librarian, project management, etc.)?

More than 40% of the utilities indicated they have no formal process in place to identify the necessary roles for each analytics project. Of those, 35% also have some form of decentralized ownership of analytics. As a result, there could be inherent challenges in getting alignment on which resources are needed and what their specific roles and responsibilities should be.

Alternatively, 24% of the utilities have an enterprise process in place or are currently defining one to determine project roles.

TO WHAT DEGREE DOES YOUR UTILITY HAVE A DEFINED PROCESS FOR IDENTIFYING NECESSARY ROLES FOR EACH ANALYTICS PROJECT (E.G. SOLUTION ARCHITECTS, DATA LIBRARIAN, PROJECT MANAGEMENT, ETC.)?

- **41%** No formal process
- **35%** Determined at the departmental level
- **15%** Enterprise process to determine project roles in development
- **9%** Enterprise process used to determine project roles in place

How would you characterize the skill level of your utility's analytics staff/team?

Enhancing the skill level of analytics staff members is an area of major opportunity, with only one utility in the entire study describing its team as experts. Also, only three respondents specifically called out current or future continuous training and development efforts.

HOW WOULD YOU CHARACTERIZE THE SKILL LEVEL OF YOUR UTILITY'S ANALYTICS STAFF/TEAM?

- **3%** Poor/Severely lacking
- **47%** Fair/Somewhat lacking
- **38%** Good/Appropriate
- **9%** Very good/Advanced
- **3%** Excellent/Expert

Comments:

- **Utility #2 –** We have a few quality data experts, but most users are novices.
- **Utility #29 –** Within certain analytic groups, individuals are pursuing degrees to increase competencies.
- **Utility #19 –** We can always learn more.
- **Utility #23 –** We are learning how to architect and manage the analytics platform.
- **Utility #24 –** Modernizing skills aligned to the data platform is a 2020 goal.
- **Utility #32 –** Skill levels vary as we have some very strong data scientists, while others are just starting with analytics through dashboard reporting via Power BI.

How would you characterize your utility's strategy with regards to developing/enhancing the skill sets of its analytics professionals?

More than half (53%) of the utilities are currently developing a strategy to enhance the skills and capabilities of their analytics employees. Another 27% indicated they have a strategy or plan in place but are facing challenges on this front. One such challenge is training, according to a large electric IOU. Although it offers a combination of computer-based and vendor-led training, this utility indicated it still has not been enough for its analytics staff "to really learn and grow [their] data science skill set."

Alternatively, 18% of the utilities do not have a strategy or plan for upskilling their analytics professionals. On the opposite end of the spectrum, only one utility said it has successfully executed a development plan or strategy.

HOW WOULD YOU CHARACTERIZE YOUR UTILITY'S STRATEGY WITH REGARDS TO DEVELOPING/ENHANCING THE SKILLSETS OF ITS ANALYTICS PROFESSIONALS?

- **18%** No strategy, no plan to develop
- **53%** Strategy in development
- **26%** Strategy/plan in place, but challenges remain
- **3%** Strategy/plan successfully executed

Analytics Governance

The degree to which utilities can manage and document their analytics processes, procedures and information is wide-ranging. Scores ranged from a low of 12 — the lowest score in the entire study — to a high of 901. One determining factor in the quality of a utility's analytics governance practices is the structure and size of the organization.

About 44% of the utilities fall below the 530-point average score for analytics governance. Of those utilities, 53% are large utilities with more than 1 million customers. These utilities all have some form of a decentralized enterprise model or no model at all, suggesting that having a more extensive customer base (with even more data) and many owners can complicate establishing a stable analytics governance structure.

Does your organization have a designated analytics governance program?

Utilities still in the process of planning their analytics governance approach make up 47% of the responses. Another 35% are further along, stating they are in the process of implementation. Only four of the respondents do not currently have an analytics governance structure in place, nor is there a plan to develop one. Two utilities have implemented a governance structure for analytics.

DOES YOUR ORGANIZATION HAVE A DESIGNATED ANALYTICS GOVERNANCE PROGRAM?

- **12%** Not in place, no plan to develop
- **47%** In process of planning
- **35%** In process of implementing
- **6%** Implemented

Comments:

- **Utility #11 –** Various groups are in different stages of planning and implementation.

Please rank your utility's analytics governance program's ability.

Utilities are primarily in the infancy stages of working toward and developing adequate capabilities and characteristics in their analytics governance programs. More than two-thirds (71%) of the respondents are focused on working toward ensuring the right resources are available. Logically, acquiring and utilizing analytics resources is a key enabler for all other capabilities, especially as 41% of the utilities also are working toward ensuring investments in analytics deliver a measurable return and business impact. As a natural progression of having the right resources and being focused on value, 56% are striving to make data readily available to those resources responsible for building analytics models.

PLEASE RANK YOUR UTILITY'S ANALYTICS GOVERNANCE PROGRAM'S ABILITY TO DO THE FOLLOWING:

(1 = Not applying resources at this time; 2 = Working towards developing capability/ characteristic; 3 = Current capability/characteristic - needs improvement; 4 = Currently capability/characteristic - doing well)

Question	1	2	3	4
Ensure that good long-term decisions about analytics are reached	18%	50%	26%	6%
Ensure that investments in analytics generate business value.	15%	41%	26%	18%
Measure and evaluate the performance of analytics models	29%	38%	21%	12%
Ensure that there is accountability, transparency, and traceability with regard to analytics resources	24%	41%	32%	3%
Ensure that data, derived data and analytics products are protected and managed in a secure and compliant fashion.	12%	38%	38%	12%
Ensure availability of adequate analytics resources	9%	71%	21%	0%
Ensure that data is readily available to those building analytics models.	9%	56%	29%	6%
Provide access to model features to users for the development of new models via a feature store	44%	41%	15%	0%
Ensure that analytics models can be deployed into production for use.	9%	44%	41%	6%

Overall, utilities have not reached their desired maturity in most of these areas:

- Ensuring good long-term decisions about analytics are reached
- Ensuring investments in analytics generate business value
- Measuring and evaluating the performance of analytics models
- Ensuring there is accountability, transparency and traceability with regard to analytics resources
- Ensuring data, derived data and analytics products are protected and managed in a secure and compliant fashion
- Ensuring availability of adequate analytics resources
- Ensuring data is readily available to those building analytics models
- Providing users access to model features for the development of new models through a feature store
- Ensuring analytics models can be deployed into production for use.

The area that shows the most promise in terms of maturity today is that of ensuring investments in analytics generate business value. About 18% of respondents said they excel in this area.

Data Governance

Organizations continually seek ways to manage their data across the entire enterprise. Among the top concerns, utilities today must develop an approach to user-level access for analytics professionals and business users, establish security protocols, and ensure data is consistent and reliable as it flows across systems.

The data governance dimension examines overall management of the availability, usability, integrity and security of data used in an enterprise, including metadata management. Ranging from scores of 150 to 853, data governance ranked in the lower half of all dimensions in the assessment with an average score of 451.

Only 9% of the respondents have fully implemented an overall enterprise program for data governance. Most of the remaining utilities are either developing an enterprise-wide program or have a limited program in place today.

Does your utility currently have a data governance program that manages at least one of the following: availability, usability, integrity and security of data?

About 77% of utilities are on the cusp of implementing a data governance program. Five utilities have no formal program in place.

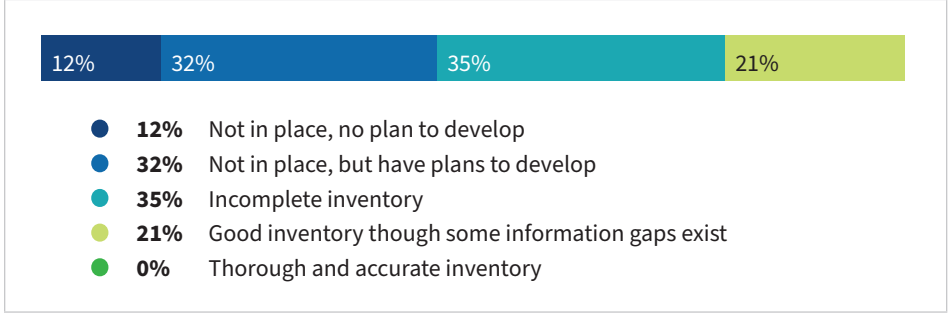
Comments:

- **Utility #23 –** Software has been purchased, and rules will be established as source data is added to a data lake.

Does your utility have an inventory of all data sources and data quality, data integration, and data analytics tools?

While 56% of utilities have some form of inventory in place, they are still navigating challenges with an incomplete account of all data (35%) and gaps in information (21%).

DOES YOUR UTILITY HAVE AN INVENTORY OF ALL DATA SOURCES AND DATA QUALITY/DATA INTEGRATION/DATA ANALYTICS TOOLS?



Comments:

- **Utility #33 –** Critical systems, as determined by the business, have been inventoried.

For each of the 10 major components of data management identified by the Data Management Association's (DAMA) Data Management Body of Knowledge (DAMA-DMBOK), please indicate the status of your utility's efforts at the enterprise level.

In DAMA-DMBOK, data governance is identified as the core component of data management, tying together nine other components: data architecture management, data development, data operations management, data security management, reference and master data management, data warehousing and business intelligence management, document and content management, metadata management and data quality management.

About 62% of utilities have existing database operations management capabilities in place and 59% have some form of enterprise-wide data security management.

Within two years, 61% of utilities indicated they will establish capabilities in data architecture management and 58% will put capabilities in place for metadata management.

Ultimately, utilities have prioritized components of data governance over others, based on their specific business needs. Still, developing an overall data governance capability is challenging, with 50% of respondents estimating they are still three to five years away from doing this at an enterprise level.

FOR EACH OF THE FOLLOWING TEN MAJOR COMPONENTS OF DATA MANAGEMENT IDENTIFIED BY THE DATA MANAGEMENT ASSOCIATION'S (DAMA) DATA MANAGEMENT BODY OF KNOWLEDGE (DAMA-DMBOK) PLEASE INDICATE THE STATUS OF YOUR UTILITY'S EFFORTS AT THE ENTERPRISE LEVEL:

Question	Enterprise-wide capabilities not planned	Enterprise-wide capabilities expected within 5 years	Enterprise-wide capabilities expected within 1-2 years	Enterprise-wide capabilities in place now
Overall Data Governance	3%	50%	35%	12%
Data architecture management	3%	21%	62%	15%
Data quality management	12%	35%	53%	0%
Meta data management	15%	21%	59%	6%
Document & content management	9%	26%	35%	29%
Data warehousing & BI management	0%	15%	41%	44%
Reference & master data management	12%	35%	47%	6%
Data security management	0%	9%	32%	59%
Database operations management	0%	6%	32%	62%
Data development	18%	9%	47%	26%

Business Process Integration

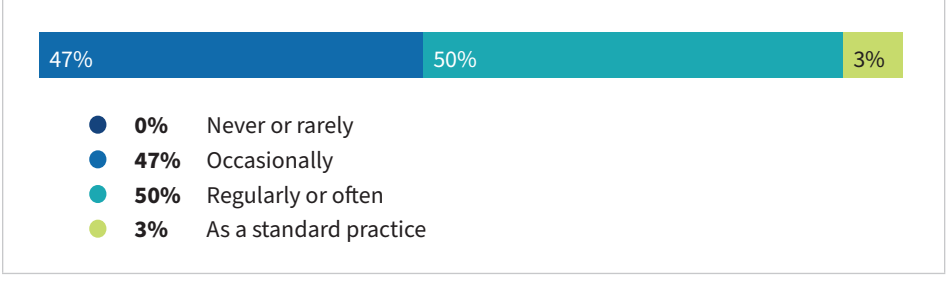
The ability to integrate and use analytics to influence how a utility operates and makes decisions is a reliable litmus test for how much value an analytics program contributes to the business. Respondents in the business process integration dimension had an average score of 457, ranging from 111 to 741.

The integration of analytics into business intelligence models mainly is dependent on availability, accessibility and processes that govern its use. Accordingly, utilities that scored in the top half of the business process integration dimension had a 10% higher score in analytics governance. Utilities that are more adept at the incorporation of analytics also are better positioned to leverage more advanced applications in the analytics maturity curve, such as predictive modeling and process optimization.

How often does your utility use data and analytics to drive its business processes?

Only one utility in the study reported using analytics to drive its processes as a standard practice. The remaining utilities are split almost evenly along the lines of regularly or often using analytics (50%) and occasionally using analytics (47%) to drive processes.

HOW OFTEN DOES YOUR UTILITY USE DATA AND ANALYTICS TO DRIVE ITS BUSINESS PROCESSES?



To what degree do data and analytics inform the development and measurement of relevant business process KPIs for the following groups?

The utilities said key performance indicators (KPIs) are greatly informative for finance (71%) and forecasting/market operations (62%), foundational elements in an organization's ability to serve its base and manage operational costs as well as returns on infrastructure and investments. In addition, 62% of the utilities indicated IT is somewhat informed by analytics.

On the other hand, nearly one-fourth of the utilities indicated data and analytics are not used to inform the development and measurement of business process KPIs for their legal/regulatory function.

TO WHAT DEGREE DO DATA AND ANALYTICS INFORM THE DEVELOPMENT AND MEASUREMENT OF RELEVANT BUSINESS PROCESS KPIS FOR THE FOLLOWING GROUPS?

Question	Don't at all inform	Somewhat inform	Greatly inform	Completely inform
Customer operations	3%	47%	50%	0%
Operations/workforce	6%	47%	47%	0%
Construction/supply chain	12%	56%	32%	0%
Legal/Regulatory	24%	59%	18%	0%
Finance	0%	26%	71%	3%
IT	3%	62%	32%	3%
Infrastructure/Engineering	0%	59%	41%	0%
Forecasting/market operations	3%	29%	62%	6%
Corporate (HR, safety, security, etc.)	6%	65%	26%	3%

Comments:

- **Utility #29 –** It can be difficult to assess this across a large organization.

Please indicate the access level to data and analytics tools by business users and process owners at your utility.

Most utilities in this study believe users who need data and analytics to inform critical business decisions do not have the access they need. Half of the utilities believe access is somewhat limited and inconsistent, while another 15% believe access is highly limited and inconsistent.

ACCESS TO DATA AND ANALYTICS TOOLS BY BUSINESS USERS AND PROCESS OWNERS IS:

- **15%** Highly limited and inconsistent
- **50%** Somewhat limited and inconsistent
- **29%** Generally adequate, but challenges exist
- **6%** Sufficient all or most of the time, with little to no challenges with quality or timeliness

Comments:

- **Utility #9 –** We have a well-managed tool kit, but access to data can still be a challenge.
- **Utility #32 –** Power BI is available to all, but more robust tools and apps are limited.

Analytics Capabilities

The average score for the degree to which different functions within utilities can apply basic to advanced analytics is 580, ranging from 278 to 778.

Of the utilities with multiservice portfolios (62%), they average 13% less in the analytics capabilities dimension than utilities that provide a single service or commodity. Single-service utilities not only have higher analytics capabilities but also average 14% higher in the business process integration dimension. Ultimately, as some utilities expand their products and services portfolio and grow their customer bases, they are investing in maturing their ability to successfully capture data and apply analytics to their business initiatives.

One respondent, a small municipal utility with less than 100,000 customers, said, "The demand for intelligent dashboards and analytics is mostly driven by the growth of their customer base and the impact on power purchasing—and, most recently, the optimization of customer operations, such as payments and billing."

In comparison, a large IOU that serves more than 1 million customers believes the only justification for investing in a robust analytics capability would be "to produce cost savings, since analytics is viewed as a cost-prohibitive function."

Most respondents indicated their utilities have capabilities in foundational skills, such as gathering and managing data, the adoption of analytics, basic reporting, and even business intelligence and dashboards. This trend was constant across business units, including customer operations, operations/workforce, construction/supply chain, legal/regulatory, finance, IT, infrastructure, engineering, forecasting/market operations, corporate (including HR, safety, security).

In contrast, when looking at more advanced skills, like statistical analysis and advanced modeling (predictive and prescriptive), the results were almost evenly split on the far ends of the spectrum. Most utilities either have no current plans to implement such capabilities or they plan to do so within three years.

Technology & Tools

By nature, utilities have an abundance of experience at identifying and managing systems and processes that enable the delivery of their core operations. Over time, they have implemented complex systems that transport and deliver critical energy services through extensive infrastructure to millions of customers each year. However, when it comes to analytics maturity, one opportunity for growth is the ability to develop data and analytics architecture and procure the appropriate tools to manage, share and implement collected information from their operations into the rest of their business. Utilities are confident in their technology selection process, use of the technologies and use satisfaction.

Technology and tools was the highest-scoring dimension in the study, ranging from a score of 190 to 907. The average score was 592.

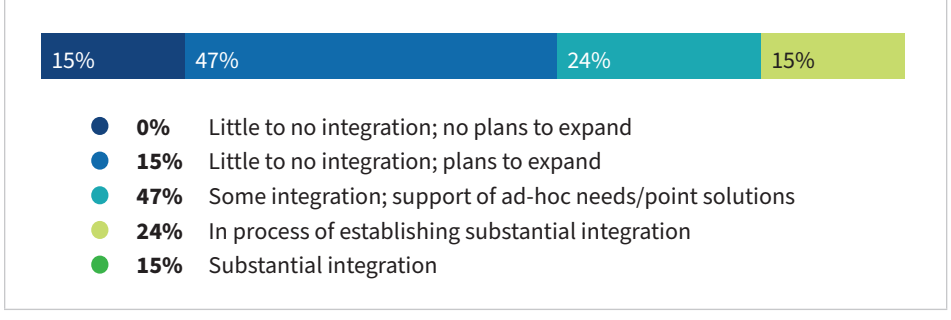
A small municipal utility based in the South believes "many of their challenges and disruptions to executing an overall analytical program were due to changes in technology or hardware, which has taught [them] that [they] cannot wait on the perfect setup."

Utilities that better manage and implement analytics architecture and technologies perform slightly better in the overall AMA study and have a higher level of technical competency. Utilities scoring in the top half of the technology and tools dimension have a 16% higher AMA score and a 96% higher technical competency capability on average than their peers. Not surprisingly, they also score 25% higher in analytics capabilities than those in the lower half of the technology and tools dimension.

To what extent is your utility integrating information from disparate sources across organizational and/or system silos?

47% of respondents said their organizations have had some form of integration with information from disparate sources across silos but are mostly supporting requests from other groups on an as-needed basis, in the form of descriptive analytics. Only 15% of the utilities reported having substantial integration across their data sources and systems.

TO WHAT EXTENT IS YOUR UTILITY INTEGRATING INFORMATION FROM DISPARATE SOURCES AND/OR ACROSS ORGANIZATIONAL AND/OR SYSTEM SILOS?



How would you rate your utility's analytics technologies and tool set?

Utilities are focusing their efforts and resources on enhancing their technologies, with 65% stating they are in the process of transitioning toward a more robust tool set. Only 12% of the utilities already have a robust analytics tool set in place.

HOW WOULD YOU RATE YOUR UTILITY'S ANALYTICS TECHNOLOGIES & TOOLSET?

- **0%** No analytics specific toolsets exist (e.g. reliant on tools such as Excel, Access, and Vendor Applications)
- **24%** Baseline tools for data management and modeling (e.g. Tableau, BI Power Tools, etc.)
- **65%** In the process of moving toward a robust toolset (e.g. enterprise analytics platform, data lake, etc.)
- **12%** Robust analytics toolset in place

Indicate what best describes your utility's approach to evaluation and selection of analytics technologies and tools.

Nearly one-fourth (24%) of the respondents indicated their organizations have consistent and effective practices in evaluating and selecting tools across their enterprise. An additional 35% believe their approach is somewhat consistent and credible but has not been scaled across the organization yet.

YOUR UTILITY'S APPROACH TO EVALUATION AND SELECTION OF ANALYTICS TECHNOLOGIES AND TOOLS IS BEST DESCRIBED AS:

- **15%** Inconsistent, one-off
- **26%** Some efforts to standardize
- **35%** Somewhat consistent and credible though not enterprise-wide approach
- **24%** Enterprise-wide, consistent and effective

DEMOGRAPHICS

WHAT TYPE OF UTILITY DO YOU WORK FOR?

IOU	65%
Municipal utility	21%
Cooperatively owned utility	3%
Other (please specify)	12%

WHAT SERVICES DOES YOUR UTILITY OFFER? (SELECT ALL THAT APPLY.)

Gas	50%
Electric	94%
Water	24%
Broadband	6%
Other (please specify)	18%

WHAT ELECTRIC SERVICES DOES YOUR UTILITY OFFER? (SELECT ALL THAT APPLY.)

Generation/abstraction	81%
Transmission	81%
Distribution	91%
Retail provider	66%
Other (please specify)	6%

HOW MANY CUSTOMERS DOES YOUR UTILITY SERVE?

Fewer than 10,000	6%
10,000 to 99,999	9%
100,000 to 999,999	26%
1 million or more	59%

WHICH REGION(S) DOES YOUR UTILITY SERVE?

US - New England (CT, MA, ME, NH, RI, VT)	12%
US - Middle Atlantic (NJ, NY, PA)	12%
US - East No. Central (IL, IN, MI, OH, WI)	29%
US - West No. Central (IA, KS, MN, MO, ND, NE, SD)	15%
US - South Atlantic (DC, DE, FL, GA, MD, NC, SC, VA, WV)	26%
US - East So. Central (AL, KY, MS, TN)	15%
US - West So. Central (AR, LA, OK, TX)	12%
US - Mountain (AZ, CO, ID, MT, NM, NV, UT, WY)	15%
US - Pacific (AK, CA, HI, OR, WA)	21%
Canada	12%
Mexico	0.00%
Other	0.00%

Appendix

Q7 - TO WHAT DEGREE DOES YOUR UTILITY TREAT, MANAGE AND VALUE DATA AS A STRATEGIC CORPORATE ASSET?

- **6%** Very little or not at all
- **21%** Limited, isolated examples
- **68%** Growing and expanding approach
- **6%** Formalized practice

Comments:

- Starting to create DG processes
- Formalized for several years now
- We have assigned data stewards and data sponsors as well as a data classification operation.
- Moving towards Growing and Expanding approach
- SAP is used as asset management repository; however, inconsistently leveraged

Q8 - TO WHAT DEGREE HAS YOUR UTILITY DEVELOPED/DEFINED AN ENTERPRISE-WIDE DATA AND ANALYTICS STRATEGY?

- **12%** Does not exist
- **26%** In the planning phases
- **53%** Development underway
- **9%** Robust enterprise-wide data and analytics strategy developed

Comments:

- In the early stages of modernizing our data and analytics platform - in scope for 2020

Q9 - TO WHAT DEGREE HAS YOUR UTILITY IMPLEMENTED AN ENTERPRISE-WIDE DATA AND ANALYTICS STRATEGY?

- **0%** Have not yet developed implementation plan
- **0%** Implementation in the early stages
- **100%** Implementation well underway
- **0%** Full strategy implemented

Comments:

- Remaining component is the enterprise vs. operating companies (e.g., centralized, decentralized, or hybrid)

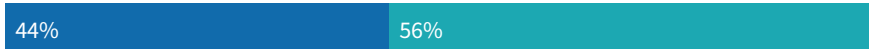
Q10 - TO WHAT DEGREE IS YOUR ANALYTICS STRATEGY ALIGNED WITH THE OVERALL VISION AND MISSION OF THE ORGANIZATION?

- **7%** Little to no linkage exists
- **67%** Linkage exists though inconsistent or indirect
- **27%** Substantial, direct and consistent linkage

Comments:

- Specific digital strategy to align digital transformation and analytics with the overall enterprise strategy has been completed and approved

Q11 - DOES YOUR STRATEGY IDENTIFY LONG-TERM ANALYTICS DIRECTIONS AND GOALS?



- **44%** Little to no linkage exists
- **56%** Linkage exists though inconsistent or indirect

Comments:

- In the early stages of modernizing our data platform for 2020
- Although there are a few sections in our strategic plan
- Direction for analytics inside utility is clear; long-term goals are not specified
- Specifically with respect to use of smart metering data
- Skills and Development are Long Term Goals but many projects are still short-term
- Long-term goals are still developing

Q12 - WHAT ARE THE TOP THREE DRIVERS OF YOUR ANALYTICS INITIATIVES?

Internal cost drivers	76%
Increase existing revenue streams	12%
Develop new revenue streams	12%
Regulatory drivers	26%
Environmental drivers	9%
Population and/or demographic changes	18%
Increase in data	62%
Part of corporate strategy	56%
Other	21%
N/A	3%

Other:

- Need to improve data driven decision making
- Asset Optimization
- Customer Engagement
- Customer Engagement
- Customer Enablement
- Customer expectations
- Becoming a Data-Driven Organization

Comments:

- Part of the corporate strategy involves the need to stay relevant with respect to disruptive new technologies (DER). We've had a great increase in AMI data which has triggered growth in our analytics infrastructure and objectives
- C-Level now recognizes the importance and need for quality data and analytics to reduce risk
- No firm commitment to analytics at this time
- Digital transformation would be my fourth

Q13 - DO YOU HAVE AN ENTERPRISE ANALYTICS ORGANIZATIONAL MODEL?

- **15%** No, no immediate plans to develop
- **41%** No, but in planning stages
- **26%** Yes, in implementation stage
- **18%** Yes, in place

Comments:

- Individual business units may have analytics org models
- Still determining future role of corp vs. OpCos, but in place today
- We did have one, but it has evolved into a more decentralized community of practice
- Expected to grow

Q14 - YOUR ORGANIZATION'S CURRENT OR PROPOSED MODEL IS BEST DEFINED AS:

- **21%** Centralized (centralized organization; consulting model)
- **10%** De-centralized (no common organizational structure across groups)
- **55%** Federated (decentralized with common enterprise procedures and/or infrastructure)
- **14%** Other

Other:

- Federated without common procedures
- Central analytics organization with several business-unit specific analytics organizations
- Both centralized and decentralized
- Hybrid with COE

Comments:

- We have a small centralized group for advanced analytics, but has not been utilized very often. Each unit also conduct analytics by themselves with no common organizational structures
- Currently Centralized but the proposed is Federated
- Hub and spoke model. Self-service analytics. Centralized data platform

Q15 - WHO IS RESPONSIBLE FOR YOUR ANALYTICS ORGANIZATION?

Centralized leadership (e.g., Chief Analytics Officer, VP Analytics, Director of analytics, etc.)	31%
IT Management	14%
Decentralized leadership (e.g., Director of Customer Analytics)	0%
Combination of IT and decentralized leadership	48%
Combination of centralized and decentralized leadership	3%
Other	3%

Comments:

- Centralized for Platform and Tools and consulting
- VP & Chief Analytics Officer is formal role

Q16 - TO WHAT DEGREE DOES YOUR UTILITY HAVE A DEFINED PROCESS FOR IDENTIFYING NECESSARY ROLES FOR EACH ANALYTICS PROJECT (E.G. SOLUTION ARCHITECTS, DATA LIBRARIAN, PROJECT MANAGEMENT, ETC.)?

- **41%** No formal process
- **35%** Determined at the departmental level
- **15%** Enterprise process to determine project roles in development
- **9%** Enterprise process used to determine project roles in place

Comments:

- Role of business translator still underway
- Rigor is applied on project roles on a case-by-case basis

Q17 - TO WHAT DEGREE DO YOUR UTILITY'S ANALYTICS INITIATIVES OBTAIN EXECUTIVE SPONSORSHIP?

- **6%** Rarely or not at all
- **38%** Occasionally
- **35%** Frequently
- **21%** Always or almost always

Comments:

- Larger initiatives get approval, but not all initiatives are sponsored/done
- There is some latitude to experiment and try things out but for larger efforts, sponsorship is required

Q18 - TO WHAT DEGREE DO YOUR UTILITY'S ANALYTICS INITIATIVES SECURE ORGANIZATIONAL BUY-IN?

- **9%** Rarely to not at all
- **29%** Occasionally
- **53%** Frequently
- **9%** Always or almost always

Q19 - HOW WOULD YOU CHARACTERIZE THE NUMBER OF ANALYTICS PROFESSIONALS EMPLOYED BY YOUR UTILITY?

- **21%** Far too few/Severely understaffed
- **74%** Too few/Somewhat understaffed
- **6%** Just right/Appropriately staffed
- **0%** Too many/Somewhat overstaffed
- **0%** Far too many/Severely overstaffed

Comments:

- Trending to where the business recognizes the need to increase data literacy
- Opportunities exist to re-allocate resources to higher value analytical work

Q20 - HOW WOULD YOU CHARACTERIZE THE SKILL LEVEL OF YOUR UTILITY'S ANALYTICS STAFF/TEAM?

- **3%** Poor/Severely lacking
- **47%** Fair/Somewhat lacking
- **38%** Good/Appropriate
- **9%** Very good/Advanced
- **3%** Excellent/Expert

Comments:

- Within certain analytics groups individuals are pursuing degrees to increase competencies
- Modernizing skills aligned to the Data Platform is a 2020 goal
- We are learning how to architect and manage the analytics platform
- Can always learn more
- Spotty. Some areas good, others not
- Skill level varies - some very strong data scientists, others just starting with analytics through dashboard reporting through Power BI, etc.
- We have some quality data experts, but most users are novices

Q21 - WHAT IS THE PROCESS OF ACQUIRING ANALYTICS TALENT (SELECT ALL THAT APPLY)?

Internally acquired and developed	85%
Externally acquired and developed	76%
Outsourcing (e.g., consultants, vendor resources)	79%
Academic partnership	47%
Other	6%

Other:

- Projects with EPRI and NREL
- Internships

Comments:

- All of the above with shift overtime to less consultants. Academic serves as pipeline
- Not much structured development happening yet

Q22 - HAVE ANALYTICS-SPECIFIC JOB ROLES & RESPONSIBILITIES BEEN DEFINED AT YOUR UTILITY?

- **0%** No, no plans to define
- **29%** No, but in the process of developing/defining
- **56%** Yes, but not at a comprehensive level
- **15%** Yes, defined across enterprise

Comments:

- A few defined but not for the district as a whole.
- IT roles defined for Data Modeler, ETL Developer, Report Developer. In business most resources are Business Analysts

Q23 - HOW WOULD YOU CHARACTERIZE YOUR UTILITY'S STRATEGY WITH REGARDS TO DEVELOPING/ENHANCING THE SKILLSETS OF ITS ANALYTICS PROFESSIONALS?

- **18%** No strategy, no plan to develop
- **53%** Strategy in development
- **26%** Strategy/plan in place, but challenges remain
- **3%** Strategy/plan successfully executed

Comments:

- Recognized cross-industry analytics academy
- Combination of CBT and vendor led training. Not enough to really learn and grow in Data Science skillset.

Q24#1 - TO WHAT DEGREE DOES YOUR ORGANIZATION'S CULTURE VALUE DATA-DRIVEN AND ANALYTICS-BASED DECISION MAKING WITHIN THE FOLLOWING FUNCTIONAL AREAS? - VALUED BY EMPLOYEES (1=NOT AT ALL, 2=SOMEWHAT, 3=MODERATELY, 4=EXTREMELY)

Question	1	2	3	4
Customer Operations	3%	29%	56%	12%
Operations/workforce	6%	53%	32%	9%
Construction/supply chain	15%	50%	29%	6%
Legal/Regulatory	26%	44%	26%	3%
Finance/Accounting	6%	26%	38%	29%
IT	3%	41%	29%	26%
Corporate (HR, Safety, Security, etc.)	15%	44%	32%	9%
Forecasting/market operations	3%	21%	35%	41%
Infrastructure/Engineering	6%	44%	32%	18%

Q24#2 - TO WHAT DEGREE DOES YOUR ORGANIZATION'S CULTURE VALUE DATA-DRIVEN AND ANALYTICS-BASED DECISION MAKING WITHIN THE FOLLOWING FUNCTIONAL AREAS? - VALUED BY EXECUTIVES (1=NOT AT ALL, 2=SOMEWHAT, 3=MODERATELY, 4=EXTREMELY)

Question	1	2	3	4
Customer Operations	9%	18%	41%	41%
Operations/workforce	3%	21%	59%	18%
Construction/supply chain	6%	29%	50%	15%
Legal/Regulatory	18%	50%	29%	3%
Finance/Accounting	3%	26%	35%	35%
IT	6%	15%	44%	35%
Corporate (HR, Safety, Security, etc.)	6%	26%	53%	15%
Forecasting/market operations	3%	21%	21%	56%
Infrastructure/Engineering	0%	24%	59%	18%

Q25 - HOW DOES YOUR ORGANIZATION PRIMARILY USE DATA? (CHECK ALL THAT APPLY)

Build reports	100%
Create lists	85%
Create dashboards	94%
Establish and/or inform KPIs	82%
Develop models to summarize data	91%
Develop models to understand historical trends	94%
Develop predictive models to influence processes/decisions	59%
Develop models to optimize business processes/decisions	44%
Other	3%

Other:

- Automation

Comments:

- Different BUs have different levels of modeling
- All aspects with heavy focus on advanced analytics, ML, and AI
- Less people using it to build models, etc. but many, many use it for reports, KPIs etc.
- These at varying level of maturity. For example, we have few models in use.
- Some predictive modeling in a few business units

Q26 - HOW DO YOU EXPECT YOUR UTILITY WILL USE ITS ANALYTICS DATA 3 YEARS FROM NOW? (CHECK ALL THAT APPLY)

Build reports	97%
Create lists	85%
Create dashboards	100%
Establish and/or inform KPIs	100%
Develop models to summarize data	100%
Develop models to understand historical trends	100%
Develop predictive models to influence processes/decisions	97%
Develop models to optimize business processes/decisions	91%
Other:	12%

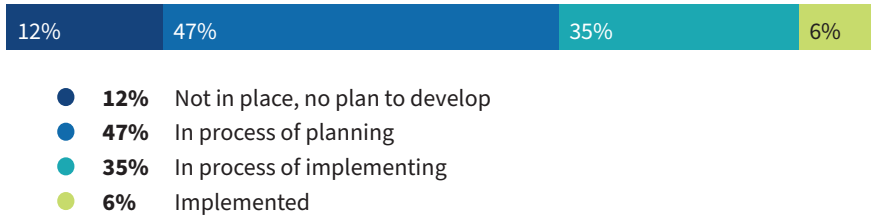
Other:

- AI
- Automation
- Prescriptive/Cognitive
- More Predictive and Cognitive

Comments:

- Progressing sophistication - ideally just part of the way we talk
- Want to use it more predictively and to help with business strategy and decision making
- At a more mature level throughout

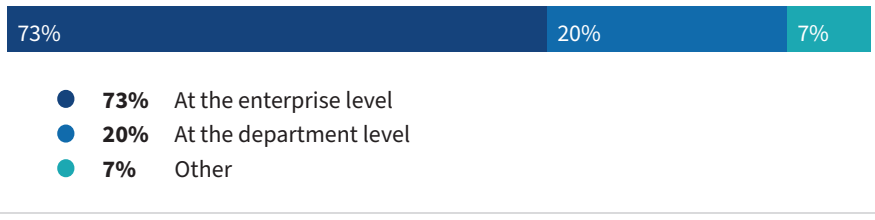
Q27 - DOES YOUR ORGANIZATION HAVE A DESIGNATED ANALYTICS GOVERNANCE PROGRAM?



Comments:

- Various groups are in different stages of planning and implementation

Q28 - IS YOUR ANALYTICS GOVERNANCE PROGRAM IMPLEMENTED OR INTENDED TO BE IMPLEMENTED?



Other:

- Data lake is governed, rest at Dept level
- Both

Comments:

- Intended to be at the enterprise level when implemented
- This is separate from data governance program

Q29 - PLEASE RANK YOUR UTILITY'S ANALYTICS GOVERNANCE PROGRAM'S ABILITY TO DO THE FOLLOWING:

(1 = Not applying resources at this time; 2 = Working towards developing capability/ characteristic; 3 = Current capability/characteristic - needs improvement; 4 = Currently capability/characteristic - doing well)

Question	1	2	3	4
Ensure that good long-term decisions about analytics are reached	18%	50%	26%	6%
Ensure that investments in analytics generate business value.	15%	41%	26%	18%
Measure and evaluate the performance of analytics models	29%	38%	21%	12%
Ensure that there is accountability, transparency, and traceability with regard to analytics resources	24%	41%	32%	3%
Ensure that data, derived data and analytics products are protected and managed in a secure and compliant fashion.	12%	38%	38%	12%
Ensure availability of adequate analytics resources	9%	71%	21%	0%
Ensure that data is readily available to those building analytics models.	9%	56%	29%	6%
Provide access to model features to users for the development of new models via a feature store	44%	41%	15%	0%
Ensure that analytics models can be deployed into production for use.	9%	44%	41%	6%

Q30 - NOTE: DATA GOVERNANCE IS DEFINED AS THE OVERALL MANAGEMENT OF THE AVAILABILITY, USABILITY, INTEGRITY AND SECURITY OF DATA USED IN AN ENTERPRISE, AND INCLUDES METADATA MANAGEMENT.

Does your utility currently have a data governance program that manages at least one of the following: availability, usability, integrity and security of data?

- **15%** No formal program in place
- **35%** Limited or in place within select business groups
- **41%** Enterprise program currently being developed or implementation underway
- **9%** Enterprise program in place

Comments:

- Software has been purchased. Rules will be established as source data is added to data lake
- IT has a formal process for transaction system data; none for analytics data

Q31 - WHAT GROUP/BUSINESS UNIT IS RESPONSIBLE FOR DATA GOVERNANCE? (SELECT ALL THAT APPLY)

Individual business units	62%
IT	66%
Analytics organization	28%
Other	17%

Other:

- Compliance
- Legal
- Security
- Corporate Development
- Center of Excellence

Comments:

- Partnership between business and IT
- Vision is to have an Analytics Organization

Q32 - DOES YOUR UTILITY HAVE A DATA DICTIONARY IN PLACE?

- **6%** No, and not considering developing one at this time
- **35%** No, but considering developing one within the next 18 months
- **26%** Development in progress
- **32%** Data dictionary in place, not comprehensive and/or improvements needed
- **0%** Robust and comprehensive data dictionary in place

Q33 - DOES YOUR UTILITY HAVE A PROCESS FOR KEEPING THE DATA DICTIONARY CURRENT?

- **20%** No formalized process
- **50%** Developing formal process
- **15%** Implementing formal process
- **15%** Formal process in place

Q34 - DOES YOUR UTILITY HAVE AN INVENTORY OF ALL DATA SOURCES AND DATA QUALITY/DATA INTEGRATION/DATA ANALYTICS TOOLS?

- **12%** Not in place, no plan to develop
- **32%** Not in place, but have plans to develop
- **35%** Incomplete inventory
- **21%** Good inventory though some information gaps exist
- **0%** Thorough and accurate inventory

Comments:

- Critical systems as determined by business in currently inventoried
- Inventory of data sources started; inventory of tools available; no data quality or integration inventory yet, but planned

Q35 - HAS YOUR UTILITY ADOPTED DATA MANAGEMENT STANDARDS?

- **3%** Not in place, no plan to develop
- **65%** Not in place, but developing or have plans to develop
- **29%** In place, though some issues with effectiveness exist
- **3%** In place, successful and meet needs of enterprise

Comments:

- Data retention policies are in an advanced state, other areas less so

Q36 - IS YOUR UTILITY ABLE TO TRACE THE DATA RELIED UPON FOR DECISION MAKING OR DRIVING BUSINESS PROCESSES BACK TO ITS ORIGINAL SOURCE?

- **9%** Little to no traceability
- **35%** Limited traceability
- **50%** Generally traceable with some exceptions
- **6%** Fully traceable

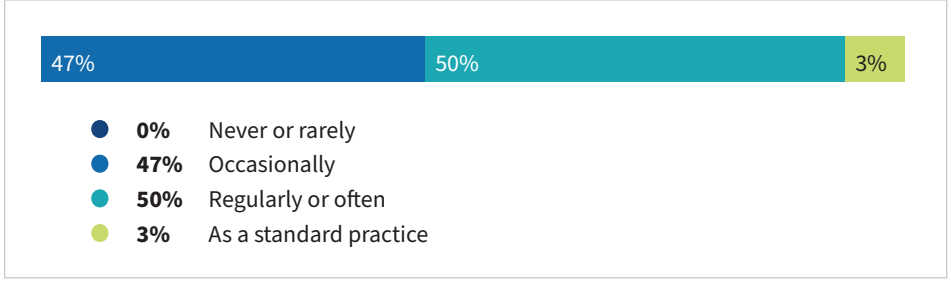
Comments:

- For our critical systems
- Full traceability for Financials and HR; generally traceable for other data.
- Source to data mart to report can be traced with exploration into ETL and Report tool

Q37 - FOR EACH OF THE FOLLOWING TEN MAJOR COMPONENTS OF DATA MANAGEMENT IDENTIFIED BY THE DATA MANAGEMENT ASSOCIATION'S (DAMA) DATA MANAGEMENT BODY OF KNOWLEDGE (DAMA-DMBOK) PLEASE INDICATE THE STATUS OF YOUR UTILITY'S EFFORTS AT THE ENTERPRISE LEVEL:

Question	Enterprise-wide capabilities not planned	Enterprise-wide capabilities expected within 5 years	Enterprise-wide capabilities expected within 1-2 years	Enterprise-wide capabilities in place now
Overall Data Governance	3%	50%	35%	12%
Data architecture management	3%	21%	62%	15%
Data quality management	12%	35%	53%	0%
Meta data management	15%	21%	59%	6%
Document & content management	9%	26%	35%	29%
Data warehousing & BI management	0%	15%	41%	44%
Reference & master data management	12%	35%	47%	6%
Data security management	0%	9%	32%	59%
Database operations management	0%	6%	32%	62%
Data development	18%	9%	47%	26%

Q38 - HOW OFTEN DOES YOUR UTILITY USE DATA AND ANALYTICS TO DRIVE ITS BUSINESS PROCESSES?



Q39 - TO WHAT DEGREE DO DATA AND ANALYTICS INFORM THE DEVELOPMENT AND MEASUREMENT OF RELEVANT BUSINESS PROCESS KPIS FOR THE FOLLOWING GROUPS?

Question	Don't at all inform	Somewhat inform	Greatly inform	Completely inform
Customer operations	3%	47%	50%	0%
Operations/workforce	6%	47%	47%	0%
Construction/supply chain	12%	56%	32%	0%
Legal/Regulatory	24%	59%	18%	0%
Finance	0%	26%	71%	3%
IT	3%	62%	32%	3%
Infrastructure/Engineering	0%	59%	41%	0%
Forecasting/market operations	3%	29%	62%	6%
Corporate (HR, safety, security, etc.)	6%	65%	26%	3%

Q40 - ACCESS TO DATA AND ANALYTICS TOOLS BY BUSINESS USERS AND PROCESS OWNERS IS:

- **15%** Highly limited and inconsistent
- **50%** Somewhat limited and inconsistent
- **29%** Generally adequate, but challenges exist
- **6%** Sufficient all or most of the time, with little to no challenges with quality or timeliness

Comments:

- Well Managed toolkit, but Access to Data can still be a challenge
- Power BI available to all, but more robust tools and apps are limited

Q41 - WHICH OF THE FOLLOWING BEST DESCRIBES YOUR ORGANIZATION'S CUSTOMER OPERATIONS BUSINESS UNIT(S) CURRENT ANALYTICS CAPABILITIES (SELECT ALL THAT APPLY)?

Question	N/A: No Plans to Implement	Current Capabilities	Anticipated Capabilities in 3 Years
Gathering and Managing Data	3%	85%	12%
Adoption of Analytics Applications	9%	74%	18%
Basic Reporting	3%	94%	3%
Business Intelligence & Dashboards	3%	91%	6%
Statistical Analysis & Forecasting/ Extrapolation	12%	56%	32%
Development of Predictive Models	15%	38%	47%
Development of Prescriptive Models	26%	18%	56%
Development of Optimization Models	26%	18%	56%
Development of Machine Learning and Artificial Intelligence	29%	12%	59%

Q41.2 - WHICH OF THE FOLLOWING BEST DESCRIBES YOUR ORGANIZATION'S OPERATIONS/WORKFORCE BUSINESS UNIT(S) CURRENT ANALYTICS CAPABILITIES (SELECT ALL THAT APPLY)?

Question	N/A: No Plans to Implement	Current Capabilities	Anticipated Capabilities in 3 Years
Gathering and Managing Data	0%	94%	6%
Adoption of Analytics Applications	12%	74%	15%
Basic Reporting	0%	97%	3%
Business Intelligence & Dashboards	6%	85%	9%
Statistical Analysis & Forecasting/ Extrapolation	9%	53%	38%
Development of Predictive Models	21%	32%	47%
Development of Prescriptive Models	32%	15%	53%
Development of Optimization Models	29%	12%	59%
Development of Machine Learning and Artificial Intelligence	35%	12%	53%

Q41.3 - WHICH OF THE FOLLOWING BEST DESCRIBES YOUR ORGANIZATION'S CONSTRUCTION/SUPPLY CHAIN BUSINESS UNIT(S) CURRENT ANALYTICS CAPABILITIES (SELECT ALL THAT APPLY)?

Question	N/A: No Plans to Implement	Current Capabilities	Anticipated Capabilities in 3 Years
Gathering and Managing Data	9%	76%	15%
Adoption of Analytics Applications	12%	50%	38%
Basic Reporting	3%	91%	6%
Business Intelligence & Dashboards	9%	71%	21%
Statistical Analysis & Forecasting/ Extrapolation	18%	32%	50%
Development of Predictive Models	29%	6%	65%
Development of Prescriptive Models	53%	3%	44%
Development of Optimization Models	44%	6%	50%
Development of Machine Learning and Artificial Intelligence	56%	3%	41%

Q41.4 - WHICH OF THE FOLLOWING BEST DESCRIBES YOUR ORGANIZATION'S LEGAL/ REGULATORY BUSINESS UNIT(S) CURRENT ANALYTICS CAPABILITIES (SELECT ALL THAT APPLY)?

Question	N/A: No Plans to Implement	Current Capabilities	Anticipated Capabilities in 3 Years
Gathering and Managing Data	12%	74%	15%
Adoption of Analytics Applications	29%	50%	21%
Basic Reporting	9%	79%	12%
Business Intelligence & Dashboards	29%	41%	29%
Statistical Analysis & Forecasting/ Extrapolation	41%	35%	24%
Development of Predictive Models	59%	15%	26%
Development of Prescriptive Models	68%	6%	26%
Development of Optimization Models	68%	6%	26%
Development of Machine Learning and Artificial Intelligence	71%	3%	26%

Q41.5 - WHICH OF THE FOLLOWING BEST DESCRIBES YOUR ORGANIZATION'S FINANCE BUSINESS UNIT(S) CURRENT ANALYTICS CAPABILITIES (SELECT ALL THAT APPLY)?

Question	N/A: No Plans to Implement	Current Capabilities	Anticipated Capabilities in 3 Years
Gathering and Managing Data	0%	97%	3%
Adoption of Analytics Applications	6%	68%	26%
Basic Reporting	0%	97%	3%
Business Intelligence & Dashboards	0%	79%	21%
Statistical Analysis & Forecasting/ Extrapolation	0%	76%	24%
Development of Predictive Models	26%	29%	44%
Development of Prescriptive Models	50%	6%	44%
Development of Optimization Models	44%	18%	38%
Development of Machine Learning and Artificial Intelligence	62%	0%	38%

Q41.6 - WHICH OF THE FOLLOWING BEST DESCRIBES YOUR ORGANIZATION'S IT BUSINESS UNIT(S) CURRENT ANALYTICS CAPABILITIES (SELECT ALL THAT APPLY)?

Question	N/A: No Plans to Implement	Current Capabilities	Anticipated Capabilities in 3 Years
Gathering and Managing Data	0%	94%	6%
Adoption of Analytics Applications	6%	76%	18%
Basic Reporting	0%	94%	6%
Business Intelligence & Dashboards	3%	88%	9%
Statistical Analysis & Forecasting/ Extrapolation	12%	56%	32%
Development of Predictive Models	21%	35%	44%
Development of Prescriptive Models	32%	29%	38%
Development of Optimization Models	26%	29%	44%
Development of Machine Learning and Artificial Intelligence	29%	15%	56%

Q41.7 - WHICH OF THE FOLLOWING BEST DESCRIBES YOUR ORGANIZATION'S INFRASTRUCTURE/ENGINEERING BUSINESS UNIT(S) CURRENT ANALYTICS CAPABILITIES (SELECT ALL THAT APPLY)?

Question	N/A: No Plans to Implement	Current Capabilities	Anticipated Capabilities in 3 Years
Gathering and Managing Data	0%	97%	3%
Adoption of Analytics Applications	6%	79%	15%
Basic Reporting	0%	97%	3%
Business Intelligence & Dashboards	6%	85%	9%
Statistical Analysis & Forecasting/ Extrapolation	12%	62%	26%
Development of Predictive Models	21%	35%	44%
Development of Prescriptive Models	32%	6%	62%
Development of Optimization Models	29%	24%	47%
Development of Machine Learning and Artificial Intelligence	41%	9%	50%

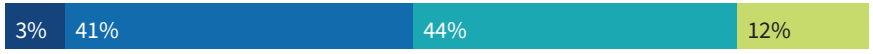
Q41.8 - WHICH OF THE FOLLOWING BEST DESCRIBES YOUR ORGANIZATION'S FORECASTING/MARKET OPERATIONS BUSINESS UNIT(S) CURRENT ANALYTICS CAPABILITIES (SELECT ALL THAT APPLY)?

Question	N/A: No Plans to Implement	Current Capabilities	Anticipated Capabilities in 3 Years
Gathering and Managing Data	0%	97%	3%
Adoption of Analytics Applications	3%	91%	6%
Basic Reporting	0%	97%	3%
Business Intelligence & Dashboards	0%	91%	9%
Statistical Analysis & Forecasting/ Extrapolation	3%	85%	12%
Development of Predictive Models	6%	68%	26%
Development of Prescriptive Models	29%	29%	41%
Development of Optimization Models	26%	32%	41%
Development of Machine Learning and Artificial Intelligence	35%	18%	47%

Q41.9 - WHICH OF THE FOLLOWING BEST DESCRIBES YOUR ORGANIZATION'S CORPORATE (HR, SAFETY, SECURITY, ETC.) BUSINESS UNIT(S) CURRENT ANALYTICS CAPABILITIES (SELECT ALL THAT APPLY)?

Question	N/A: No Plans to Implement	Current Capabilities	Anticipated Capabilities in 3 Years
Gathering and Managing Data	0%	88%	12%
Adoption of Analytics Applications	18%	56%	26%
Basic Reporting	0%	97%	3%
Business Intelligence & Dashboards	3%	71%	26%
Statistical Analysis & Forecasting/ Extrapolation	29%	29%	41%
Development of Predictive Models	29%	12%	59%
Development of Prescriptive Models	47%	9%	44%
Development of Optimization Models	62%	3%	35%
Development of Machine Learning and Artificial Intelligence	56%	3%	41%

Q50 - DOES YOUR UTILITY HAVE AN ENTERPRISE ANALYTICS ARCHITECTURE IN PLACE?



- **3%** Not currently in place, and no currently plan to implement
- **41%** In the planning and early development phases
- **44%** Analytics architecture in implementation phases
- **12%** Comprehensive architecture in place

Q51 - TO WHAT EXTENT IS YOUR UTILITY INTEGRATING INFORMATION FROM DISPARATE SOURCES AND/OR ACROSS ORGANIZATIONAL AND/OR SYSTEM SILOS?

- **0%** Little to no integration; no plans to expand
- **15%** Little to no integration; plans to expand
- **47%** Some integration; support of ad-hoc needs/point solutions
- **24%** In process of establishing substantial integration
- **15%** Substantial integration

Q52 - DOES YOUR UTILITY HAVE A PROCESS TO ACQUIRE AND MAKE AVAILABLE THIRD-PARTY AND PUBLIC DATASETS?

- **71%** Yes
- **29%** No

Q53 - HOW WOULD YOU RATE YOUR UTILITY'S ANALYTICS TECHNOLOGIES & TOOLSET?

- **0%** No analytics specific toolsets exist (e.g. reliant on tools such as Excel, Access, and Vendor Applications)
- **24%** Baseline tools for data management and modeling (e.g. Tableau, BI Power Tools, etc.)
- **65%** In the process of moving toward a robust toolset (e.g. enterprise analytics platform, data lake, etc.)
- **12%** Robust analytics toolset in place

Q54 - YOUR UTILITY'S APPROACH TO EVALUATION AND SELECTION OF ANALYTICS TECHNOLOGIES AND TOOLS IS BEST DESCRIBED AS:

- **15%** Inconsistent, one-off
- **26%** Some efforts to standardize
- **35%** Somewhat consistent and credible though not enterprise-wide approach
- **24%** Enterprise-wide, consistent and effective

Q55 - WHAT BUSINESS SEGMENTS MAKE SIGNIFICANT USE OF ANALYTICS TECHNOLOGIES AND TOOLSETS WITHIN YOUR UTILITY (CHECK ALL THAT APPLY)?

Customer operations	82%
Operations/workforce	76%
Construction/supply chain	38%
Legal/Regulatory	15%
Finance	56%
IT	65%
Infrastructure/Engineering	59%
Forecasting/market operations	91%
Corporate (HR, safety, security, etc.)	35%