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The State of Digital Water:

A ZPRYME RESEARCH REPORT

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Introduction and Summary

Water utilities have traditionally trailed behind their power delivery contemporaries when it comes to deploying Industrial Internet of Things (IIoT) systems as well as capturing and managing data. The last few years, however, have seen a broad recognition that data and analytics are essential for the industry to improve operational and customer delivery. More than 6 million IIoT devices are connected every day, and Gartner is forecasting that there will be more than 20 billion connected devices by the end of 2020.

The proliferation of investment in smarter operations means not only millions of new IIoT devices but also more data to make better decisions about networks. To truly maximize the value from IIoT, utilities will need to increasingly rely on analytics to understand the flood of data.

To better understand how utilities are using IIoT devices, what data they're capturing, and how they can best use analytics, Zpryme surveyed over 100 water utility professionals.

KEY FINDINGS INCLUDE:

Data access, amount of data, and data silos are the top data challenges water utilities face.

CMMS, AMI, supply chain management, and LIMS are the systems water utilities will focus on **developing the most** in the next 3 years.

Water utilities expect **operational efficiencies, analytics-based decision making, and increased security** to be the top **benefits** of IIoT applications.

Industry and Data Challenges

Today's water utilities face many challenges in delivering reliable clean water as cities become more populated and temperatures rise. Their power delivery counterparts face similar issues, but water utilities seem to be lagging behind when it comes to leveraging technology to address these issues. The advancement of IIoT technology presents a significant opportunity for water utilities to improve operations and customer satisfaction by providing more insight into what is happening across the water value chain. 72% of utilities report that aging infrastructure is the biggest challenge they face (Figure 1). In fact, the top four challenges are all related to infrastructure with 58% reporting capital and operational costs, 38% reporting asset management, and 38% reporting leaks and breaks. If water utilities don't effectively mitigate the potential impact of aging infrastructure, the capital and operational costs will rise over time. One potential solution is a greater reliance on data to understand asset performance and make better operational decisions. However, 37% of utilities report that data is an operational challenge as well.

Figure 1. What are the primary challenges your utility is facing?

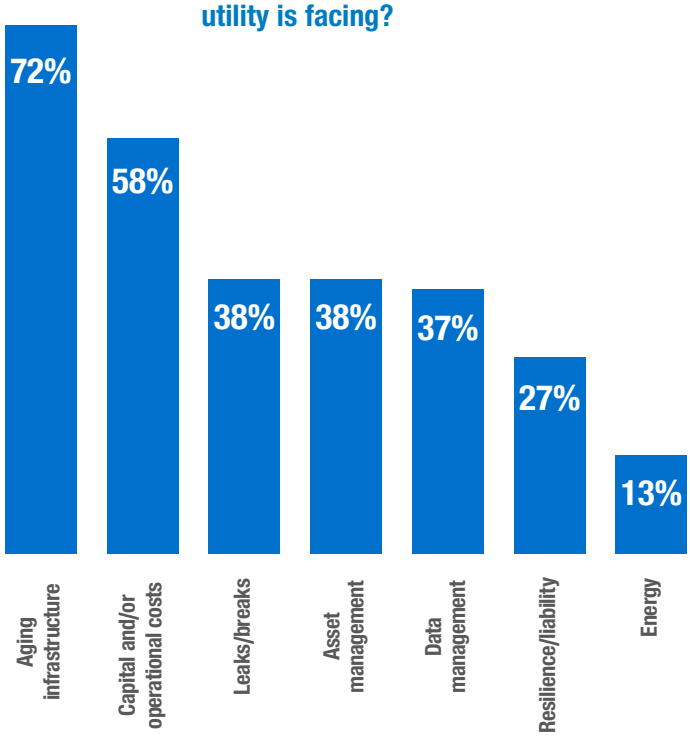
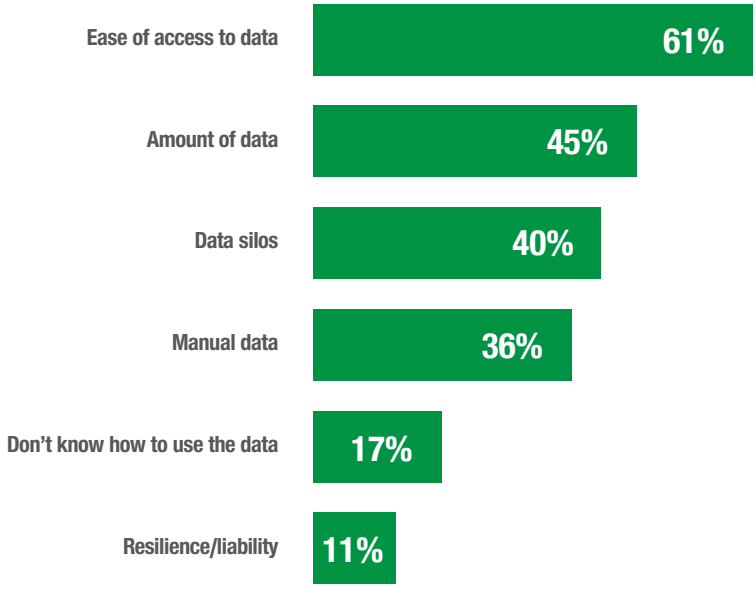


Figure 2. What are the primary data challenges your utility is currently facing?



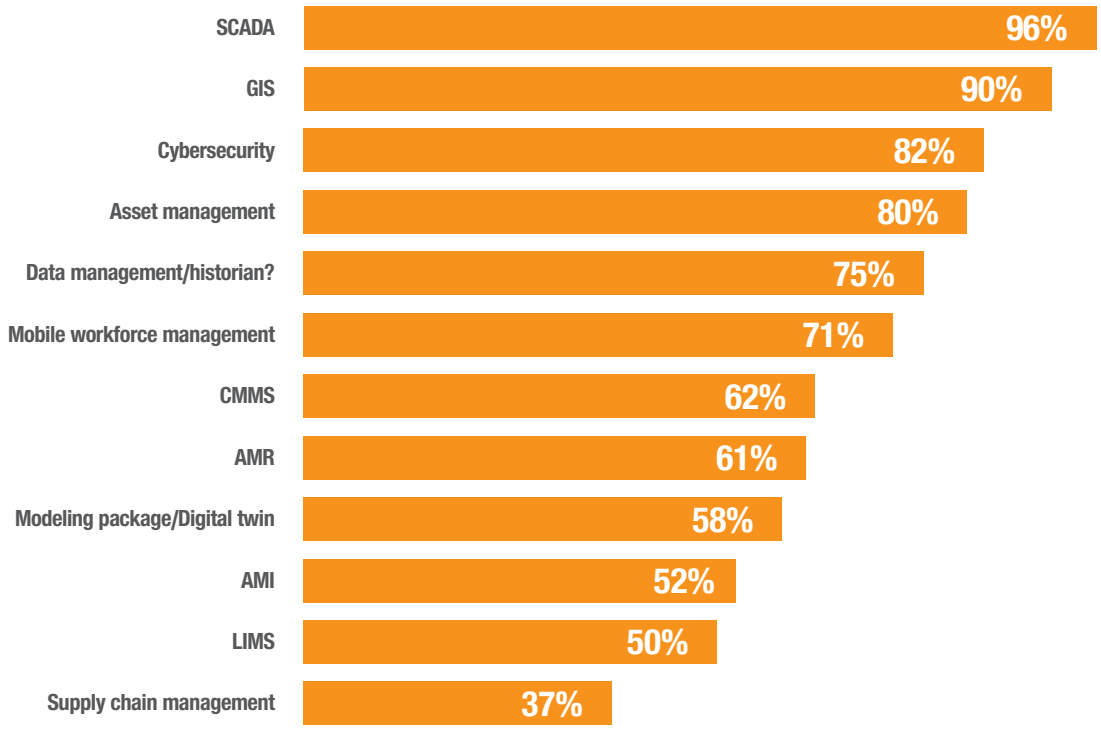
What are the particular issues around data management and analysis for water utilities? Zpryme found the top three challenges utilities are facing in regard to data are closely related. For starters, they are struggling to access data (61%) (Figure 2). Even if they can access data, the amount of data utilities deal with is overwhelming, creating the second top challenge (45%). If they can get access to the data and sort out what is meaningful, the data lives in silos within the organization (40%). Data silos limit collaboration across groups and make it difficult to understand how events and technologies impact the entire system. Properly addressing these data challenges will not be easy, but as water utilities continue to digitize, there are software solutions that aggregate data from multiple systems, manage it, and can analyze it to drive business intelligence.

The number of distinct systems utilities are using to collect data poses another challenge. It is no surprise 96% of water utilities are currently using supervisory control and data acquisition (SCADA) and 90% are using geographic information systems (GIS) (Figure 3), as these technologies have been a staple in the industry for more than a generation. Just over 80% are also using some asset management and cybersecurity system, but not all utilities have become fully digital. Only just over half are using AMI (52%) or AMR (61%) meters, fewer than their electric counterparts. Similarly, only about half of utilities are using computerized maintenance management system (CMMS) (62%). CMMS facilitates efficient management of work orders, machine run times, inventory, schedules, and email notifications by automating maintenance schedules and tracking everything from time and resources to materials and workload. CMMS software seamlessly interfaces with SCADA systems to boost preventive and predictive maintenance tasks based on different combinations of temperature, pressure, and vibration and can help lower operational costs by identifying and streamlining preventative maintenance.

CMMS is not the only system that currently only sees limited use. Only 50% of utilities are using a laboratory information management system (LIMS), which can have an impact on the speed and reliability of water sample testing. Deploying a LIMS will improve the efficiency of sample management and the integrity of field samples that in an analog setting can have transcription errors. The integration of CMMS and LIMS with other more commonly used IIoT devices will dramatically improve operational efficiency at utilities.

The Status of IIoT at Water Utilities

Figure 3. Current status of systems existing/underway.

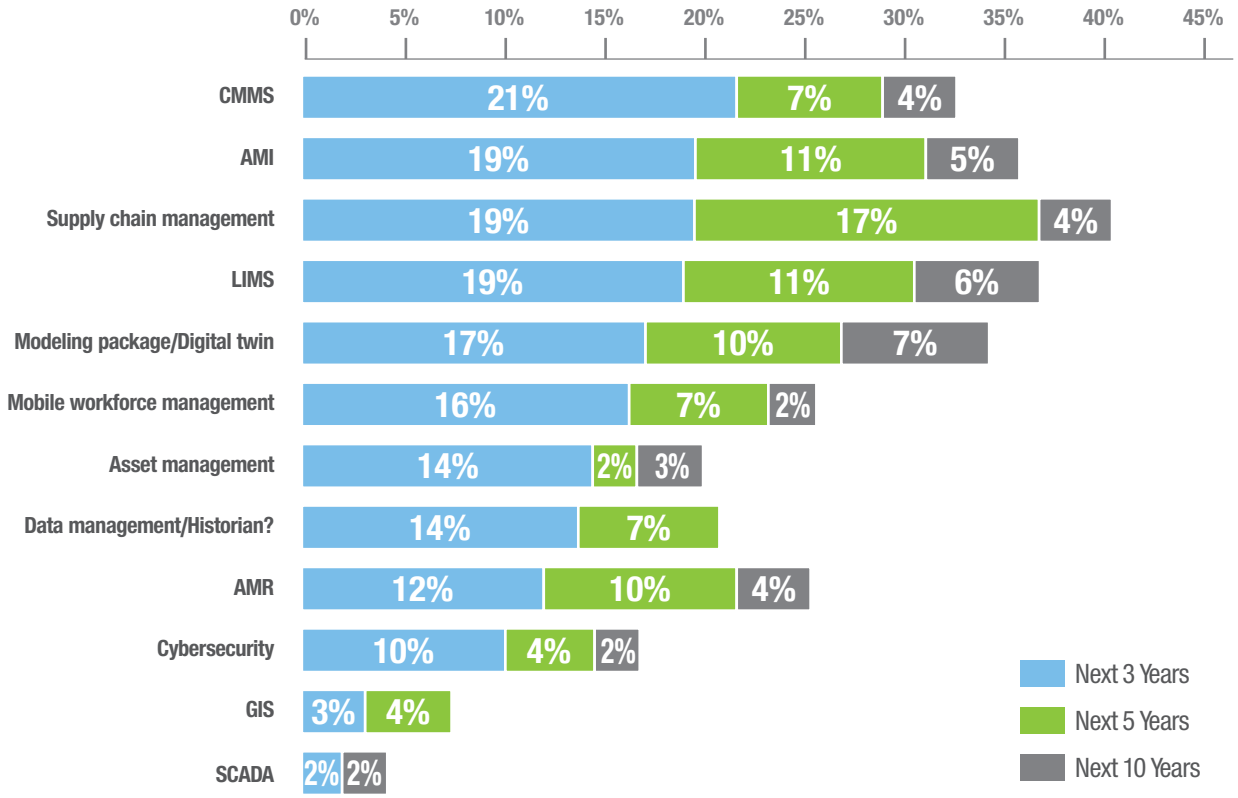


The Status of IIoT at Water Utilities continued

Over the next 3-5 years, there will be a significant increase in the number of utilities using AMI meters (30%), and 22% of utilities are still planning to deploy AMR (Figure 4). The expansion of smart metering will provide data about the customer that can help utilities improve operations. Furthermore, 28% plan to deploy CMMS and 30% plan to deploy LIMS.

Another area ripe for expansion is supply chain management, as 36% of respondents plan to enhance those systems in the next 3 to 5 years. With more visibility into the supply chain, water utilities can look at how meter data and supply chain data give insight into production, delivery, and usage patterns. Mobile Workforce Management and Data Management will also be areas of focus as utilities invest in better data management to make analytics-based decisions on workforce and resource management.

Figure 4. Plans for Further Deployment of these Systems



The Benefits of IIoT

With more data available through smart devices, utilities can leverage IIoT to create benefits within their organizations. 79% of utilities agree IIoT is an important technology trend, and 49% agree it is critical to their organization's success (Figure 5), yet only 33% report that they are already using it. Given the challenges outlined in Figure 2 it is not surprising only one third of utilities report using IIoT. Particularly interesting is how many utilities report neutrality or lack of knowledge on these subjects, indicating that significantly more market education is necessary for the industry.

The Benefits of IIoT continued

Many water utilities have concerns around IIoT technology, the largest of them being around the deployment of IIoT (Figure 6): network security (67%) and data privacy (62%). It is understandable to have concerns around network security in the information age, but the benefits of digitalization from an operational delivery perspective far outweigh the threats posed by nefarious cyber actors as the capability of cybersecurity software has dramatically improved with AI able to provide advanced threat detection. Some utilities are also apprehensive about their ability to effectively use the data gathered from deploying more IIoT sensors. 54% report that they have concerns over data analysis capabilities, 51% are concerned about realistic efficiency opportunities, and just under half report a worry over budget. Each concern reflects utilities' fears around sufficient investment or properly managing data to drive ROI, which comes back to a lack of quality data and understanding of how to use it. These are legitimate concerns for smaller utilities with significant constraints on their CAPEX and OPEX budgets; however, the organizations are finding that the increase in data is leading to far better business decision capabilities that will ultimately alleviate these concerns.

Figure 5. Agreement with Statements Regarding IIoT Technologies and investments

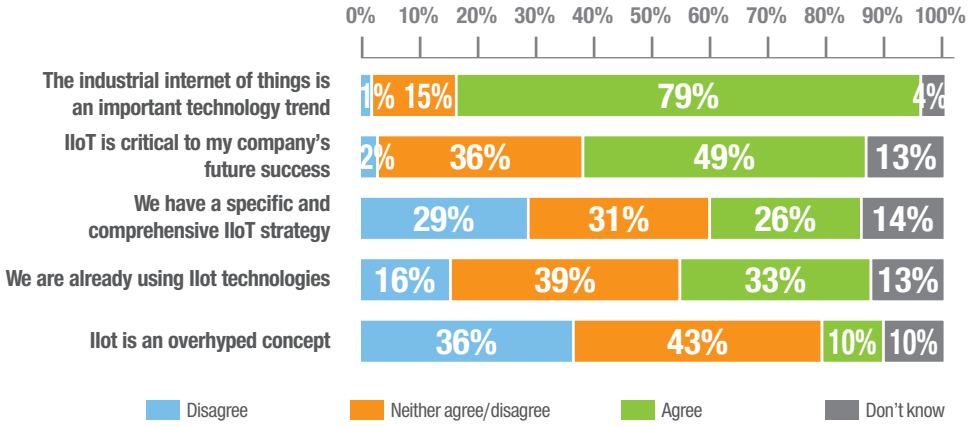
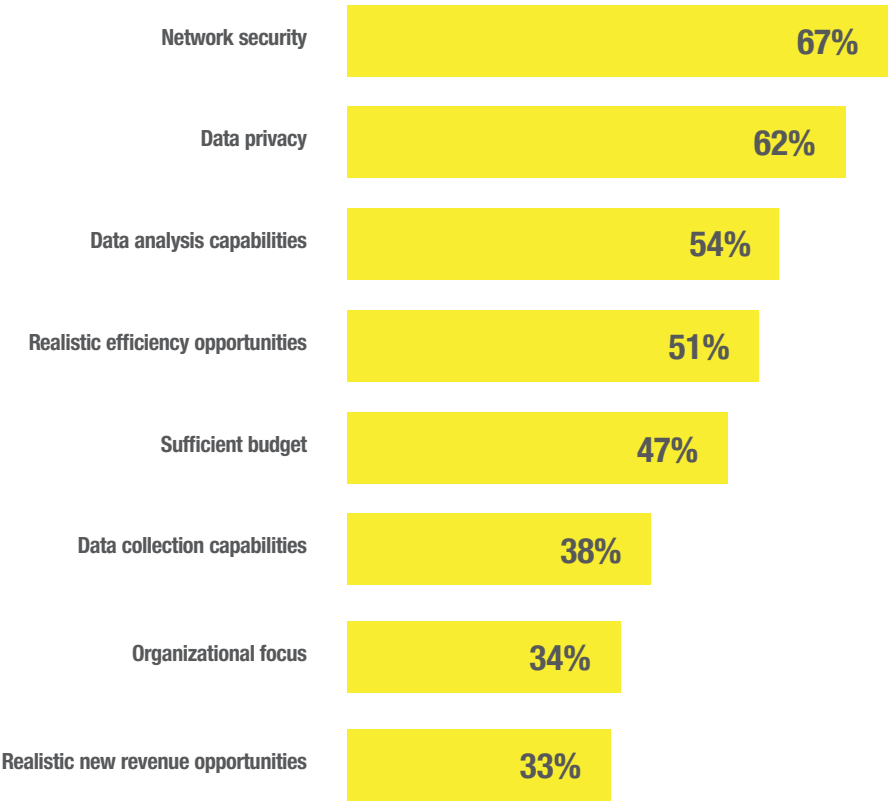


Figure 6. Concerns around IIoT



IIoT sensor deployment is one answer to the challenges around aging infrastructure and capital investment because it is a cost-effective way to improve asset management, extend asset life, and optimize capital expenditures. These attributes are why 62% of utilities report operational efficiency as the number one benefit they expect from deployment of sensors (Figure 7), followed by the related analytics-based decision making at 43%. With limited budget to conduct maintenance, utilities must have as much information on their system as possible. Real-time data allows operators to make better decisions about the health of an asset and even improve the efficiency around truck rolls.

Figure 7. Benefits of deploying IIoT sensors.

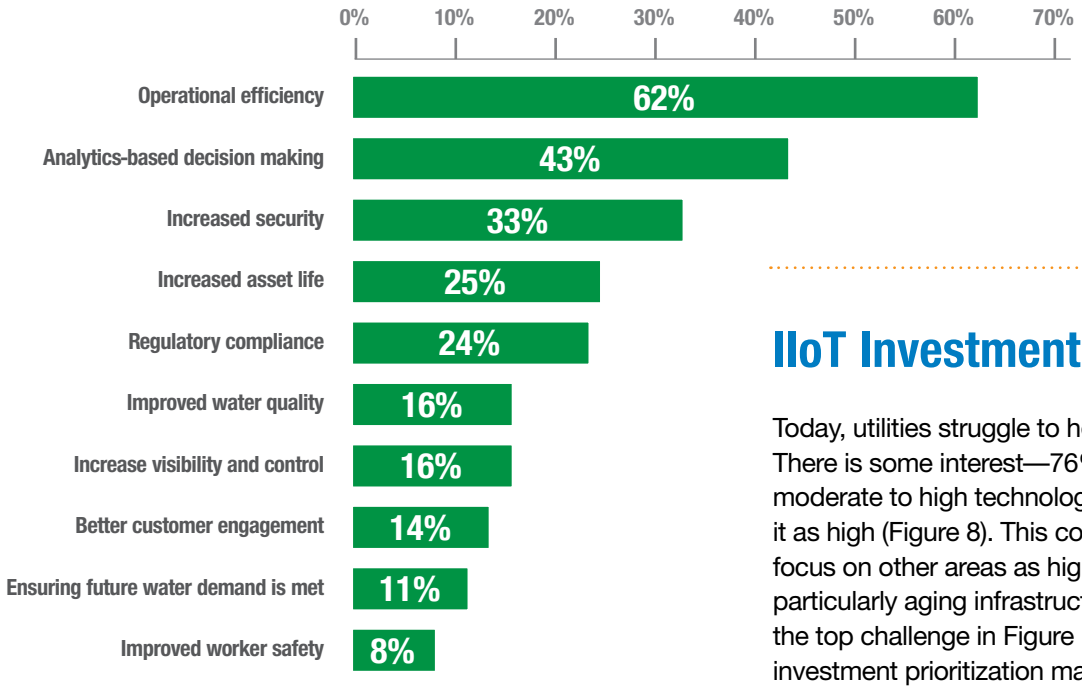
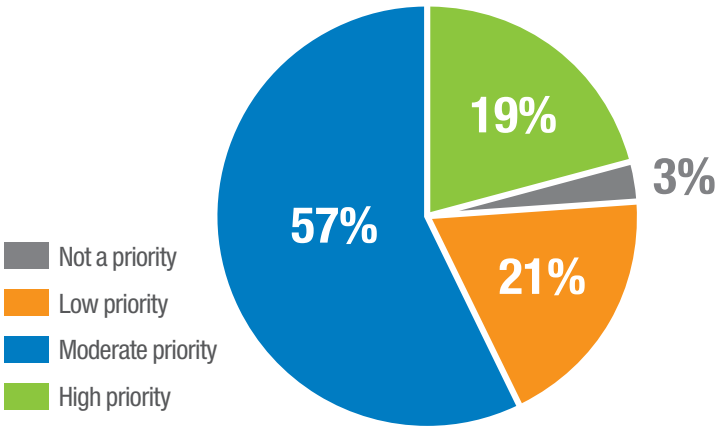


Figure 8. Importance of IIoT to operations compared to other technology investments.

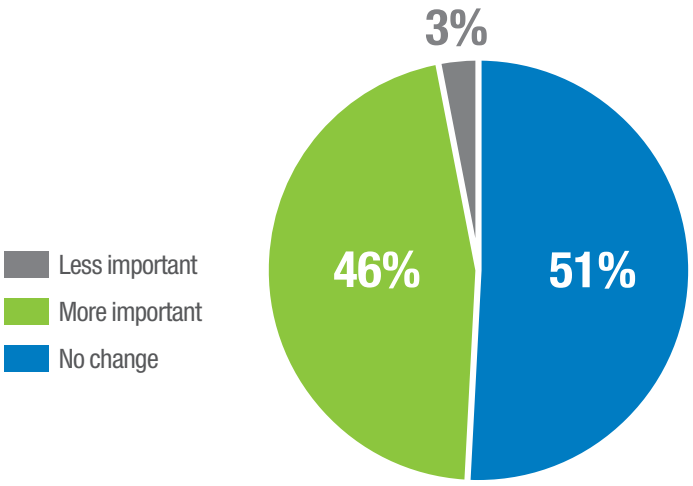


IIoT Investment

Today, utilities struggle to heavily prioritize IIoT investments. There is some interest—76% of utilities report IIoT as a moderate to high technology priority—but only 19% rate it as high (Figure 8). This contrast can be attributed to a focus on other areas as higher priority for investment, particularly aging infrastructure, which was recognized as the top challenge in Figure 1. From a traditional mindset this investment prioritization makes sense. An IIoT device does not provide an immediate return on investment like a new water treatment facility would. However, over the long-term IIoT devices become a critical component of a well-run enterprise, as they improve information around water-flows, water quality, and the health of all assets on the grid.

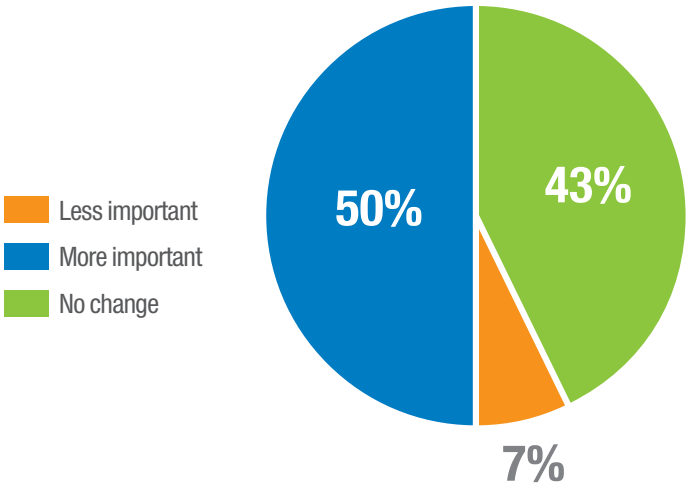
As utilities better understand the long-term benefits, investment in IIoT is becoming a higher priority. 46% of utilities report it as more important than it was 12 months ago (Figure 9), and 50% say it will be even more important 12 months from now (Figure 10). This change reflects a broad recognition of the potential for IIoT.

Figure 9. Change of importance over past 12 months.



The expected change in importance comes as other utilities, particularly electric, prove new use cases for IIoT. With an increased understanding of how to leverage IIoT for operational benefits and ROI, the importance of the technology will increase.

Figure 10. Change of importance over next 12 months.

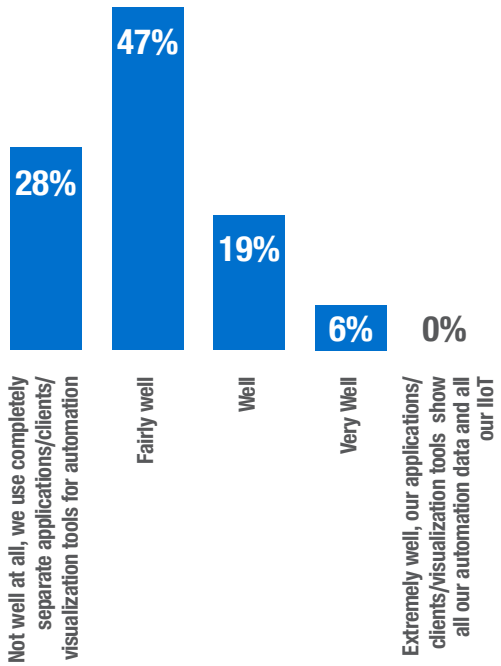


Data Integration

Another factor contributing to the importance of IIoT is the ability to integrate the technology with existing systems. IIoT data and existing control systems data still has a way to go to be fully integrated with only 25% of utilities reporting strong integration at this point (Figure 11).

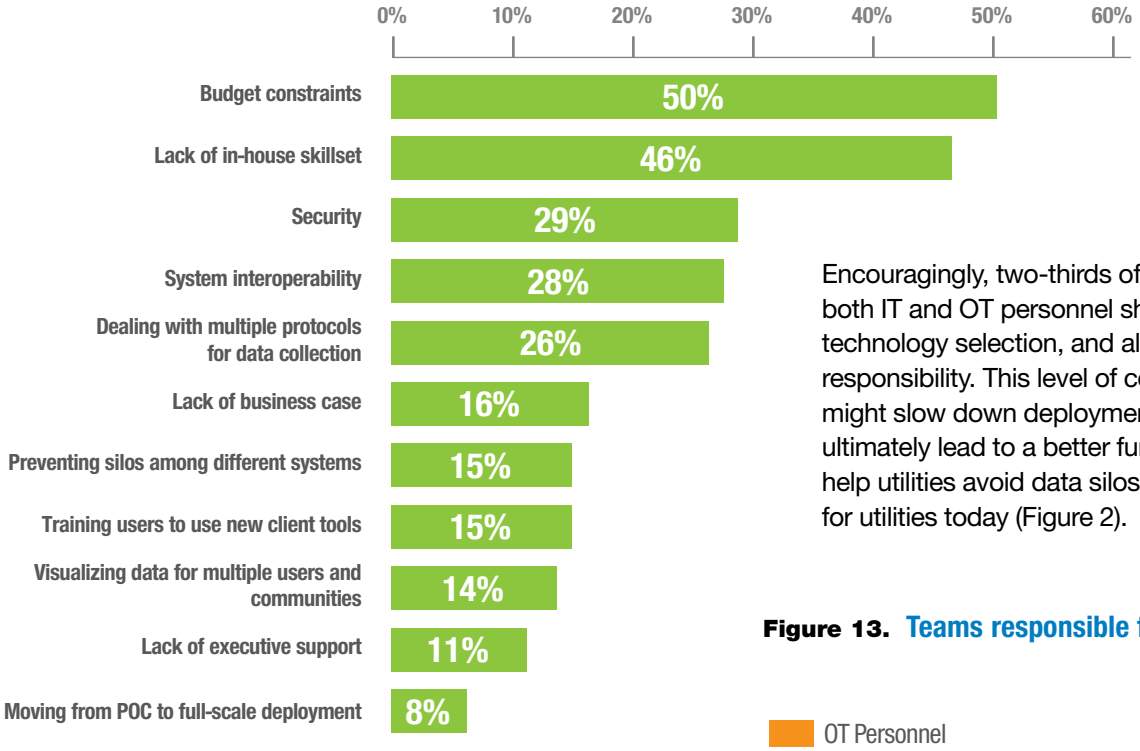
What is causing the slower integration with IIoT and existing automation and control systems? Survey respondents reported budget constraints (50%) and lack of in-house skills (46%) as the biggest barriers to integration (Figure 12). Water utilities might have to look to outside vendors to solve both of these challenges. Recruiting a large IT and OT data team can be expensive and timely. Partnering with a third party can address the lack of in-house skills and speed up the timeline on integrating with critical industrial control systems, but vendors and utilities must work together on creating budget-friendly projects that don't break the bank.

Figure 11. Data Integration.



Data Integration continued

Figure 12. Challenges integrating IIoT data.



Encouragingly, two-thirds of water utilities report that both IT and OT personnel share responsibility for IIoT technology selection, and almost 60% share budgetary responsibility. This level of collaborative decision-making might slow down deployment in the short run, but it will ultimately lead to a better functioning utility. It will also help utilities avoid data silos down the road, a major issue for utilities today (Figure 2).

Figure 13. Teams responsible for IIoT technology selection.

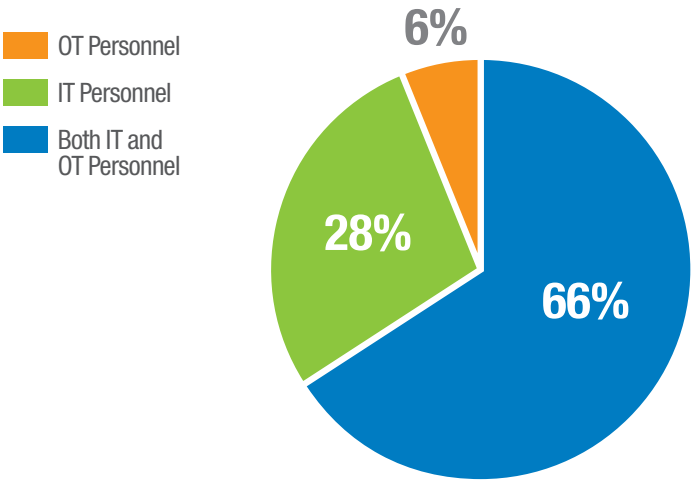
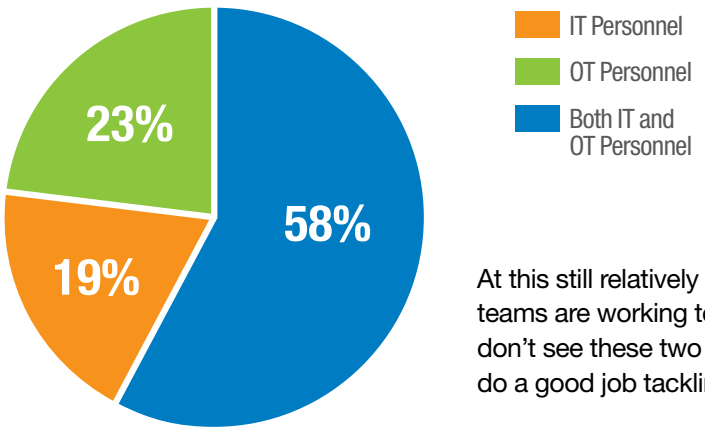
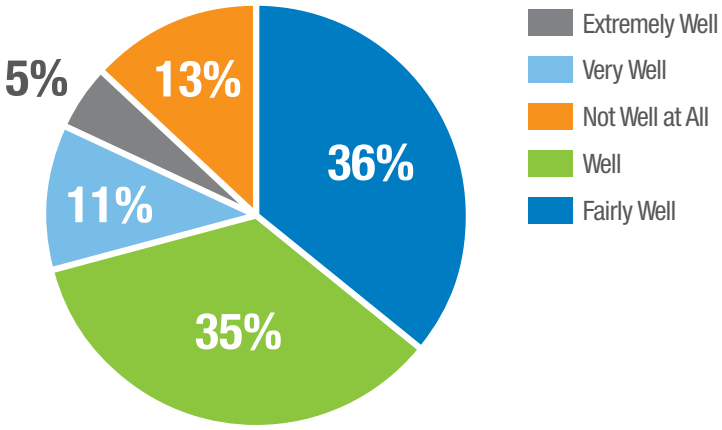


Figure 14. Teams responsible for IIoT budget decisions.



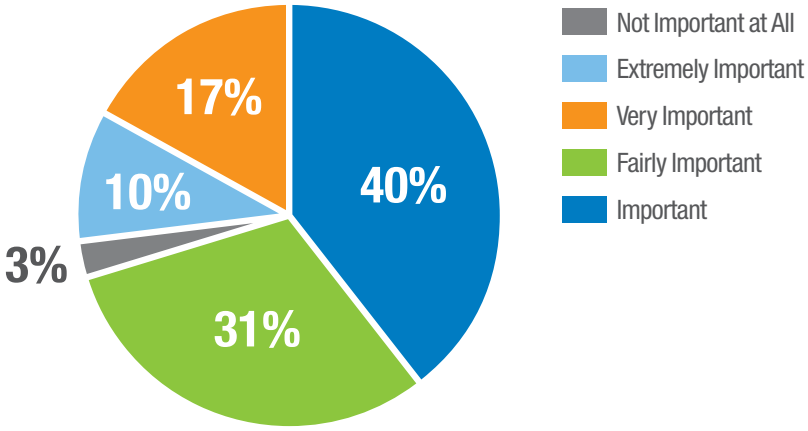
At this still relatively early stage of IIoT integration, utilities are reporting that IT and OT teams are working together at least fairly well (87%) (Figure 15). Over half of utilities don't see these two groups working together as a challenge and report these teams do a good job tackling budgetary and strategic decision making on IIoT.

Figure 15. How well IT/OT personnel work together.



With IT and OT personnel working together it will be crucial to integrate multiple types of data to solve for the key business challenges around aging infrastructure and asset management. Utilities also recognize this importance, as 67% report that IIoT and control system data is important, and 97% of utilities report that it is at least fairly important (Figure 16). The only utilities that aren't recognizing the importance right now have not made IIoT deployment a priority.

Figure 16. Importance of IIoT data integration for asset management.



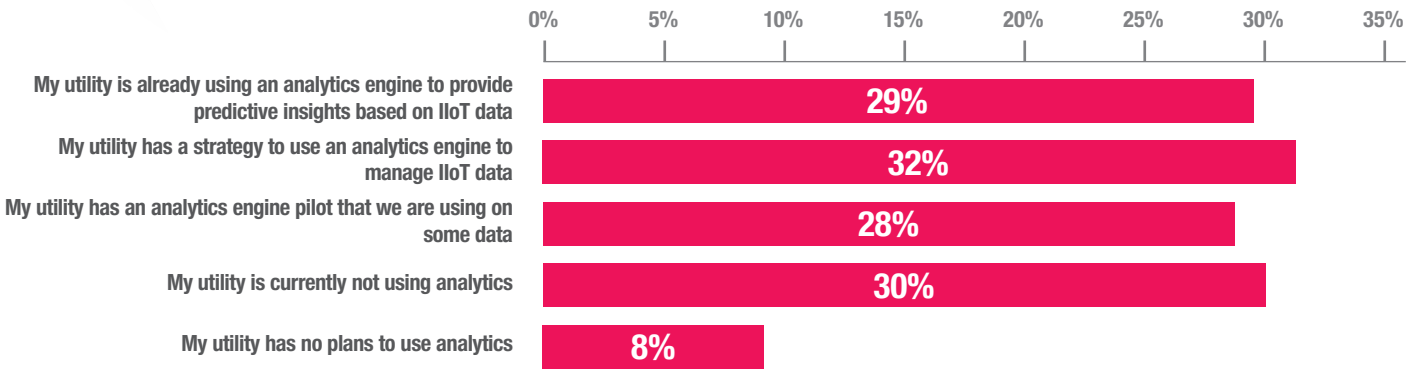
Conclusion and Recommendations

Water utilities face a series of significant challenges over the coming decade. Aging infrastructure and capital expenditures will only be exacerbated by changing customer demands and climate change. Navigating these challenges will require an innovative approach with data at the core. Water utilities must simultaneously focus on expanding their ability to capture more IIoT data and their ability to effectively analyze it. Most utilities have made significant progress over the past five years in the ability to gather that data, but there is still more work to do when it comes to crucial systems like AMI, CMMS, and LIMS. And most utilities are only just beginning to understand the importance of data management and analytics.

Only 29% of utilities report already using an analytics engine to provide predictive insights based on IIoT data (Figure 17). Some utilities have a strategy to use an analytics engine they have not yet implemented (32%) or are still in the pilot phase (28%). Others report not using analytics at all (30%), which can be attributed to the challenges highlighted in Figure 2.

Conclusion and Recommendations continued

Figure 17. Use of analytics.



Looking over the five-year time horizon, the opportunities for IIoT and analytics become more pronounced. Predicative analytics will be at the forefront of improved OPEX and CAPEX decision making and asset life-cycle management. There are several key steps that water utilities can take now to ensure that they are getting the most out of their data.

Recommendations

- Develop a coordinated strategic roadmap that is centered around using AI to maximize the benefits of IIoT data.
- Develop a change management and communication plan that emphasizes the importance of IIoT data to employees, customers, policy-makers, vendor partners, and regulators.
- Create a digitally enabled workforce. Analytics and IIoT require skilled people and processes to execute effectively. Training the existing workforce and hiring top quality data professionals will be essential for utilities to thrive.
- Develop strong relationship with key vendor partners that can help optimize data management and analytics.

Demographics

Utility Type
Municipal 68%
District/State/Federal 20%
IOU 10%
Cooperative 2%

Services (other than water)
Wastewater 46%
Electric 23%
Solid Waste 13%
Gas 10%

Region Served
United States 96%
International 4%

Number of People Served
< 150,000 . . . . . 42%
150,000 to 1M 36%
>1M 22%

Level of Job Responsibility
Manager 39%
Professional Staff 35%
Executive 12%
Director 11%
Administrative 2%
Other 4%

Primary Role
Operations 37%
Engineering 21%
Executive 11%
Maintenance 8%
IT 5%
Planning 5%
Customer Service 3%
Other 4%

About Zpryme

Based in Austin, Texas, Zpryme is a research-based firm with services focused on three areas: energy/utilities, transportation, and mobile. The company's market research offerings include consumer and business surveys, executive interviews, feasibility studies, and market sizing and analysis.