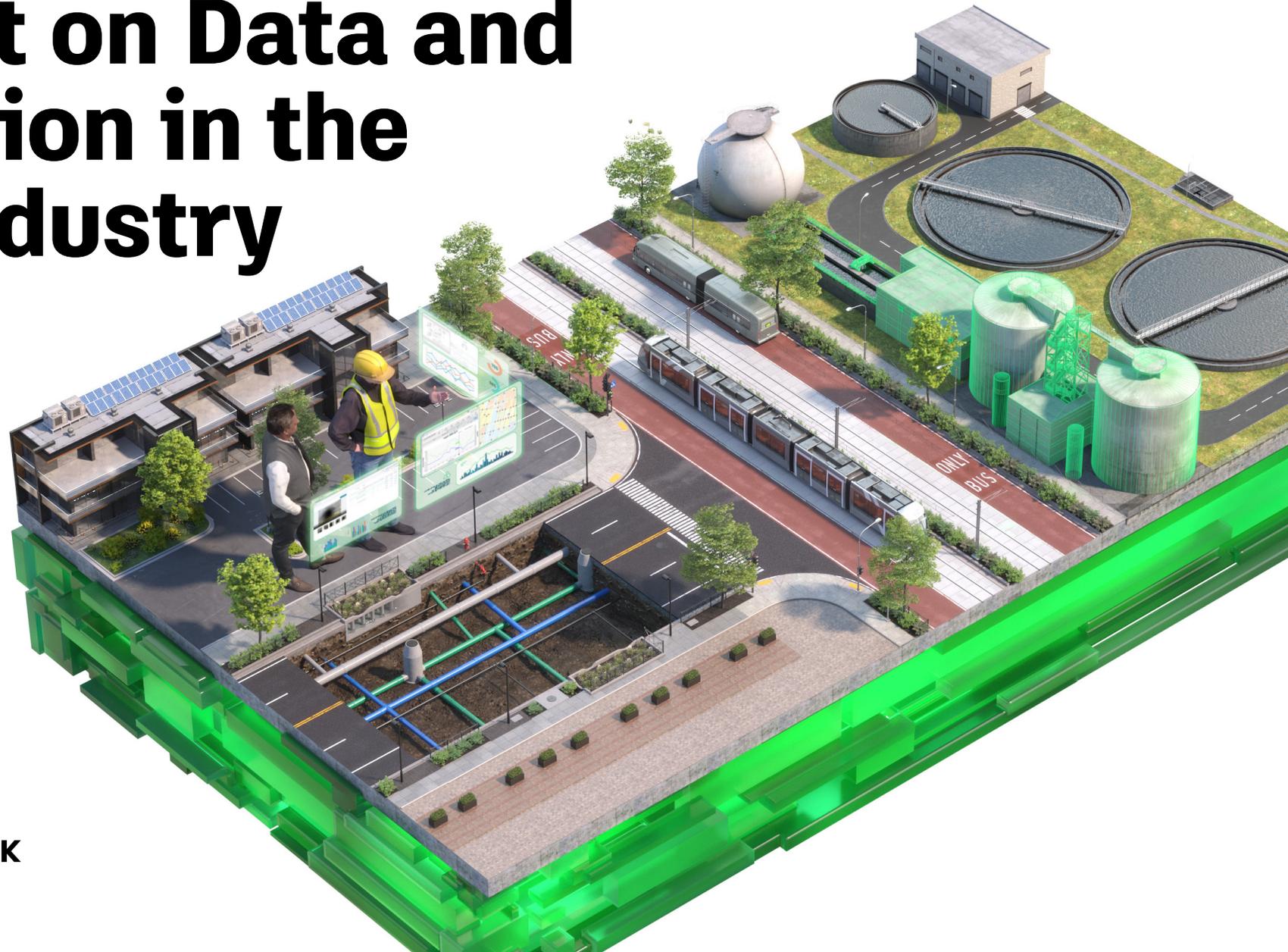


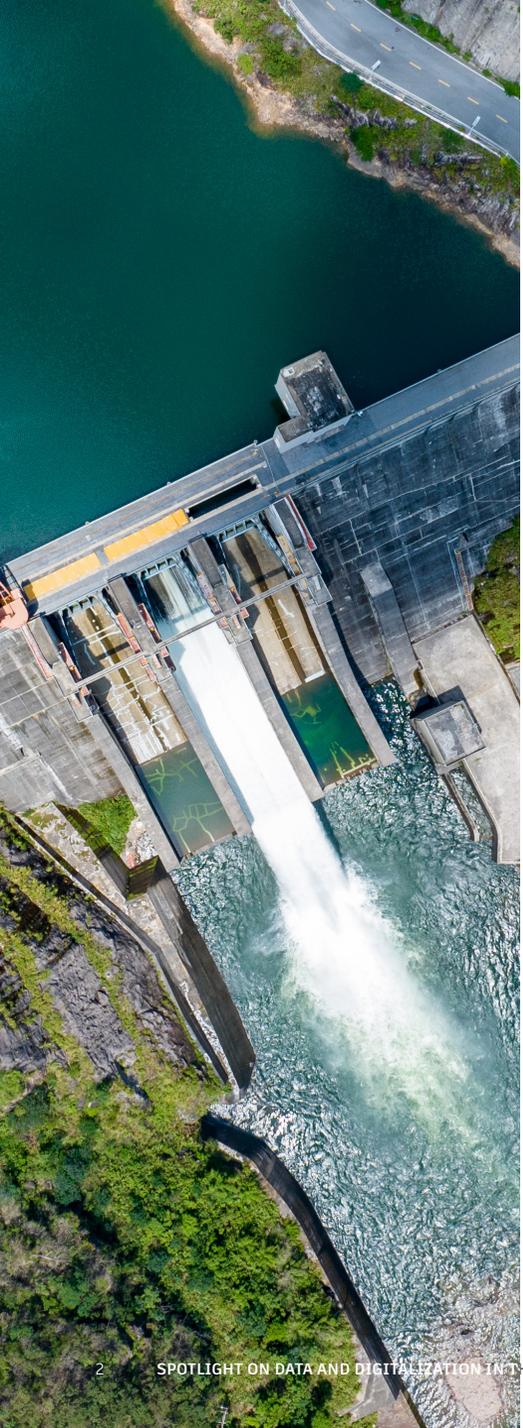
A STATE OF DESIGN & MAKE SPECIAL EDITION

# Spotlight on Data and Digitization in the Water Industry



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# Introduction

**The water industry is at a critical juncture, grappling with the challenges of aging infrastructure and increasing demand and facing mounting environmental pressures. As these challenges intensify, infrastructure designers, engineers, builders, operators, and business owners recognize the necessity for change, understanding that traditional ways of working are not sustainable for future progress. From storm and drought resilience to safe drinking water, whole ecosystems and communities rely on the water industry to safely and sustainably shape human lives and landscapes. The industry increasingly recognizes that leveraging advanced technologies and data-driven insights is not only an opportunity but also a necessity for ensuring long-term sustainability and efficiency.**

“Every drop of water carries data throughout its journey,” says Carolina Venegas Martínez, senior strategy manager for the water industry at Autodesk. “But the industry needs the software, the solutions, and the cloud infrastructure to convert that data into insights so operators can make better decisions. And while the industry is starting on its journey, it is primed for a full digital transformation.”

Digitalization is enabling more precise management of resources, enhancing the resilience of water systems and helping

to attract and retain the skilled workforce needed to navigate this new era. From predictive maintenance and automated monitoring systems to advanced metering infrastructure and artificial intelligence–assisted decision-making, the integration of these technologies is transforming how water utilities operate.

“Data and access to common data environments play a very important role in the water industry today,” says Frank Zamora Avendaño, chief information officer and IT director at Acciona, an engineering

consulting firm that specializes in the development and management of infrastructure, water, services, and renewable energies. “They enable real-time monitoring, predictive maintenance, and informed decision-making.”

As the industry navigates digital transformation, business leaders and experts in the water sector are assessing the current state of digitalization, the challenges and opportunities it presents, and the future role of data in shaping a more sustainable and resilient industry.

# Digital transformation is no longer optional

For the water industry, digital transformation has gone from optional to necessary. And while the path to digital transformation will look different at every company, commitment to the journey is essential.

“Lack of investment in digital infrastructure and transformation-focused funds is one of the biggest challenges—owners need thoughtful planning of steps that need to be taken so they can prioritize their actions,” says Zeynep Erdal, director of integrated solutions and capabilities for governments and communities at Black & Veatch, a global employee-owned engineering, procurement, consulting, and construction company. “Acknowledgment of these challenges does not diminish the importance of digital transformation; it highlights the reality that utilities may not have the capacity or budget to address all pressing issues simultaneously.”

Business leaders and experts in utilities, civil infrastructure, and engineering agree with Erdal’s assessment—37% of respondents to Autodesk’s 2024 *State*

*of Design & Make* survey cite the cost of implementation as the top barrier to digital transformation.

As global spending on water infrastructure continues to rise, the industry’s ability to embrace and implement digital solutions will be critical in shaping a resilient and sustainable future. Data from Global Water Intelligence (GWI) projects that more than \$1 trillion will be spent on water and wastewater management by utilities and industrial end users worldwide in 2024. “In most parts of the world, we have underinvested in our water assets for a long time,” says Thomas Debruyne, APAC technology integration lead for water at GHD, a professional services company operating in the water, energy, environment, buildings and transportation markets.

## Cost is the top barrier to digital transformation



Survey question: What are the barriers to digital transformation in your company or organization?



## DIGITAL TRANSFORMATION IS NO LONGER OPTIONAL

Financial investments required of digital transformation aren't all that stand in the way of innovation. "Resistance to change, data silos, cybersecurity, and skill gaps are significant barriers to digital transformation," says Zamora Avendaño. Business leaders and experts agree: 34% cite the significant time investment required to adopt and train people on new tools and workflows as the second biggest barrier standing in the way of digital transformation.

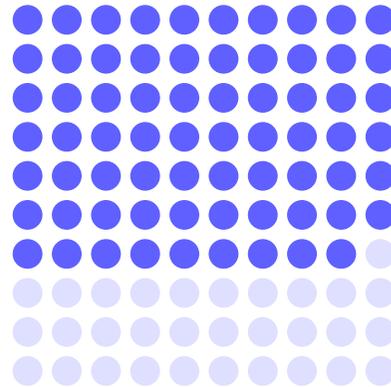
In the United States, seasoned operators, which comprise 30% of the industry's

1.7 million workers, will reach retirement age within the next 10 years.\* "There's definitely a brain drain in water because of people aging out," says Matt Valade, chief technology officer at Hazen and Sawyer, a water infrastructure construction company. "Many are also needing to find improved ways to become more efficient to do the same work but with less staff."

In the context of talent, digital maturity is increasingly recognized as a key factor for both attracting and retaining skilled workers.

## Technology and talent

**69%** say digital maturity helps attract talent



**36%**

are prioritizing hiring workers with digital project management skills



**33%**

are prioritizing hiring workers with data science and data management skills

Source: 2024 State of Design & Make report

\* Esri

## DIGITAL TRANSFORMATION IS NO LONGER OPTIONAL

“The new generations look at things a little bit differently,” says Elik Livay, vice president, water market leader at Gannett Fleming, an engineering consulting firm. “They’re looking towards our environment. They’re looking for work-life balance. They’re looking for advanced technology. One of the drivers to push for the technology is really to attract talent, and we now have a dedicated chief technology leader within each business group that’s looking for ways to integrate technology into everything we do.”

Thirty-three percent of the respondents to Autodesk’s 2024 *State of Design & Make* survey cite resistance to changing established processes as a barrier to digital transformation. “It is in the water industry’s

DNA to be risk adverse, as, for instance, we cannot afford *not* to provide safe drinking water nor to discharge harmful water to the environment after treatment,” Debruyne says. “Adding to this, water rates and investment are usually heavily regulated, as it is a public service; therefore our speed of transformation is not as fast as most industries, and we need to be cognizant of the adequate drivers and challenges.”

While resistance may be high, there’s a shared sense of urgency calling for more change across the industry. A staggering 97% of respondents to Autodesk’s 2024 *State of Design & Make* survey working in utilities and telecom, civil infrastructure, and engineering services say their organization is actively taking steps to

enhance sustainability. This comes at a time when nearly 70% of national climate plans under the Paris Agreement now include action plans focused on water security—a clear indicator of the urgent need for innovation.

The challenges the water industry faces illustrate the complexity of overhauling traditional systems and the need for a strategic approach to integrating digital technologies. Despite these obstacles, there’s overwhelming alignment around the imperative for digitalization. The water industry must navigate these financial, technology, and workforce barriers to ensure sustainable and efficient management of one of the planet’s most vital resources.

**“It’s daunting to consider the critical role of a water utility. We provide essential services to over 400,000 people. For instance, a water treatment plant must, without fail, provide treatment that meets state and federal water quality standards.”**

—Melissa Grove,  
business system technology  
administrator, Aurora Water



# A watershed moment

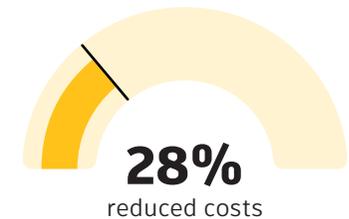
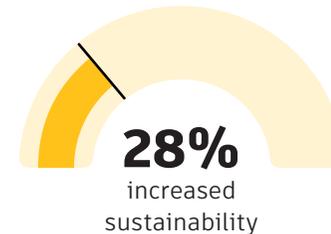
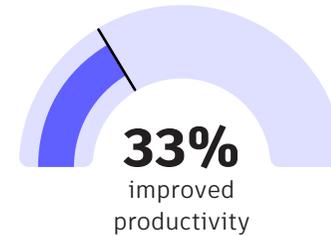
Long characterized by its cautious approach to technological adoption and innovation, the water industry now faces its watershed moment. The convergence of data availability, advanced technology, and pressing global challenges demands a fundamental shift in mindset. The tools and insights for disruptive change are within reach; what's required now is agility and a willingness to embrace change.

“When I started, people were still hand drawing, and we had one telephone for four people—nobody had a computer,” says Vinnie Hart, managing director of technical practices (EVP) at water engineering consulting firm Carollo. “Workflows have come a really long way. Now, it’s a question of how we’re capturing it and how we’re going to use it long-term.”

Organizations that have proactively adopted digitalization are already reaping significant rewards. In the past three years alone, 76% of *2024 State of Design & Make*

survey respondents in utilities and telecom, civil infrastructure, and engineering services say their organizations have increased investments in technology to deliver improved project outcomes, data management, and analysis. Nearly three-quarters (72%) of respondents say they have increased their spending on artificial intelligence (AI) and emerging technologies. These early adopters say they are reaping tangible benefits such as improved productivity (33%), enhanced profitability (30%), and increased sustainability (28%) from doing so.

## Productivity tops the list of digital transformation benefits



Survey question: Has your company or organization experienced any of the following benefits of digital transformation?



## A WATERSHED MOMENT

“The water industry has historically been data rich but information poor,” says GHD’s Debruyne. “To derive more value from data we need to break down silos (across asset lifecycle, across department, etc.), so compiling data in a common data environment or data lake for instance and utilities will likely end-up with a significant amount of data. The challenge is less and less how to collect and store this vast amount of data, instead how to derive fewer but tangible and actionable insights in a timely manner, in a way that can help manage and operate assets more efficiently.”

Janice Lusco, national discipline lead, business advisory practice at Arcadis—a sustainable design, engineering, and consultancy solutions company—agrees: “By using data, you can be proactive, rather than reactive. Think about it: You wouldn’t call your utility unless something was wrong. But what if they actually called you and said, ‘Hey, your

water usage pattern doesn’t look right. Can you go check?’ That brings opportunities, as it not only improves customer experience and customer satisfaction, but it also helps the utility control water loss and champion sustainability.”

Looking ahead, the momentum is only expected to grow—79% say they will continue to increase investments in technology aimed at enhancing project outcomes over the next three years, with similar rises in spending on AI and data management. According to GWI, global spend on data management and analysis will reach \$14.6 billion in 2024, up from \$12.3 billion in 2022. Yet, despite these positive trends, challenges remain. More than a quarter of the industry—26%—identifies data automation and digitalization as one of their top challenges while 20% highlight difficulties in procuring and managing digital solutions.

## Global spend on data management and analysis



Source: Global Water Intelligence (GWI)



## A WATERSHED MOMENT

“Data is going to be essential for water districts of the future,” says Matthew Brown, IT officer of Moulton Niguel Water District (MNWD), a California-based water utility. “Every drop matters, and what that means is we need to account for everything.”

This moment of transition is not just about adopting new tools; it’s about bridging the gaps between data collection, management, and actionable insights. As utilities continue to gather vast amounts of data, the challenge lies in effectively managing and integrating this information, particularly in areas such as meter data management and hydraulic modeling. Less than half of utilities, civil infrastructure, and engineering services respondents to Autodesk’s *2024 State of Design & Make* survey consider their organization’s design or operations automation, including use of artificial intelligence, to be “very mature” (43%). Closing this gap is crucial for utilities aiming to leverage data for pinpointing leaks, optimizing capital improvements, and enhancing overall operational efficiency.

**“Data is going to be essential for water districts of the future. Every drop matters, and what that means is we need to account for everything.”**

—Matthew Brown,  
IT officer of Moulton Niguel Water District (MNWD)

# The rapidly expanding role of AI and emerging tech

Although historically slow to adopt new technologies, the water industry is now leveraging digitalization to drive efficiency, enhance sustainability, and improve decision-making across the board. In fact, 80% of 2024 State of Design & Make respondents in utilities, civil engineering, and engineering services say the future growth of their companies hinges on the use of digital tools.

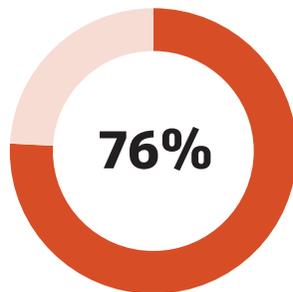
“As generative AI has become more mainstream lately, it generated hype in our industry, which is a good thing,” says Debruyne at GHD. “However, the downside is there could be confusion with regards to generative AI and analytical AI, and some may throw existing concepts and solutions in the same basket; some refer to this phenomenon as ‘AI washing.’ There is merit in clearly understanding the differences between the two, how they can be leveraged, knowing that numerous solutions and approaches can already be deployed leveraging AI and are already proven on-site for decades, such as machine learning to predict

pipe bursts or advanced aeration control on reclamation plants. In short, we should rely on the hype to accelerate transformation and awareness but remain granular and solution driven not to slow implementations and raise unnecessary concerns.”

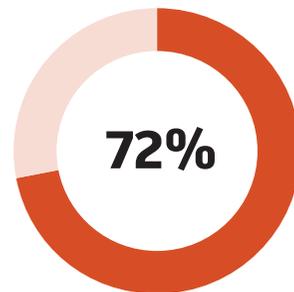
Investments in emerging tech are matching enthusiasm, with the majority of business leaders saying they will increase their investments in new technology in the next three years.

## Investments in AI and emerging tech continue to rise

In the past three years:

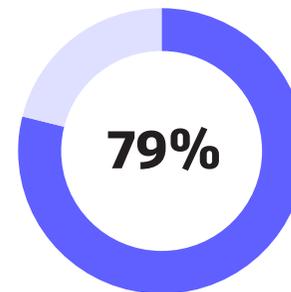


increased investments in **technology** to deliver improved project outcomes

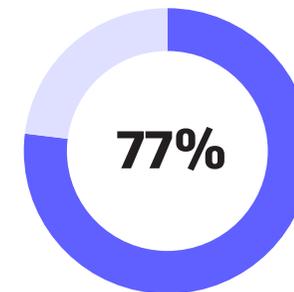


increased investments in **artificial intelligence** and **emerging technologies**

In the next three years:



will increase investments in **technology** to deliver improved project outcomes



will increase investments in **artificial intelligence** and **emerging technologies**

Source: 2024 State of Design & Make report

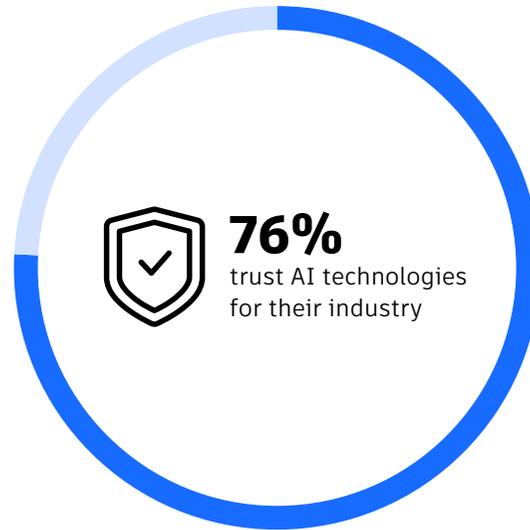


## THE RAPIDLY EXPANDING ROLE OF AI AND EMERGING TECH

Additionally, 66% of survey respondents say they believe that within the next two to three years, AI will be essential across all areas of their operations. That said, only 36% of survey respondents say their organizations currently leverage internal data to drive collaboration with AI and automation.

“We’re using it in small pockets,” says Brown of MNWD. “It might help us do a little bit of analysis on some data or help us generate some code faster when we’re building an application. We’re using it, then really checking the data and making sure that a human signs off on it.”

## Trust in AI is high



**79%**  
agree AI will enhance  
their industry



**66%**  
agree in 2-3 years AI will be  
essential across the board



**79%**  
agree AI will make the  
industry more creative



**63%**  
say they are approaching  
or have already achieved  
their goal of incorporating  
AI into their company

Source: 2024 State of Design & Make report

## THE RAPIDLY EXPANDING ROLE OF AI AND EMERGING TECH

More than three-quarters of survey respondents in utilities, civil infrastructure, and engineering services (76%) say they trust AI technologies for their industry, with 79% saying AI will enhance the sector and make it more creative.

“Trust is a bit of a strong word,” Erdal says. “Seventy-six percent of respondents

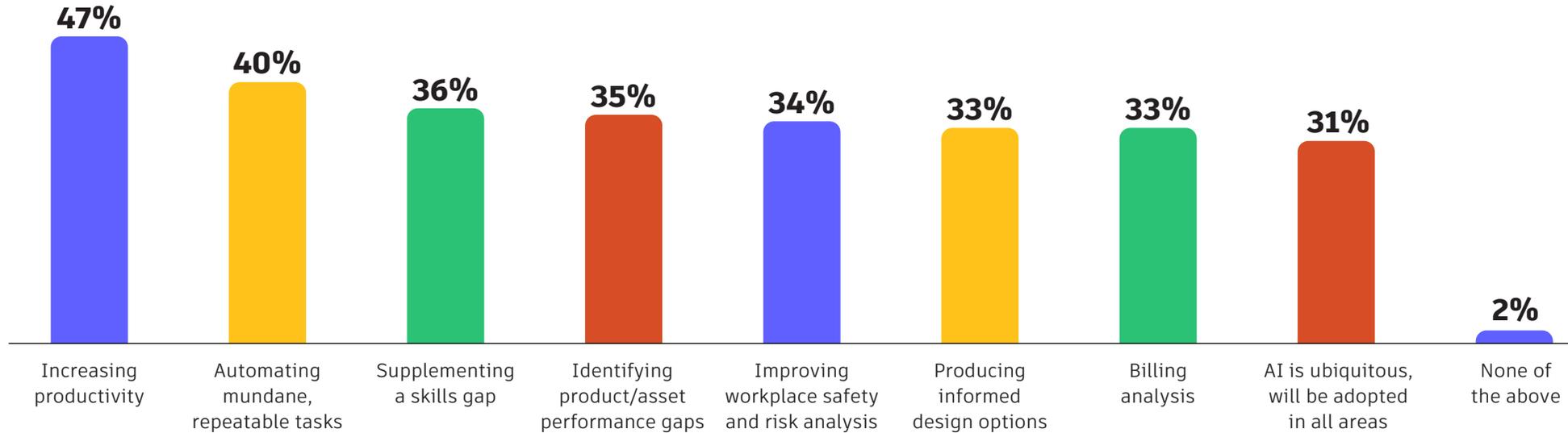
saying they trust AI is a pretty significant value. That trust is founded on the excitement, which is great. This is the time for us to build new tools that we can trust.”

Specific use cases of AI within the water industry highlight its potential to revolutionize operations.

In operations and asset management, AI is increasingly central to predictive maintenance, where complex performance data is automatically analyzed to detect early warning signs of infrastructure failure. Water professionals make hundreds of complex operational decisions daily based on human judgment and experience. AI can help extend their knowledge, filling

the gaps where plants don’t have enough people in place and optimizing treatment plants and networks to use less energy and chemicals. All of this makes drinking water safer and systems more resilient while assisting operators in preventing raw sewage and stormwater runoff from entering oceans, lakes, and rivers.

## AI use cases across the water industry



Source: 2024 State of Design & Make report

## THE RAPIDLY EXPANDING ROLE OF AI AND EMERGING TECH

The team at Aurora Water, a Colorado-based water utility, has had a first-hand view of how revolutionary these AI simulations can be. “We have thousands of miles of water lines to replace, which is too many to do even on a 100-year time frame,” says Shiva Sapkota at Aurora Water. “A couple of years ago, we engaged machine learning in our system to help predict where the next water line failure will be, so that we can prioritize that instead of trying to scramble to fix things once they break.”

To test the machine learning model, Aurora Water’s team held back a couple years’ worth of water line failure data that they had already collected. They then checked this against the predictions from the machine learning model. “When the results came back, we were satisfied with the outcome and adopted it,” Sapkota says. “Through that effort, we were able to significantly increase our capital funding. We went from \$2 million a year to almost \$15 million a year that we are spending on our line replacement program. I think this has been the largest spend we have ever made in the history of our utility, because the data is there to highlight how important it is to invest in this infrastructure.”

As the water industry continues to digitalize, the integration of these advanced technologies is not only enhancing operations but also driving a fundamental shift in how utilities approach asset management and resource optimization. Organizations that embrace the role of data and are proactive in onboarding emerging digital tools are not only positioning themselves for future growth but also leading the way in building a more resilient and sustainable water industry.



# The future of the water industry depends on data management

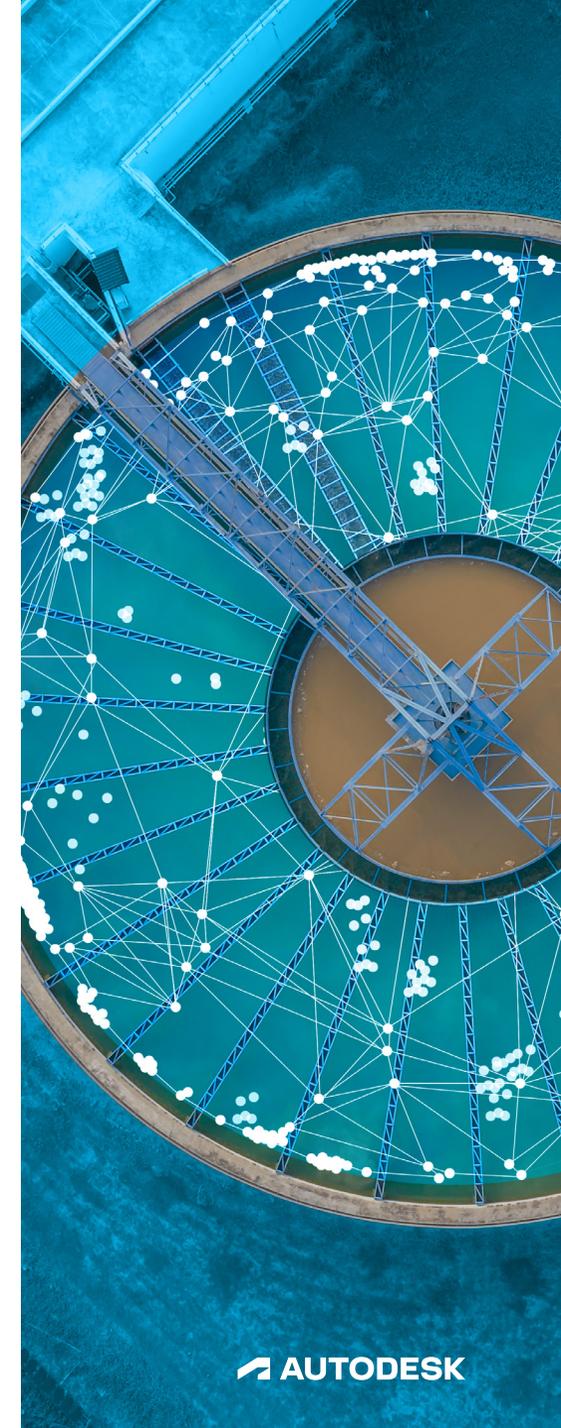
**As the water industry continues to evolve, the role of data is set to become even more critical in addressing both existing challenges and emerging complexities. The future of data in this sector holds immense potential to revolutionize operations, enhance sustainability, and drive innovation. However, with these opportunities come new challenges that will require robust technological solutions and strategic foresight.**

Data will be at the forefront of solving some of the most pressing issues in the water industry. From managing scarce resources more efficiently to improving infrastructure resilience, the ability to collect, analyze, and act on data will be crucial. Investment in advanced metering infrastructure, analytics, automation, and leak detection technologies is expected to accelerate over the next five years, expanding beyond the largest and most sophisticated utilities. This shift will empower a broader range of water and wastewater utilities to leverage data for more precise decision-making, ultimately leading to better resource management and reduced environmental impact.

The COVID-19 pandemic has underscored the value of remote monitoring and automation, particularly for utilities and industrial companies facing labor shortages. As these technologies become more widespread, they will enable organizations to maintain operational continuity with fewer on-site personnel, ensuring that critical water services remain uninterrupted even in times of crisis. Moreover, an increase in cyberattacks on water systems has highlighted the urgent need for enhanced cybersecurity measures. As the industry becomes more digitized, the integration of cybersecurity practices, coupled with firmer oversight from regulatory bodies, will be essential to safeguard against potential threats.

Collaboration and standardization within organizations and across the industry as a whole will play a vital role in enabling a more streamlined future.

“The California Data Consortium is one way we’re trying to share data with a number of other agencies that are part of the Consortium,” says Brown of MNWD. “Together, we hope to come up with some universal applications that can work across agencies. After all, all water districts are doing the same thing. If we can standardize some of this data collection, then we can potentially see some big results.”





## THE FUTURE OF THE WATER INDUSTRY DEPENDS ON DATA MANAGEMENT

Looking ahead, the challenges associated with managing and utilizing vast amounts of data will continue to grow. As more utilities adopt advanced technologies, the need for skilled professionals who can navigate the complexities of data analysis and digital project management will become increasingly critical. The industry will need to invest not only in technology but also in training and development

programs to ensure that the workforce is equipped to meet these new demands.

“In the next five years, I foresee a strong emphasis on data-driven decision-making tools,” says Zamora Avendaño. “Advanced [Internet of Things], artificial intelligence, and machine learning will enable more important data analysis and predictive capabilities.”

**“I think we’re just starting to scratch the surface on digital transformation in the water industry.”**

–Matt Valade, chief technology officer at Hazen and Sawyer



## THE FUTURE OF THE WATER INDUSTRY DEPENDS ON DATA MANAGEMENT

As data becomes more integrated into every aspect of water management, issues related to data privacy, security, and interoperability will emerge as significant concerns. The industry will need to develop and implement robust frameworks to address these challenges, ensuring that data is used ethically and securely while maximizing its potential to drive innovation and efficiency.

“I think we’re just starting to scratch the surface on digital transformation in the water industry,” says Valade of Hazen and Sawyer. “I’d say the biggest change we’ve seen is that our clients, even those who are not very swift adopters of technology, are really starting to understand that they need to deal with their data better, protect their data better, but also have the ability to use their data to collaborate on projects better. I’m excited to be at the forefront of that.”

The water industry is witnessing a transformative shift, with digital tools and emerging technologies playing a pivotal role in reshaping operations and outcomes. The organizations that seize this opportunity, adapting to the demands of the digital age with agility and foresight, will lead the way in shaping a more efficient, sustainable, and resilient water sector.

# Conclusion

**As the water industry continues to embrace digital transformation, data will play an essential role in solving critical problems, improving operations, and enhancing sustainability.**

“Over the past decade, our industry and company have seen tremendous benefits from digital transformation,” says Erdal from Black & Veatch. “Real-time data is going to be critical, offering deeper insights and facilitating better decision-making for us and our clients.”

To fully realize the benefits of this data-driven future, the industry must proactively address the challenges that come with it, from aging infrastructure and an evolving workforce to environmental threats and cybersecurity risks.

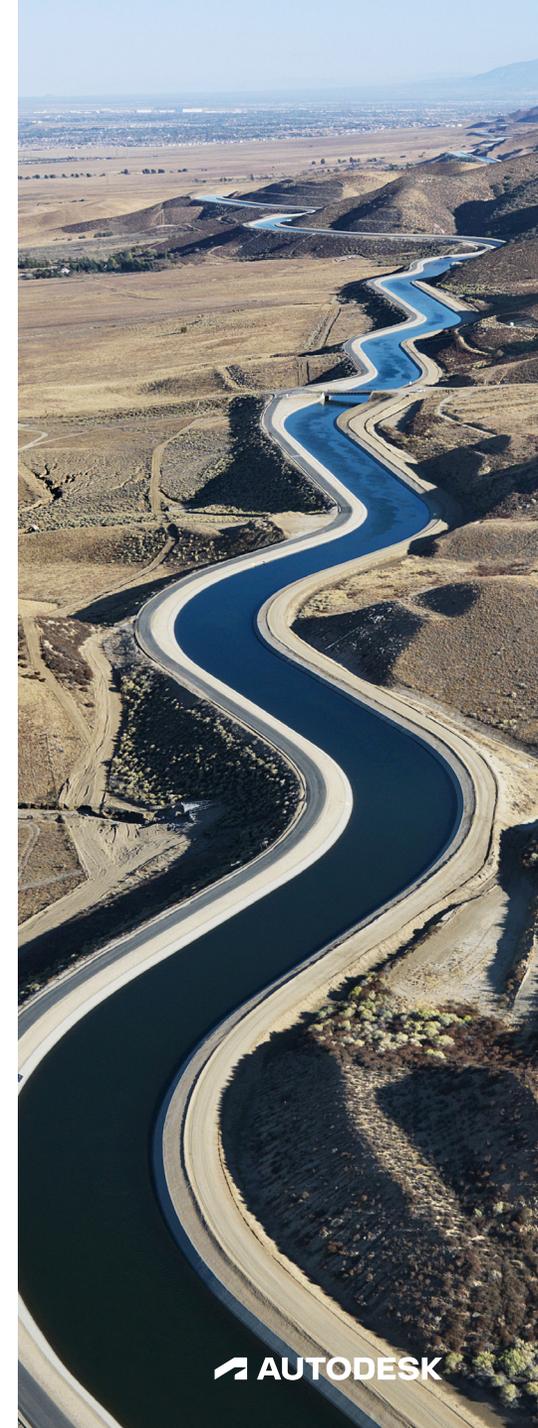
The path forward will require not only technological innovation but also a

strategic focus on developing the skills and frameworks necessary to fully realize the potential of digitalization. Connected, collaborative experiences will help the industry design, deliver, and operate complex projects in a unified ecosystem, breaking down silos of individual digital solutions and removing friction from workflows. AI will play a role throughout, offering expressive generative capabilities, personalized insights, and accelerated work.

By welcoming these changes, the industry can build a more resilient, efficient, and sustainable future for water management. The adoption of new technologies, tools, and skills is not just a strategy—it’s an

imperative to gain the most potential from digital transformation. The industry’s future growth and sustainability depend on it.

“Embracing a culture of innovation and creating a safe space for sharing ideas will help accelerate the value of digital,” Erdal says. “This will unlock new possibilities, improve workflows, and bring in a new era for how we design, build, and manage sustainable infrastructure.”



## About the *Spotlight on Data and Digitalization in the Water Industry* report

Data for the *Spotlight on Data and Digitalization in the Water Industry* report was compiled from the Autodesk 2024 *State of Design & Make* survey. This year's survey is comprised of 5,398 industry leaders, futurists, and experts in architecture, engineering, construction, and operations; design and manufacturing; and media and entertainment from countries around the globe. More information about the 2024 *State of Design & Make* survey and report can be found [here](#).

For the purposes of the *Spotlight on Data and Digitalization in the Water Industry* report, we combined 2024 *State of Design & Make* survey data from the utilities and telecom, civil infrastructure owners, and engineering service provider subindustries, totaling 687 respondents.

The *Spotlight on Data and Digitalization in the Water Industry* report also includes qualitative interviews from leaders and experts across the water industry.

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