



Creating resilience through
innovation:

How water utilities can harness
customer experience, digital twins
and AI to build future readiness



Water intelligence: An NCS whitepaper



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We've released this whitepaper – Creating resilience through innovation: How water utilities can harness customer experience, digital twins and AI to build future readiness – exploring how customer experience, digital twins, and artificial intelligence are delivering measurable outcomes for water utilities and the communities they serve.

In this publication, we bring together real-world examples from NCS clients and share how we've delivered value. We pair this with fresh insights from our team, offering clients creative perspectives and practical tips to guide decision making and maximise the benefits for your organisation.

We encourage you to challenge us. As a team, we are committed to listening to your complex problems and needs, as well as your boldest ideas. We're ready to make the extraordinary happen – together, and support you with finished, future-proof solutions. Whether it's reimagining legacy systems or seeking to unlock transformative value through AI, we're here to take the challenge on.

If you are ready to have a conversation, reach out to our team today.

Key insights

The convergence of operational technology (OT) and information technology (IT) is reshaping the water sector. Utilities that invest in integrated, data-driven platforms are building the foundations for resilience, agility, and sustainability. Customer experience, digital twins, and AI each offer powerful tools to respond – but their true power is realised when deployed together.

managers and insights for optimising infrastructure operations and planning for long-term impacts. This can provide water utilities with the capability to explore and visualise emerging consumption patterns and their effects on the functioning of water systems and can provide predictive analytics for asset maintenance.

Digital resilience and AI

As utilities progress along the maturity curve, AI will shift from being an add-on capability to becoming core business DNA. AI changes this equation by transforming raw data into actionable intelligence that drives efficiency, resilience, sustainability, and improved customer outcomes.

Customer experience

In the era of AI, people couldn't be more crucial. The utilities that thrive will be those that embed the customer at the centre of their strategy, using digital tools not merely to modernise service, but to build resilience, trust, and long-term relationships.

Digital transformation

The greatest opportunities for transformation in the water industry lie deeper within the operational backbone: the networks, assets, and supply chains that keep services running. Digital twins provide valuable analysis for water utility



How NCS can help

NCS drives responsible growth across sectors like energy, utilities, mining, chemicals, manufacturing, and construction, enhancing businesses through smarter decisions and optimised operations to deliver operational efficiency, safe and compliant operations, along with enriched employee and customer experiences.

We partner with organisations to help our clients navigate this shift – bringing proven capabilities in digital platforms, AI integration, and cloud transformation. By applying these technologies in context, we can support your team to take practical steps towards better management of water utilities.

At NCS in Australia, we are reinventing technology services from the inside out. We provide advisory, design, build and managed services to our clients, with unrivalled service, attention and understanding every step of the way.

Our energy, utilities and resources expertise

Energy, utilities and resources companies play a crucial role in supporting economic growth, ensuring energy security, and promoting sustainable development through innovative technologies and infrastructure investments.

Brooke Mabry is our Energy, Utilities and Resources Lead at NCS Australia. Brooke has authored this white paper in collaboration with several other leaders across our business. Lasath Kahingala, NCS Australia's Data and AI Consulting National Lead, has shared data and AI insights; while Steve Avery, Stuart Clift and Scott Harford – senior Account Executives and Managers in the Energy, Utilities and Resources industry – have added their valuable insights too.

Together, the team are focused on delivering **value for our clients, and our clients' customers** – with adaptive approaches, outcomes and thinking. They pair this with **deep industry knowledge** to help our clients succeed, every step of the way. At NCS, we think differently and we are always up for the challenge. Discover how by connecting with our team today.

Creating resilience through innovation: How water utilities can harness customer experience, digital twins, and AI to build future readiness

Water utilities today stand at a crossroads. On one side are the familiar challenges: ageing infrastructure, natural disasters, increasing regulation, and tight budgets. On the other side are new pressures – climate change, shifting customer expectations, cyber threats, and rapid technological disruption. Together, these forces demand a new way of operating, one that is not only efficient but also resilient, adaptive, and future-ready.

Across Australia and around the world, water utilities are beginning to harness digital technologies to meet this moment. Customer experience platforms, digital twins, and artificial intelligence are no longer theoretical innovations; they are practical tools delivering measurable outcomes for utilities and the communities they serve. This white paper explores how each of these three domains is transforming the sector, and how utilities can chart a path to future readiness by embracing them together.

Digital resilience and AI: Turning information into intelligence

The water sector is data-rich but insight-poor. SCADA systems, IoT sensors, billing platforms, and customer channels generate terabytes of data every day, yet much of it remains siloed, underutilised, or untapped. Artificial intelligence changes this equation by transforming raw data into actionable intelligence that drives efficiency, resilience, sustainability, and improved customer outcomes.

In this part of our white paper, Lasath Kahingala, NCS Australia's Data & AI Consulting National Lead, shares his insights about transforming information into intelligence with data and AI.



The maturity curve

Utilities' use of AI typically progresses through four stages:

1. **Foundational:** consolidating and governing data.
2. **Descriptive:** visualising "what happened" through dashboards.
3. **Predictive:** using machine learning to forecast "what could happen."
4. **Prescriptive/autonomous:** enabling AI to recommend or initiate actions.

Most Australian utilities sit between descriptive and predictive stages, with pilots underway in asset maintenance, water quality monitoring, and demand forecasting. The convergence of generative AI and digital twins points toward a future where end-to-end process re-imagination delivers outcomes well beyond productivity gains, including resilience, sustainability, and entirely new ways of operating.

Opportunities across the value chain

AI presents opportunities at every stage of the water lifecycle:

Catchment management – satellite imagery and AI to monitor land use and runoff risks.

Treatment plants – predictive dosing to optimise chemicals and reduce energy use.

- **Distribution networks** – early leak detection and predictive demand balancing.
- **Customer service** – generative AI to deliver personalised recommendations, proactive engagement, and 24/7 support.
- **Incident management** – real time immersive technology to improve operation centres' efficiency through a unified platform.
- **Regulation and compliance** – automated reporting and monitoring to ensure assurance at scale.

Emerging possibilities

Beyond current pilots, AI unlocks transformative potential across five key domains:

- 1. AI-driven operational efficiency** – predictive analytics and IoT-enabled monitoring reduce unplanned downtime, optimise pumping and energy, and detect leaks or quality deviations early.
- 2. Resilient and adaptive systems** – scenario modelling and digital twins simulate droughts, floods, and contamination, enabling proactive planning and climate-resilient infrastructure.
- 3. Enhanced customer engagement** – predictive insights support proactive service alerts, leak notifications, and tailored sustainability advice, supported by AI-enabled chatbots and self-service tools.
- 4. Sustainability and circular economy leadership** – AI tracks ESG metrics, optimises reuse, and enables recovery of energy and nutrients from waste streams, positioning utilities as leaders in the circular economy.
- 5. Innovation and new business models** – AI creates opportunities for “water-as-a-service,” dynamic pricing via smart meters, and monetisation of predictive insights for partners such as insurers and urban planners.

Overcoming barriers

Adoption is not without its challenges. Fragmented legacy systems, inconsistent data quality, and limited in-house capability often slow progress. Overcoming these challenges requires strong data foundations; targeted workforce upskilling; and a culture that encourages innovation, while managing risk. A holistic approach is critical for utilities to experiment confidently, scale responsibly, and deliver sustainable value – especially in a sector where infrastructure is critical to every citizen.

The road ahead

As utilities progress along the maturity curve, AI will shift from being an add-on capability to becoming core business DNA. Future operations will see AI guiding crews, optimising energy use, balancing demand in real time, and ensuring seamless customer interactions. Over time, AI will be as fundamental to utilities as pumps and pipes – an embedded capability powering smarter, more resilient critical infrastructure, and more sustainable water services.

At NCS, we bring the experience that shows we can support our clients with navigating digital transformation and change, regardless of where clients are on their journey with digital resilience and adopting AI. As one example, we previously supported a national agency with a successful risk assessment to determine the cyber security posture of its critical information infrastructure.



Customer experience: From service provider to trusted partner

For decades, customer engagement in the water sector was largely transactional. Utilities delivered a commodity, billed for it, and responded to faults or complaints. But the expectations of today's customers are far more complex. Influenced by their interactions with banks, telcos, and retailers, customers expect seamless digital experiences, proactive communication, and personalised service. They also expect their utility to reflect community values such as sustainability, transparency, and social responsibility.

This shift redefines the role of the water utility. It is no longer sufficient to deliver safe and reliable water; utilities must also earn the trust and loyalty of their customers. And trust is not built through billing statements or call centres alone – it

is forged through every interaction, digital or human.

Scott Harford, an Account Executive at NCS Australia who contributes his expertise to our Energy Utilities and Resources team, discusses the changing expectations of customers and explores the benefits of having a customer-centric model for amplifying outcomes.

The changing expectations

Customers increasingly want utilities to anticipate their needs, rather than simply respond to them. Whether it is early notification of a service outage, personalised advice on water conservation, or transparent updates during a contamination event, customers expect proactive communication. They also want to be empowered with self-service tools: mobile apps to track usage, chatbots to answer simple questions, or dashboards that help them understand their environmental footprint.

At the same time, customers are more diverse than ever. A single utility may serve households, small businesses, industrial users, and vulnerable communities – each



with unique needs. Meeting these expectations requires segmentation, personalisation, and empathy at scale, which in turn depend on robust data and digital platforms.

Building a customer-centric model

To deliver these outcomes, utilities are shifting from reactive customer service models to customer-centric operating models. Key enablers include:

- Unified digital platforms that bring together billing, service requests, and outage notifications into a single customer view.
- Analytics-driven insights that help utilities understand consumption patterns, predict churn, or identify customers at risk of payment difficulty.
- Omnichannel communication so customers can engage on their channel of choice – whether SMS, web, app, or voice – while receiving a consistent experience.
- Personalisation engines that tailor messages, advice, and offers to

individual customers, improving engagement and satisfaction.

When combined, these elements allow utilities to move from being reactive service providers to trusted partners who support their communities.

PUB, Singapore's national water agency, needed to modernise its digital presence to better serve its diverse stakeholders. NCS partnered with PUB to redesign their website and create a unified portal, enhancing accessibility, improved end-user experience and streamlining access to vital services. The intuitive navigation has simplified access to information and services, resulting in a 28% increase in overall satisfaction, as measured by the WOGAA statistics in June 2024 after the go-live.

To address long wait times often experienced in call centres, NCS developed a hyper-realistic human conversational AI concierge leveraging advanced chatbot and voicebot capabilities. The solution streamlines enquiries and engages customers more effectively.

Benefits beyond the customer

Improving customer experience delivers value beyond satisfaction scores. By reducing inbound calls through proactive communication, utilities can lower costs. By identifying customers at risk of hardship earlier, they can intervene more compassionately and reduce bad debt. And by engaging customers in conservation or recycling programs, utilities can extend the life of existing infrastructure, delaying the need for costly expansions.

Customer centricity and focusing on delivering value for our clients' customers is integral to how we work at NCS. As well as asking the right questions, we bring a track record of proven results, with our work transforming the Ministry of Manpower (MOM)'s Contact Centre just one example of work we've done to deliver an unsurpassed experience for customers. The use of generative AI capabilities has helped to unlock benefits to streamline Contact Centre operations and improve customer experiences at MOM – with NCS named AWS APJ Public Sector Consulting Partner of the Year for the Asia Pacific and Japan following this pivotal work.

Future outlook

Looking ahead, customer experience in water will increasingly be shaped by generative AI, hyper-personalisation, and integration with smart home devices. Imagine a scenario where a customer receives an alert not just about a leak in their home, but also a predictive estimate of the financial and environmental impact – alongside immediate options to book a plumber. Such experiences position the utility not just as a service provider, but as a partner in the customer's life.

Ultimately, the utilities that thrive will be those that embed the customer at the centre of their strategy, using digital tools not merely to modernise service, but to build resilience, trust, and long-term relationships.

Operational efficiency: From reactive maintenance to predictive resilience

While customer-facing innovation often captures the spotlight, the greatest opportunities for transformation in the water industry lie deeper within the operational backbone: the networks, assets, and supply chains that keep services running. For Australian water utilities, climate change, urban growth, and ageing infrastructure are putting unprecedented pressure on these systems. At the same time, regulatory and budgetary constraints are tightening, requiring utilities to achieve more with less.

Digital transformation offers a way forward, as Steve Avery, and Stuart Clift, two experienced Account Managers working with the Energy, Utilities and Resources industry, share.

By leveraging real-time data, advanced analytics, and automation, utilities are shifting from reactive, labour-intensive approaches to proactive, predictive, and increasingly autonomous modes of operation. This shift is not only about cost reduction; it is about

building resilient, adaptable organisations capable of delivering safe, sustainable services in the face of uncertainty.

Digital twins provide valuable analysis for water utility managers and insights for optimising infrastructure operations and planning for long-term impacts. This can provide water utilities with the capability to explore and visualise emerging consumption patterns and their effects on the functioning of water systems and can provide predictive analytics for asset maintenance.

Reactive maintenance vs predictive resilience

Traditional maintenance approaches – whether based on fixed schedules or emergency repairs – are inefficient and often costly. Fixed schedules can lead to unnecessary interventions, while reactive maintenance exposes utilities to service disruptions, higher costs, and safety risks.

Predictive resilience, enabled by sensors, IoT devices, and AI-driven analytics, allows utilities to monitor asset conditions in real time and forecast when intervention is required. By detecting anomalies early, operators can intervene before failures occur, reducing unplanned downtime and extending asset life. The benefits extend well beyond reliability. Predictive approaches cut operational expenditure, reduce after-hours callouts, and improve workforce safety by lowering the need for urgent field interventions.

North East Water provides a clear example. By deploying a hybrid digital twin that integrates SCADA and IoT data

into a predictive maintenance platform, the utility reduced after-hours pump inspections and repairs by around 16 per pump per year. Machine learning models now flag pump anomalies before they escalate, empowering frontline staff with real-time insights and reducing both costs and disruption.

Network optimisation and real-time visibility

Water networks are complex, dynamic systems, yet many utilities operate with limited real-time visibility into performance. As demand patterns shift and environmental conditions fluctuate, this lack of transparency leads to inefficiencies and risks.

Digital twins and real-time telemetry are addressing this challenge by enabling dynamic simulation of network behaviour. Utilities can now optimise pressure management to reduce leakage and pipe bursts, improve pumping efficiency to lower energy costs, and monitor water quality across the network.

Melbourne Water has demonstrated the power of this approach through a cloud-based digital twin that simulates its recycled water production process. NCS helped Melbourne Water to integrate data from multiple platforms and using predictive AI models helped to anticipate factors that could affect the production of recycled water. Integrated with predictive AI models, the platform forecasts turbidity issues with 80% accuracy up to three days in advance.



This capability not only allows for proactive operational adjustments but also provides customers with early warnings about service impacts, strengthening trust and transparency.

Smarter lifecycle planning

Managing the lifecycle of capital-intensive infrastructure is one of the water sector's most strategic challenges. Traditionally, renewal or refurbishment decisions have been made on the basis of asset age, often leading to premature investments or costly delays.

Data-driven lifecycle planning changes this dynamic. By consolidating performance metrics, condition assessments, and risk profiles into integrated models, utilities can prioritise investments based on criticality and remaining useful life. This ensures that scarce capital is deployed where it delivers the greatest impact.

Such approaches also strengthen accountability. With regulators and communities demanding greater transparency, digital lifecycle models provide robust evidence for investment decisions, enabling utilities to demonstrate

how they are balancing cost, risk, and service outcomes.

Taking the next step

Now is the time to act. By defining your priority challenges, mobilising your data, and working with experienced technology partners, you can unlock new levels of performance and sustainability in your asset operations.

Reach out to our team today if we can support you and your business on your transformation journey.

To find out more [visit >](#)