

The Digital Journey of Water and Sanitation Utilities in Latin America and The Caribbean:

What is at Stake and How to Begin

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**The digital journey
of water and sanitation
utilities in Latin America
and the Caribbean:
what is at stake and
how to begin**





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Index

Introduction

1		6
	What digital transformation is and why it goes beyond technology	7
2	2.1 The basics of digital transformation.....	7
	2.2 Global and cross-industry momentum for digital technologies.....	9
	2.3 Driving forces across the water sector.....	13
	2.4 A transformation beyond technology	14
	The inescapable digital transformation of water utilities	17
3	3.1 The rise of the modern utility.....	17
	3.2 Digital transformation is a process	20
	3.3 Key success factors for digital transformation.....	22
	3.4 The cybersecurity dimension of digital transformation.....	23
	3.5 Digital transformation: lessons learned from the COVID crisis.....	25
	Examples of digital technology deployments	28
4	4.1 An omnichannel experience for the end customer	29
	4.2 Real-time water consumption management.....	31
	4.3 Geospatial AI solution to prioritize and optimize investment.....	33
	4.4 AI to reduce cost and risk in the operation	34
	4.5 Improve water quality and asset management decisions with a digital twin	35
	4.6 Fluid and efficient remote working	36
	4.7 Efficient on-site data collection and analysis	37
	4.8 Empowering employees through digital learning.....	38
	4.9 Collaboration and coordination of works in urban areas.....	40
	4.10 Remote assistance with AR	41
	4.11 AI for pollution prevention from sewers	42
	4.12 Digital twins to model the city	43

Regional focus on LAC		44
5	5.1 LAC digital landscape	44
	5.2 What is at stake for water utilities in LAC and how digitalization can help	48
Fresh ideas and practical steps to embrace change in LAC		53
6	6.1 Voices from the ground: Two examples, tips, and recommendations from two utilities in Latin America	54
	6.2 Think outside the box	58
	6.3 Closing the dialogue gap between utilities and start-ups	62
Getting started: A 13-question guide		67
7		
Conclusion		72
8		
Bibliography		73
9		

List of Figures and Tables

Figures

Figure 1:	Investment in digital technologies is at the top of the agenda to drive growth	11
Figure 2:	Key pillars of digital transformation.....	14
Figure 3:	The digital transformation journey and adoption phases in utilities.....	21
Figure 4:	Demography and urbanization in the LAC region	46
Figure 5a:	The technology talent gap in Latin America.....	47
Figure 5b:	Number of developers per country in Latin America’s tech market.....	48
Figure 6:	Exposure to drought in the LAC region over the past three years.....	49
Figure 7:	Water measurement and public awareness in Latin America.....	52
Figure 8:	Scope of the Global System for Mobile Communications (GSMA) Mobile Utilities initiative.....	59
Figure 9:	Scope of the Global Innovation Challenge (GIC) in Singapore	60
Figure 10:	The Xylem Global Student Innovation Challenge by the numbers	61
Figure 11:	Life cycle of the Trial Reservoir initiative	66

Tables

Table 1:	Glossary of terms in the digital ecosystem.....	8
Table 2:	Top technologies of 2021	10
Table 3:	Three main areas of digital technology application in utilities.....	18
Table 4:	Areas of focus for cybersecurity threats to utilities	24
Table 5:	Examples of digital solutions to tackle operations and finance issues during the pandemic	27
Table 6:	Snapshot of WaterInno Accelerator activities	63

Acronyms

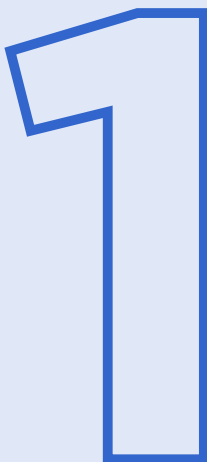
3D	Three-dimensional
AFD	Agence Française de Développement
AI	Artificial intelligence
AR	Augmented reality
CRM	Customer relationship management
EU	European Union
GIS	Geographic Information Systems
HR	Human resources
IDB	Inter-American Development Bank
IOT	Internet of things
IT	Information technology
LAC	Latin America and the Caribbean
OECD	Organisation for Economic Co-operation and Development
OT	Operational technology
SCADA	Supervisory Control and Data Acquisition
SDG	Sustainable Development Goal
SME	Small and medium enterprise
SMS	Short Message Service
TA	Technical assistance
TCO	Total Cost of Ownership
UN	United Nations
WEF	World Economic Forum

Introduction

This report provides a foundation for digital transformation of water and sanitation utilities and illustrates how emerging technologies, new types of organizations, and forms of working can improve service performance and address issues related to water and wastewater management. It also explores the fundamental dimensions of digital transformation and highlights key success factors in the deployment of new solutions, as well as trends associated with data profusion and operational interconnectivity. The report offers a sampling of recent deployments in a variety of business areas within water utilities and describes how utilities in the Latin American and the Caribbean (LAC) region can embrace change. Lastly, the report insists on the notion of the digital ecosystem surrounding water utilities and shares examples of new types of collaboration and partnerships to facilitate the journey. The digital imperative for companies in multiple business sectors is a megatrend that is here to stay. The water and sanitation sector is no exception, and it can benefit enormously from the adoption of new technologies.

We aim to answer the following questions: What does digital transformation mean for the Water and Sanitation sector? What insights can be leveraged from peers around the world? What are the learning points for the LAC region, considering the specific local context and its priorities? The authors also want to offer some tangible illustrations and actionable insights for professionals, wherever their organizations stand along the journey to a fully digital, connected, and data-driven company.

The target audience is anyone interested in this sector, with a special focus on key actors in the ecosystem (such as regulators as well as practitioners). The goal of this paper is to raise awareness among people from water and sanitation utilities and provide them with insights to get started with the digital journey.



A photograph of two call center agents, a woman and a man, both wearing headsets and smiling. The woman is in the foreground, looking towards the camera, while the man is slightly behind her, looking to the side. They are in a professional office setting.

What digital transformation is and why it goes beyond technology

This section explores the foundations of digital transformation, offering definitions, highlighting the key technological building blocks, and explaining why this trend is more than IT and data.

2.1 The basics of digital transformation

Digital transformation is a broad term. It can be generally defined as the evolution of an organization's activities, processes, and competencies to address the growing importance of digital technology in all aspects of business. Table 1 proposes key definitions.

Digital transformation entails a series of activities and different levels of change within the organization. According to Gartner,¹ “Digital transformation can refer to anything from IT modernization (for example, cloud computing), to digital optimization, to the invention of new digital business models. The term is widely used in public sector organizations to refer to modest initiatives such as putting services online or legacy modernization. Thus, the term is more like ‘digitization’ than ‘digital business transformation.’”

¹ <https://www.gartner.com/en/glossary>.



Table 1:
Glossary of terms in the digital ecosystem

Terminology	Definition	Examples
Modernization	Process of adapting something to modern needs or habits. ^a	<ul style="list-style-type: none"> Establish a call center to allow customers to call and submit requests remotely. Open decentralized customer front desks with extended operating hours.
Dematerialization of processes	Move from physical actions to electronic transactions or operations.	<ul style="list-style-type: none"> Send water bills via email or SMS. Enable payment via internet. Receive bills from suppliers electronically.
Digitization	Convert analogical data to numerical data (move from analogical to digital)	<ul style="list-style-type: none"> Convert a paper list of meter readings into an electronic database.
Digitalization	The process of using digitized information to make established ways of working simpler and more efficient.	<ul style="list-style-type: none"> Send customers an SMS with the amount of the next bill.
Digital transformation	Digital transformation is the process of using digital technologies to create new — or modify existing — business processes, cultures, and customer experiences to meet changing business and market requirements. “This reimagining of business in the digital age is digital transformation.” ^b Digital transformation is a foundational change in how an organization delivers value to its customers/users.	<ul style="list-style-type: none"> Detect leakage using remote sensors in real-time and automatically sort field interventions into a priority hierarchy. Design water network extensions using digital twins and 3D models. Automatically inform customers via mobile app in the event of a network water quality issue. Use surveys and call center data to identify main complaints and proactively improve customer engagement strategy. Use 3D printing to produce spare parts quickly in the field. Leverage operational data (energy, failure, temperature, etc.) for predictive maintenance. Use digital twins to coordinate with other actors active in the urban space for planning and designing the systems and networks differently.
Digital transformation journey	The process of adopting digital technologies.	<ul style="list-style-type: none"> Set objectives, establish program governance, develop a road map, nominate a sponsor, adapt processes, etc.

Source: Authors.

^a Oxford English Dictionary.

^b Salesforce (2021).

2.2 Global and cross-industry momentum for digital technologies

The roles of IT and technology are more critical than ever in a world that is increasingly digitally dependent. Organizations are under mounting pressure to stay competitive and create connected experiences for employees, suppliers, and customers. The momentum for digital transformation accelerated during the COVID-19 pandemic, as remote work became the norm. In that context, technologies such as cloud computing, AI, and machine learning increased in use.

Table 2 below contains a list of the top technologies of 2021 whose presence has accelerated across multiple business sectors. These also apply to the water industry – with different levels of maturity.

Table 2:
Top technologies of 2021

Trend and technology area(s) of focus	Business applications and benefits
3D printing/additive manufacturing + data	Additive manufacturing uses computer-aided design software or 3D object scanners to direct hardware to deposit material in precise geometric shapes.
5G	Deployment of 5G infrastructure and 5G network can provide speed for increased bandwidth and reliable connectivity. 5G enables better IoT connectivity, enhances user experience, and improves digital collaboration.
Artificial intelligence AI	Wide range of application areas, such as compliance, decision making, and forecasting, as well as natural language processing, machine learning, and predictive analysis. AI can help make timely repairs and adjustments in a way that poses fewer inconveniences for citizens.
Internet of things IoT	Large-scale deployment of connected devices. IoT allows for precise control over water resources data. Smart meters have become the most popular IoT device. Water sensors track water quality, temperature, pressure, consumption, and more.
Automation	Use of control systems for handling different processes and machinery in an industry to replace human labor. Deployment of solutions to automate repetitive office tasks. Benefits include work efficiency and infrastructure reliability, accelerated response to emergency events, and reduction of maintenance costs.
Blockchain	<p>A blockchain is a growing chain of digital records. The technology enables businesses to remove intermediaries and can be used to deal with water trading that involves the voluntary exchange of water access rights (i.e., the way we manage and operate access to assets like water).^b</p> <p>A clear benefit offered by blockchain technology is transparency. Moreover, the technology can also make record keeping more consistent, streamlined, and automated.</p>
Customer relationship management - CRM and data analytics	Enables data-driven, analytics-based customer experience. Proposes personalized, omnichannel experience across the customer lifecycle.

Source: Authors – adapted from various sources (see footnotes).

^a GE (2021).

^b Weisbord (2018).

Because of this constantly changing technological environment, organizations will see an increase in “digital-ready culture.” Clients and consumers demand consistent engagement with their suppliers across their preferred channels, utilizing more than one channel during their customer journey (i.e., ability to seamlessly reach customers via SMS, email, in-app push, and social channels).

Digital transformation is happening now and is here to stay

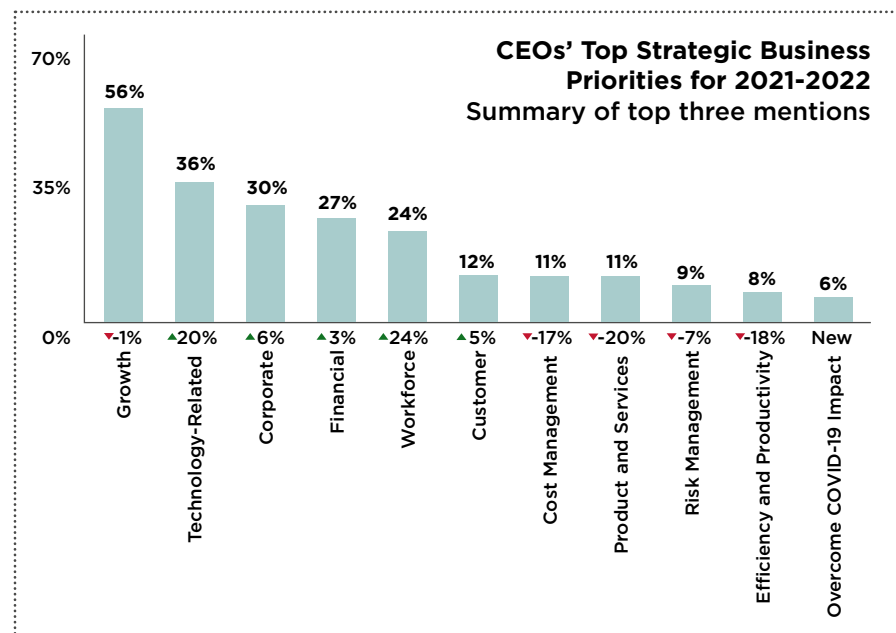
The term *digital transformation* has become increasingly popular over the past few years, even though IT intensification across businesses started decades ago. However, data profusion/explosion, systems integration, automation, and connectivity have meant a change of paradigm, precipitating dramatic shifts in the ways that companies operate and serve clients.

Figure 1 below shows how modernization and technology integration are poised to remain top priorities in the coming years and will drive significant investments. These transformations will also be seen and experienced in the water sector.

Investment in technologies that are the backbone of digital transformation is at the top of the agenda to drive growth in a variety of business areas. In the water sector, it can also support quality, reliability, and performance optimization.

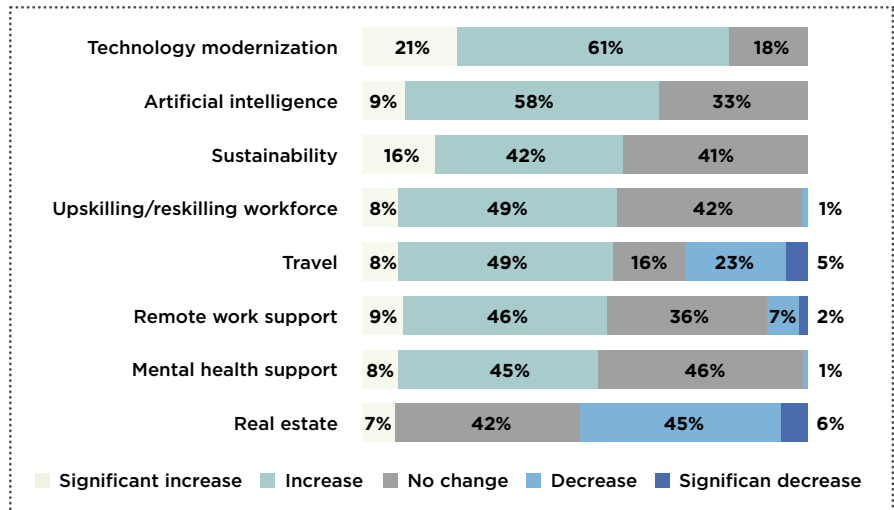
Figure 1: Investment in digital technologies is at the top of the agenda to drive growth

The 2021 Gartner CEO Survey² shows that CEOs are placing their growth bets on new segments and increasing investment in digital initiatives.



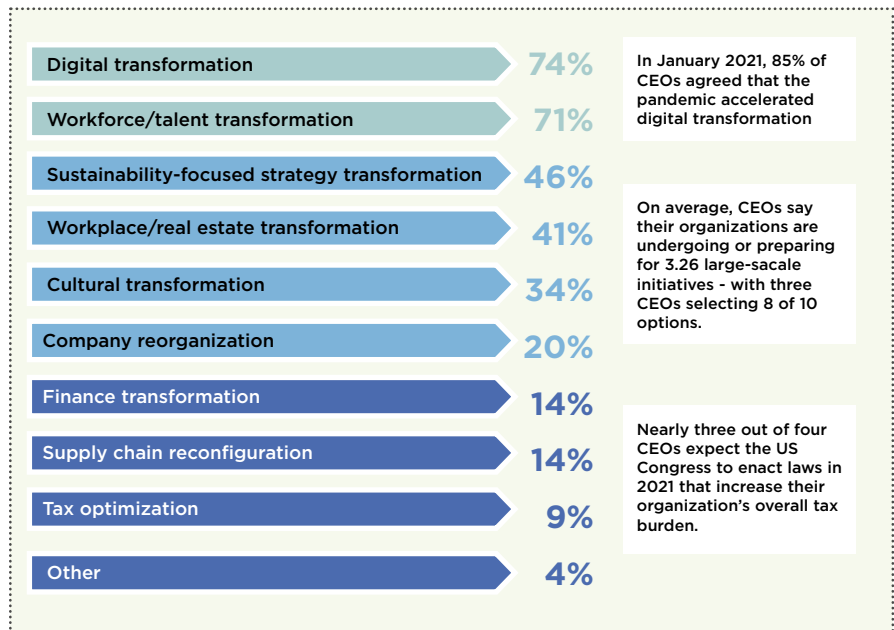
² <https://www.gartner.com/smarterwithgartner>.

According to the Fortune/Deloitte CEO Survey, (2022), spending will continue to increase in technology modernization and AI.



CEOs were asked if they considered their organization to be undergoing or preparing for any of the following large-scale initiatives:

Nearly three out of four indicated their organization is undergoing or preparing for digital transformation.



2.3 Driving forces across the water sector

According to Global Water Intelligence (GWI) (GWI, 2016), there are three main driving forces for digital transformation of the water sector:

Improving efficiency:

This is the most important driver for adoption of data-driven solutions. Industrial plant operators and utilities alike are constantly seeking ways to optimize all aspects of their operations, ranging from treatment processes to network management to customer interactions. Smarter solutions enable greater efficiency in a multitude of ways, helping to achieve cost savings on the supply side through reductions in energy use, chemical consumption, and leakage, right through to improved customer services that give utilities and their customers access to more detailed information about their water usage. A major element of improving efficiency also relies on the aggregation of data from a wider array of sources, from internal data about customer billing to external data from weather stations, river flow gauges, and geological surveys. All of this brings a greater need for sophisticated software that can integrate, analyze and display this information to provide end-users with valuable and actionable insights.

Cost:

Linked to efficiency is a second major driver, which is end-users' desire to reduce costs. Smart solutions for improved oversight, automated control, leakage monitoring, asset management, and non-revenue water (NRW) reduction can lead to huge cost savings through lower energy consumption, chemical use, and labor costs. Although the price of these advanced systems has previously hindered wider uptake, the increase in software-as-a-service (SaaS) approaches will allow more end-users to reap the economic benefits without large upfront capital costs.

Regulation:

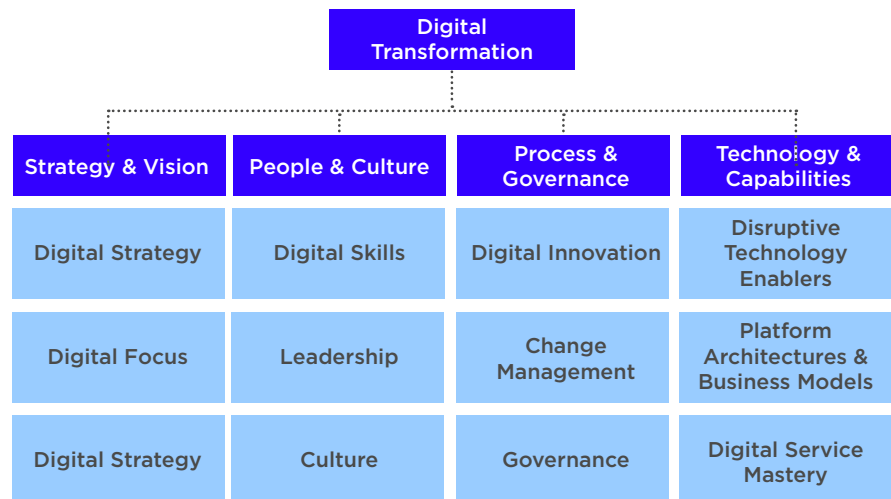
Tightening regulations continue to drive spending for both the utility and industrial end-users, and smart solutions help them ensure compliance. These regulations push the wider adoption of digital solutions across the water sector. Stricter standards for drinking water quality, water abstraction rules and wastewater discharge will not only drive the uptake of sensors to measure water and wastewater quality, but also push utilities to improve the services offered to their customers.

2.4 A transformation beyond technology

Digital transformation is changing the way of doing business and the water sector is no exception. Over the years, it has embedded emerging digital technologies in its day-to-day operations to increase performance, modify operational procedures, improve customer satisfaction, and address key issues to protect resources and manage water in a world with increasing demand.

Digital transformation is not just about technology though. Comprehensive, effective digital transformation also impacts leadership, engagement, and organizational culture. Moreover, security concerns, along with other potential risks, should factor into any technology implementation (see section 3.4). Digital transformation requires new capabilities and organizational components that institutions need to acquire and develop, and these are summarized below in Figure 2.

Figure 2:
Key pillars of digital transformation




Source: Evans (2017).

Beyond the technology implementation aspect, the digital transformation effort encompasses a series of activities, including change management/training, communication, process reengineering, leadership, and organization. These tasks need to be wisely articulated with the design and deployment of new tools to maximize adoption and guarantee rapid benefit realization.

Consequences and recommendations:

To improve the adoption of emerging technologies and activate these four pillars depicted in Figure 2, the World Economic Forum (WEF) proposes a series of recommendations (WEF, 2021) categorized into three main thematic areas. Below is a summary of the suggestions:

- Creating new ecosystems
 - Formulate approaches to prepare users/employees/clients for technological transitions and provide engagement opportunities and assistance for those impacted
 - Empower workers and colleagues to innovate and scale-up good ideas
- Creating new business models
- Building skills and education
 - Project industry needs into the future to understand the new or retrained roles required for teams and departments
 - Promote an impact-focused industry narrative to attract a new generation of talent
 - Upskill boardrooms



The inescapable digital transformation of water utilities

3.1 The rise of the modern utility

The term *digital utility* refers to a set of tools and capabilities along the water utility value chain. Water utilities are under pressure to guarantee water access to their customers with the right level of service and quality. Challenges such as climate change and growing populations contribute to put pressure on their operations.

Below are some of the growing concerns:

- Deteriorating water/wastewater infrastructure.
- Lack of public appreciation for the value of water.
- Water scarcity/supply, drought potential: Need for resilient water systems to cope with the increasing frequency of extreme events linked to climate change.
- Need to replace an ageing and retiring workforce. According to the American Water Works Association (AWWA) (EPA, 2020) approximately one-third of drinking water and wastewater operators in the US will be eligible to retire in the next 10 years. Recruitment and retention of skilled workers required for jobs in today's high-tech environment are key.
- Energy usage/cost.
- Utility security/cybersecurity.



With that in mind, water utilities can leverage a set of digitally enabled capabilities to address these growing business problems.

Table 3 below summarizes three areas where digital technologies are making the biggest impact in water utilities.

Table 3:
Three main areas of digital technology application in utilities

Area	Focus	Effect	Examples
Infrastructure and operations	Connectivity and analytics	<p>Providing real-time monitoring of infrastructure performance.</p> <p>Building resilient and sustainable cities.</p>	<p>Modernizing operations: using sensors, automation, communications infrastructure, IoT and IT/OT integration.</p> <p>Digital twins (virtual models designed to accurately reflect a physical object).</p> <p>Integrated operations centers: unifying cybersecurity, physical security, operations, and asset health.</p> <p>AI: integrating machine learning, predictive analytics, robotic process automation (RPA) and other automation technologies to drive more data-centric and evidence-based decision making.</p>
Customers	Systems of engagement	Helping engage consumers and restructure the way people think about water use.	Customer-led digital channels: chat-bots, mobile apps, web, etc.
Employees, field agents and external stakeholders	<p>Ways of working</p> <p>Admin process with the wider ecosystem.</p>	<p>Redesigning jobs and reimagining how work is done in a hybrid human-and-machine environment.</p> <p>Including the wide ecosystems with partners and suppliers to better collaborate, exchange data, create the “extended company” beyond its physical boundaries, and initiate open innovation programs.</p>	Digital workers: redefining how employees in the office and the field do their jobs using the cloud, Big Data, mobile, wearables, etc.

Source: Authors.

Walking through the Smart Utilities

An important trend in the sector is smart water: it involves the use of emerging technology (hardware, software, and analytics) to help water and wastewater utilities solve problems through automation, data gathering, and data analysis. The need to optimize data security and accuracy of results, as well as the challenges posed by COVID-19, have contributed to the growing interest in smart water.

According to WEF,³ smart water is potentially a solution for issues including leak detection, water efficiency, energy efficiency, water quality improvements, and more. Smart water technology provides a platform for more efficient technology use and more informed decision-making.

The rise of smart water is giving birth to a new type of company. The term smart utilities refers to water companies that utilize connected sensors throughout their grids to analyze operations and increase service delivery efficiency.

Digital transformation is a key component of this paradigm shift, since it is a key enabler and includes a broad spectrum of other activities beyond technology deployment, like training, process engineering, and organizational design.

³ <https://intelligence.weforum.org/>.

3.2 Digital transformation is a process

Digital transformation is not new and started years ago in many organizations

Digitalization is generally defined as the process of using digitized information to make established ways of working simpler and more efficient. On the other hand, digital transformation is the process of using digital technologies to create new, or modify existing, business processes, cultures, and customer experiences. Converting analogical data to numerical data is, therefore, not new. It is merely accelerating due to the increasing availability of technologies, enhanced connectivity, and the profusion of data.

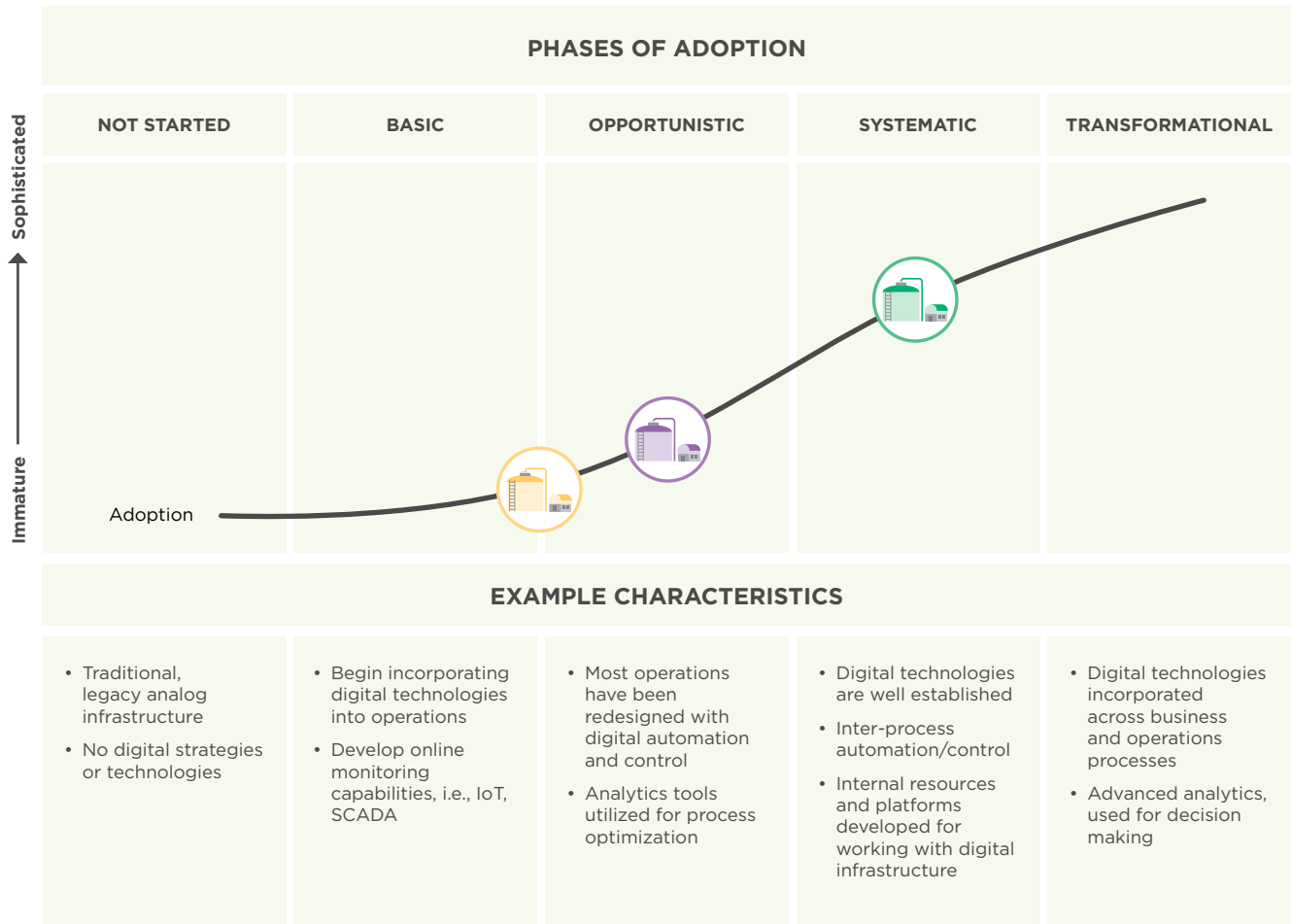
The key drivers for using computerized tools have remained the same since they were introduced in the 1980s:

- Remove painful tasks and automate repetitive tasks. Ex: smart metering.
- Enable secure management of assets remotely. Ex: SCADA.
- Be proactive and make quicker decisions. Ex: leak detection, predictive maintenance.
- Improve accuracy and keep records up to date. Ex: GIS, geolocalization.
- Understand a large amount of data. Ex: data analytics, machine learning.
- Fulfill emerging needs. Ex: real-time information, mobile payments.

In the day-to-day business of water utilities, digital transformation is not just about adding technology into the existing organizational structure. Rather, it is about building the culture and capability for continuous learning and improvement. An in-depth analysis is required to build a robust case for change and make the introduction of new systems successful in the long-term. The enabling environment (policies, regulations, etc.) plays a crucial role in this transition (IWA, 2019).

Utilities are at different levels of maturity in adopting various categories of digital solutions and approaches. The Digital Water Adoption Curve, shown in Figure 3 and adapted from IWA (2019) is a synthesized view of how utilities are adopting digital technologies.

Figure 3:
The digital transformation journey and adoption phases in utilities



Source: IWA (2019).

Considering the complexity of this business transformation, it is critical to avoid initiating a digital transformation without first having an idea of what the company is getting into. Therefore, it is essential to know how ready the organization is for digital, and how best to move forward on the journey.

3.3 Key success factors for digital transformation

All changes or transformation processes require robust prerequisites to be in place. Given the strategic consequences of the digital transformation journey, all key elements of a good strategy of change management plan also apply. Hence, deploying new technologies and driving both cultural and organizational change is no exception. Below are some key success factors:

1

Strong leadership: The organization needs a leader, a credible sponsor for a digital transformation, someone who can establish a vision and road map for the organization.

2

A clear strategy: Digital transformation requires defining a strategy that goes beyond a mere IT vision of what technologies to implement. Strategy should also build in the ability to periodically reassess the road map to ensure the strategy is still relevant and has the right IT components to enable its optimal deployment.

3

A robust framework to manage data efficiently: The organization should have the ability to process data coming from a variety of sources, devices, phones, and machine sensors and extract value from them through approaches such as Big Data.

4

A highly skilled implementation team: Digital transformation involves a variety of activities with different levels of complexity and knowledge of business and technology. The right combination of skill sets is required to deliver the change from design to implementation.

- 5 An agile governance mindset: Leaders address roadblocks quickly, adapt to changing contexts, and drive cross-functional, mission-oriented, “fail-fast-learn” behavioral change into the wider organization.
- 6 Process adjustments: To support change and deliver expected benefits, processes and policies need to be revisited/adapted to maximize the technology.
- 7 Open communication: Digital transformation is an opportunity to open conversation channels with both customers and employees, and communication is fundamental for implementing fully informed changes to the business.
- 8 Clear tracking of progress and benefits: Effective monitoring of progress toward defined outcomes is vital, gathering clear metrics and evaluating targets related to processes and outcomes.
- 9 Ability to prioritize and stay realistic: good ideas will evolve into lasting success stories only if providers, regulators, and users/customers all stand to benefit.

3.4 The cybersecurity dimension of digital transformation

The process of digital transformation of utilities does not come without risk. In February 2021, a US water utility suffered a major cyber incident. A hacker was able to break into a Florida water treatment facility’s system and tried to modify the level of sodium hydroxide added to the water supply.

The employee whose desktop was accessed noticed the intrusion and readjusted the controls to safe levels before any contaminated water reached the community. Had the hacker been successful, the event could have impacted nearly 15,000 customers.

Cyberattacks are not new. The first attack of this kind was over two decades ago in Australia, when an employee took control of 142 pumping stations for three months and released more than one million liters of sewage into local waterways.⁴ However, the increasing sophistication of hackers makes cybersecurity planning more vital when planning a digital transformation within a water utility.

Table 4 below highlights five areas of focus with respect to the security of water utility digital assets.

Table 4:
Areas of focus for cybersecurity threats to utilities

Key areas	Topics to consider
Define a cybersecurity strategy.	Understand regulatory requirements. Identify critical assets. Assess key risks and threats. Fill control gaps, check security standards. Evaluate readiness to deliver and allocate the correct level of resources.
Build capability to react and document a response plan.	Put in place an incident response plan: develop an actionable plan and provide specific, concrete procedures to follow during a cyber incident, including: Roles and responsibilities Information chain Procedures covering data, infrastructure, and people Communications planning Business continuity, back-up, restore and recovery plan Regulatory reporting needs Debriefing: Lessons learned and monitoring
Keep up to date and comply with changing regulations.	Norms and regulations related to cybersecurity are constantly evolving at both national and global levels. With respect to water utilities, this may include mandatory reporting, with transparency of information related to customers and partners. The right people and processes need to be in place to ensure compliance.

4 <https://web.mit.edu/smadnick/www/wp/2017-09.pdf>.

Key areas	Topics to consider
Adapt to rising risks associated with third parties and new ways of working.	Day-to-day operations involve cooperation with many third parties, with exchange of data and shared network and infrastructure; these third-party collaborations, in turn, increase exposure to cyber risks. Since COVID-19, the rise of remote working has also increased the risk of attacks leading to security breaches or data loss from unsecured networks at workers' homes. Such realities should be addressed by the organization's cybersecurity strategy.
Establish a security-by-design approach to adopting disruptive technologies.	Digital innovation in the water industry involves technologies like IoT, smart meters, analytics, and AI, among others. As utilities consider piloting or adopting these technologies, a thorough approach is paramount in the design of new system implementations, and should include tests, back-ups, and architecture.

Source: Adapted from Stathos (2021).

3.5 Digital transformation: lessons learned from the COVID crisis

The COVID public health crisis has badly hurt utilities and their customers. The pandemic's impacts had numerous effects on the water utility sector, including:

- **Payment difficulties:** Customers could not make payments at utilities' offices. In some utilities, more than 80% of pre-pandemic payments were made in-person by customers at the counter. With lockdowns, this in-person channel was closed, resulting in payment difficulties and, as a result, an increase in the number of delayed payments.
- **Financial difficulties:** Customers suffered the economic consequences of COVID-19, making it difficult for them to pay their bills. As a result, water utilities experienced significant revenue reductions.

- Remote work disruption: Personnel shortages due to quarantine—because of contact with people who tested positive, or to illness—disorganized work. Field agents and workers in general had to adapt to this sudden significant shortage of personnel. In that context, the shift to remote work forced utilities to reinvent their organizational perspectives and processes. Field agents had to adapt to the situation introduced by the implementation of new tools, platforms and procedures when operating the assets or interacting with clients and partners.

In April 2021, a case study (Lentini and Cepero, forthcoming) analyzed how water and sanitation operators responded to the pandemic, through a survey involving 28 operators from 13 LAC countries. Despite some specific regional characteristics and heterogeneous business contexts, key take-aways of the study included:

- Limited staff availability has affected the provision of water and sanitation.
- Utilities had to develop new protocols to protect technical personnel from increased health risks.
- Reduced financial capacity impacted operators' ability to purchase inputs and maintain equipment, limiting the completion of works under construction, and, in some cases, the payment of personnel, among others.

Table 5 below details how digital solutions helped in operations and on the financial side during the pandemic among the surveyed utilities.

Table 5:
Examples of digital solutions to tackle operations and finance issues during the pandemic

Business area / application	Objectives	Solutions	Level of implementation (In the sample)
Digitization of user management / digital systems of engagement.	<ul style="list-style-type: none"> • Provide 24/7 service. • Minimize the need for customer/user assistance from staff in company offices. • Continue providing services within the context of restrictions on movement. 	<p>Online account management, online claims, remote termination of service, etc.</p> <p>Payment options include automatic debit charges to a bank account or credit card / phone / electronic wallet / bank transfer / cell phone / WhatsApp</p>	61%
Digitization in commercial management.	<ul style="list-style-type: none"> • Minimize the need for customer / user assistance from staff in company offices. 	<p>Integration tools and system automation, digitization of documentation and work orders.</p> <p>This area includes the use of bots and machine learning tools for commercial tasks.</p>	60%

Source: Lentini and Cepero (2021).



Examples of digital technology deployments

DISCLAIMER

The information in this section is provided for information purpose only.

It does not constitute any recommendation, promotion, endorsement, or solicitation for the readers to enter into any transaction with the cited vendors and operators.

These case studies are solely an informational/awareness exercise and do not reflect the position or preference of IDB on the topic.

Stories and facts come from around the world to showcase the variety of contexts where digital solutions are transforming the sector. They were chosen to resonate with some of the local LAC business environments.



The section below showcases real-life examples of how digital technologies have been implemented. It details the contexts and some of the benefits associated with these projects.

The spectrum of possible cases is wide. For this paper, it was decided to focus on the following important business areas in water utilities:

- Customers: new systems of engagement with clients.
- Smart metering for real-time resource monitoring.
- Facilities: remote management with seamless field work and fluid planning.
- Collaboration: automatization and collaboration everywhere with employees and partners.
- eLearning and workforce empowerment.

The projects below have been selected because they are good illustrations of how digital transformation journeys leveraged modern technologies to achieve better outcomes and impact. The projects also reflect how some of the previously mentioned key success factors were incorporated in the strategy and execution of the digital transformation. This is simply a sampling of projects; the idea is to highlight a variety of real-life business situations across a water utility value chain.

4.1 An omnichannel experience for the end customer

Ensuring the right technologies are in place means customer service teams work faster and smarter, while providing better customer service.

It is no surprise that utility providers may struggle to improve communication with customers, considering consumers' changing behavior and expectations. In the following example, a water utility from the United Kingdom leverages data from multiple sources to create insights so that contact center agents can provide a more personalized and proactive response across multiple channels.

Topic	Customer experience – data – insight
Country	United Kingdom
Operator	United Utilities
Objective	Put the end-customer at the center of the game and provide a more personalized response while empowering teams and partners to work faster and smarter.
Challenge	Siloed information that makes it difficult to track a case through to resolution.
Solutions	Salesforce, Tableau.
Results / Benefits	<p>A unified platform enables contact center agents to check satisfaction levels, which means they can provide a more personalized and proactive response across multiple channels.</p> <p>Analytics reveal new water consumption trends.</p> <p>The ability to consolidate billions of rows of data from more than 30 source systems to generate analytics that help improve operational performance and customer experience.</p>
Why it is interesting	Unifying a massive data set generated from multiple sources helped create insights, with the unified platform supporting a single view of the customer’s account. The utility has empowered its employees to respond faster to service needs by using Salesforce tools to generate a 360°-view of each customer.
Key take-aways	Most of the data is there, but siloed information is a hurdle to be tackled to unlock the potential for rapid improvements in customer service, achievable using off-the-shelf digital solutions
Lessons for utilities in Latin America and the Caribbean	<p>Start with a robust and interoperable data infrastructure.</p> <p>Train staff and revisit processes to speed query resolution and track customer satisfaction.</p>

Source: <https://www.unitedutilities.com/>.



DID YOU KNOW?

The importance of marketing and customer care

- 89% of users who choose to change water, electricity, and gas suppliers do so because of problems encountered in the customer experience.
- 68% of users are willing to pay more in exchange for a better service experience and dialogue with the company.
- 81% of marketers expect customer experience to be the aspect on which the main challenges of water marketing will be played out over the next three years.
- It costs six to seven times more to win a new customer than it does to retain a current customer.

Source: DOXEE Italy (2021)

4.2 Real-time water consumption management

In this example, the deployment of smart meters and IoT technology since 2008 was combined with data-driven tools and enhanced network monitoring to build a resilient water service.

Resilience here means “the capacity of any entity—an individual, a community, an organization, or a natural system—to prepare for disruptions, to recover from shocks and stresses, and to adapt and grow from a disruptive experience” (Rodin, 2014).⁵

⁵ <https://www.drjudithrodin.com/issues/resilience/>.

Topic	Control water consumption in real-time through smart meters.
Country	Spain
Operator	City of Gandia, with Idrica Operator: Global Omnium Global Omnium is Spain's second largest private water utility company.
Objective	Use of algorithm to enable the creation of consumption patterns, thereby predicting demand.
Challenge	Water demand could not be accurately predicted, and work orders and leak detection were not managed efficiently.
Solution	Phased approach combining hardware and software deployment. Hardware: Deployment of 40,000 smart meters. Connectivity: Vodafone's NB-IoT connectivity network was implemented through SIM cards for data collection and transmission. Software platform integration: Use of Idrica's GoAigua platform.
Results	26 automated district metered areas 150 average leaks detected per month 60 serious leaks detected per month
Why it is interesting	The city of Gandia started to implement the strategy in 2008. Over time, it has introduced additional technology and data-driven tools to enhance network monitoring and build a resilient water service.
Key take-aways	The strategy involves multiple actors and skills of varying complexity. In the case of Gandia, program outcomes are a direct result of Global Omnium, Vodafone, and Gandia's focus on data and implementation of GoAigua's technology.
Lessons for utilities in Latin America and the Caribbean	Automated metered areas could be an appropriate starting point for digital transformation, enabling rapid changes in water network operations, delivering tangible results in a short period of time (leakage detection).

Source: Idrica (n.d).

4.3 Geospatial AI solution to prioritize and optimize investment

Use geospatial AI to remotely monitor and dynamically manage dams, water pipeline networks and water quality.

Topic	AI + Geospatial data
Country	Italy (Tuscany region)
Operator	Acquedotto del Fiora SpA (AdF)
Objective	Address the risk of failure in ageing water infrastructure combined with increasingly extreme weather, by identifying the top 20% of at-risk zones in the network before failure occurs
Challenge	Combine network data, such as pipeline locations, age, diameter, and material, with geospatial data on ground motion, vegetation, and soil condition.
Solution	Use the geospatial data analytics expertise of Rezatec to remotely determine the highest risk of pipeline failure across the entire network
Results / Benefits	Holistic view of incremental risk across the entire wastewater collection network through analysis of satellite data hard stop/period
Why it is interesting	The implementation has direct operational impacts in bringing insights on the condition of the entire network, reducing the cost and time spent finding leaks and optimizing maintenance and upgrading.
Lessons for utilities in Latin America and the Caribbean	Start by using available data in risk analysis and sync with operations and maintenance activities.

Source: <https://www.rezatec.com/solutions/water-utilities/pipeline-risk/>.

4.4 AI to reduce cost and risk in the operation

Using AI to operate water utilities better means shifting the paradigm from manually reacting to proactively controlling how water utilities are operated and managed.

Topic	AI for Predictive Control
Country	UK
Operator	United Utilities
Objective	Reduce cost and risk in the operation of critical assets. Use data for prescriptive decision-making
Challenge	Find a system that can be integrated into existing SCADA systems.
Solution	Emagin, a cloud-based software solution utilizing real-time operational data and AI to improve the efficiency of water and wastewater treatment processes.
Results / Benefits	Ability to make decisions based on dynamically forecasted conditions.
Why it is interesting	This AI tool, called HARVI, provides water and wastewater facilities with an operational intelligence platform that supports real-time decision-making to enhance reliability and better prepare for emergencies.
Lessons for utilities in Latin America and the Caribbean	Utilities can leverage the use of their existing data to embrace innovation by using new tools already widely available.

Sources:

<https://www.innovyze.com/en-us/products/emagin>

<https://www.unitedutilities.com/corporate/newsroom/blog/making-waves-meet-emagin-and-their-ai-tool-harvi/>

4.5 Improve water quality and asset management decisions with a digital twin

AEGEA is one of Brazil's largest private water and sanitation companies, serving over 21 million people in 153 cities. The utility initiated a pilot project using a digital twin to optimize operational activities and prevent pipe bursts.

Topic	Water Services and Asset Management
Country	Brazil (city of Manaus)
Operator	AEGEA
Objective	Improve the quality of water services and asset management in Manaus.
Challenge	Integrate all data stored in the different systems into a single platform. Create a digital twin that brings SCADA, GIS, hydraulic modelling, and customer information into a connected data environment. Build a 3D Model that continuously monitors all infrastructure assets.
Solution	The platform OpenFlows WaterSight
Results / Benefits	Ability to analyze the behavior of systems using real data and determine the best way to operate them. Ex: check the level of the tanks and the efficient point of pumps and determine if there are any leaks in the network.
Why it is interesting	The deployment of the digital twin reduced response times to network events with real-time simulation and automatic events generation capabilities.
Lessons for utilities in Latin America and the Caribbean	Some of the largest utilities in LAC have already deployed complex systems such as these and could disseminate this use across other utilities.

Source: https://prod-bentleycdn.azureedge.net/it/project-profiles/2021/aegea_digital-twin-sao-jorge.

4.6 Fluid and efficient remote working

In this example, the use of new software, real-time data, and mobile applications for field workers and sub-contractors helped improve work order throughput by 25%.

Topic	Field service management
Country	US
Operator	California Water Service Group (CWSG) Founded in 1926, CWSG serves two million people across five states. The utility must respond to various issues, ranging from broken meters to major pipeline leaks.
Objective	The company dispatches thousands of work orders per year. It needs to send out the right field employees and report information back to their systems.
Challenge	Automate work management processes.
Solution	Configure and deploy a solution called Kloudgin, a cloud-based software. The platform features cloud Field Service and Asset Management Systems.
Results / Benefits	Improved work order throughput by 25% after implementing a field service management and enterprise asset management solution.
Why it is interesting	The highly flexible and scalable connected software suite provides modern digital tools to employees and can also help manage subcontractors.
Lessons for utilities in Latin America and the Caribbean	These tools help coordinate operations in real-time and manage the entire workforce, including local subcontractors, to improve job efficiency in the context of a mobile workforce operating across a large area.

Source: California Water Service and Kloudgin.

4.7 Efficient on-site data collection and analysis

In this example, the use of remote protocols for all field employees helped track project and work order completion with mobile devices, improving efficacy of the overall process.

Topic	Remote working and field work
Country	US
Operator	Veolia North America - Taunton, Massachusetts
Objective	Tackle the lack of visibility and traceability and track project and work order completion.
Challenge	Leverage data to ensure greater accountability and improve effectiveness.
Solutions	Remote protocol for all field employees to track project completion using iPads.
Results / Benefits	Employees use digital tablets to track work orders. Remote technology helps reduce the paperwork and filing usually required for work orders.
Why it is interesting	This is an easy and efficient way to improve data collection and field analysis.
Lessons for utilities in Latin America and the Caribbean	Improving field work and easing the collection of reliable data is a key topic for a mobile workforce, and LAC is no exception. It is also an opportunity to revisit ways of working, including in the context of up-skilling programs or programs for newly onboarded staff.

Source: Water and Waste Digest and <https://www.wwdmag.com/operations-maintenance/Veolia> (2021).

4.8 Empowering employees through digital learning

In this example, the water utility expanded the learning opportunities of its staff by using a digital platform fully focused on the water business.

Topic	People development - digital learning
Country	France - Bolivia
Operator	SAGUAPAC, Santa Cruz de la Sierra
Objective	Rethink the utility's approach to training, taking advantage of knowledge gained during the pandemic as colleagues worked remotely and teams, including newcomers who could not benefit from on-site interactions, had to find alternative ways to fulfil various needs.
Challenge	Deploy an online training platform and expand the curriculum.
Solutions	A multilingual learning platform in Spanish with 35 curricula customized to the local Latin American market.
Results / Benefits	The new online learning platform will meet emerging needs for tailor-made and online learning.
Why it is interesting	This is a very effective way to enable a skilled workforce by deploying innovative learning management systems.
Key take-aways	This initiative is supported by a wide consortium and can become a widespread product. The curriculum addresses a wide spectrum of knowledge in a variety of business topics.
Lessons for utilities in Latin America and the Caribbean	Remote learning is an interesting lever to accelerate the adoption of new skills and leverage new technologies to give access to a wide range of business topics. Training everyone, everywhere, anytime in a flexible way and at an affordable cost is an opportunity for utilities with an ageing workforce.

Source: <https://www.watura.fr/?lang=en/>.

Example of a digital training platform operating in Europe and LAC

Interview with Sebastien Rigal, CEO, WATURA

“The lack of skilled professionals for effective water management, especially at the educational, scientific, technological, and institutional levels, is a key factor that contributes to the global water crisis.”

WATURA’s mission is to develop solutions to train a greater number of technicians in technical professions in the drinking water and sanitation sector more quickly and at a lower cost while harmonizing and guaranteeing the quality of skills transfer.

Since 2010, WATURA has been a specialist in vocational training for the water and sanitation sectors. Our ambition is to provide high quality training using online tools. In 2018, our company developed the first digital training platform dedicated to water and sanitation professionals.

The WATURA eLearning platform (www.watura.fr) is available anywhere, any time, and on any device (computer, tablet, smartphone).

Thanks to this platform, every user can strengthen their technical and project management skills.

In January 2021, WATURA started partnering with SAGUAPAC, a water and sanitation cooperative in Santa Cruz de la Sierra, Bolivia, serving approximately 1.5 million inhabitants. The objective of this collaboration is to roll out a digital training solution, in Spanish, dedicated to the water and sanitation sectors. The project will develop 35 training courses adapted to the local and regional context, drawing on both local know-how and international expertise.

According to Fernando Yavari, SAGUAPAC’s Head of Planning and Management, “this alliance will allow us to develop mutually with a common horizon.”

After extensive testing on-site and by teams, the digital training platform will make professional training available to a greater number of technicians, while facilitating collective intelligence to improve the efficiency of their daily activities.

4.9 Collaboration and coordination of works in urban areas

This example highlights an initiative in Morocco to improve collaboration with contractors, partners, and local authorities to facilitate the administrative process around new developments.

DigiRadeej is a collaborative platform that streamlines exchanges and procedures with stakeholders of Radeej, a water utility in Morocco.

Topic	Using open digital platforms to ease collaboration and completion of paperwork for development projects.
Country	Morocco
Operator	Radeej - Water utility for the El Jadida region.
Objective	Streamline exchanges and procedures to enable collaboration across multiple partners in the utility's work ecosystem.
Challenge	Streamline the extensive amounts of paperwork along with multiple layers of administrative tasks and procedures that often resulted in numerous repeat requests that went unfulfilled as excess paper limited access to the files.
Solutions	Launch of the DigiRadeej platform in 2019: As part of the actions to improve services to private customers and promoters/investors, Radeej implemented a digital platform intended for online management of procedures for requesting, studying, and following up on subscriptions, extensions, and connections in all areas supplied by the water utility, digiradeej.radeej.ma .
Results / Benefits	A seamless tool to upload documents and track queries with external partners.
Why it is interesting	It is one of the first experiences of its kind in Morocco. It accompanies the development of new urban areas bringing together various stakeholders. It is a tangible response to the country's overall digital road map that aims to create a more seamless experience using digital technologies and speed-up some of the processes involving public administration.
Key take-aways	Digital transformation of local water utilities also includes tools to interact with stakeholders in the context of rapid development of urban areas.
Lessons for utilities in Latin America and the Caribbean	In regions with numerous development projects and extensive paperwork requirements, this kind of platform saves time and improves efficiency, limiting interactions and minimizing errors in the transmission of administrative information.

Source: <http://digiradeej.radeej.ma>.

4.10 Remote assistance with augmented reality (AR)

In this example, the utility improves learning and remote on-site assistance using AR to connect field workers with experts and senior staff in real-time to enable remote supervision and guidance in operations.

Topic	Knowledge capture and remote assistance for Field Services.
Country	Israel
Operator - supplier - vendor	Mekorot, national water utility
Objective	Address the difficulties in managing knowledge and documenting know-how inherent in the context of an ageing workforce and the need to share expertise.
Challenge	Improve knowledge capture of field service procedures or support on-site activities when senior experts cannot travel.
Solutions	Use AR as a knowledge management tool in training sessions or live events to guide operators (remote assistance). AR lets the remote expert superimpose markings, messages, and diagrams directly onto the engineer's field of view.
Results / Benefits	New field technicians unfamiliar with legacy equipment are guided remotely by experts.
Why it is interesting	When on-site staff is not familiar with the operation of certain tools, AR tools and remote guidance from senior experts save time and money. This approach assures that field workers get the right level of technical support and still have the capacity to complete critical functions when experts cannot be available on-site. It is also a great way to mobilize the knowledge of key experts and effectively train the workforce
Key take-aways	Augmented Reality (AR) tools are key enablers for remote supervision and management of asset condition assessments.
Lessons for utilities in Latin America and the Caribbean	In the context of knowledge gaps or an ageing workforce, utilities can preserve the knowledge of their veteran employees while streamlining on-the-job training processes. AR can be a fast and efficient answer in the case of weather events that prevent movement or impose mobility restrictions. Also, the use of such technology can support business continuity when the utility is under a stressful situation like the COVID lockdown or when a fraction of the workforce is in quarantine.

Source: <https://www.fieldbit.net/markets/Utilities/>.

4.11 AI for pollution prevention from sewers

In this example, the UK utility leverages data and AI to enhance the way it manages wastewater network blockages, enabling increased accuracy and better predictions compared to traditional statistical methods.

Topic	AI and IoT to reduce wastewater network blockages and pollution.
Country	United Kingdom
Operator – supplier - vendor	Yorkshire Water
Objective	Leverage digital technologies to cut pollution incidents by 50%.
Challenge	During heavy rainfall, a combined sewer system (CSS) piping network can be stretched to the limit, and untreated water may escape into waterways. Consequently, run-off water, which could be polluted with oil, pesticides, fertilizer, and more, can be released into nature.
Solutions	Siemens, Yorkshire Water, and the University of Sheffield have joined forces to develop a system that employs AI and IoT to locate blockages before overflows can occur. The data from sensors on the combined sewer outlets (CSOs) along with real-time information on rainfall is delivered to an application running on an open, cloud-based IoT operating system that identifies anomalies in sewer system behavior.
Results / Benefits	The app improves accuracy and predictions of blockages compared to traditional statistical methods.
Why it is interesting	Climate change effects come with extreme weather and heavy rainfalls. Enhanced tools are designed to optimize sewer operations and protect the environment from diffuse pollution.
Key take-aways	AI and IoT can offer insight to sewer operations, even though the technology needs additional development.
Lessons for utilities in Latin America and the Caribbean	This approach can help tackle the risk of pollution events in regions where heavy rainfall occurs and with operators running CSS.

Source: Yorkshire Water and Siemens (2021).

4.12 Digital twins to model the city

In this example, a Danish utility uses digital twins (a virtual replica of a physical asset) to model operations and explore various scenarios for dynamically optimizing storage volumes so the utility can maximize capacity use.

Topic	The use of digital twins to unlock data silos to simulate operations with a virtual replica of a physical asset, thus leading to an integrated approach across the entire water cycle.
Country	Denmark
Operator	Aarhus ReWater
Objective	Address the difficulty in integrating many existing digital technologies and datasets to generate insights for operations.
Challenge	Deploy a single integrated platform in the form of a digital twin that gives operators the ability to test new ideas and make changes in the virtual system, before planning in the physical system.
Solutions	Aquatech defines a digital twin as “an actively integrated, accurate digital representation of physical assets, systems, and treatment processes with a constant stream of data pairing from the physical twin for continuous calibration. It will unlock value by enabling improved insights that support better decisions, leading to better outcomes in the physical world.”
Results / Benefits	Ability to manage the conveyance of combined sewage, managing storage volumes dynamically so that the utility can maximize the use of capacity in the collection system and storage facilities. Globally, with the use of digital twins, recent experience shows that utilities can improve sustainability, reduce capital and operating expenditures, increase efficiencies, and improve the level of service.
Why it is interesting	Digital twins are the ultimate set of tools to leverage the power of digitized assets, enabling cost-effective modelling and scenario modelling to better operate assets.
Key take-aways	Prerequisites that need to be in place to enable digital twins deliver value: <ul style="list-style-type: none"> • the advanced state of technology deployment (i.e., high maturity in the digital transformation journey) • a robust change management approach to support teams’ adoption of new ways of working.

Source: Aquatech (2021).



Regional focus on LAC

The preceding sections have showcased some examples of digital business transformation journeys and applications of emerging technologies across the water sector value chain.

This section focuses on some of the specific trends in the LAC region and presents ways that digitalization can help address key topics of current concern by water utilities.

5.1 LAC digital landscape

The dynamics of the region’s digital landscape can best be understood through discussion of the dimensions set out below. These will include a brief description of the region’s strengths and weaknesses in terms of the state of its current technology as well as its capabilities to adopt new technologies. This particular aspect of the discussion can have a huge effect on the region’s overall digital journey.



1

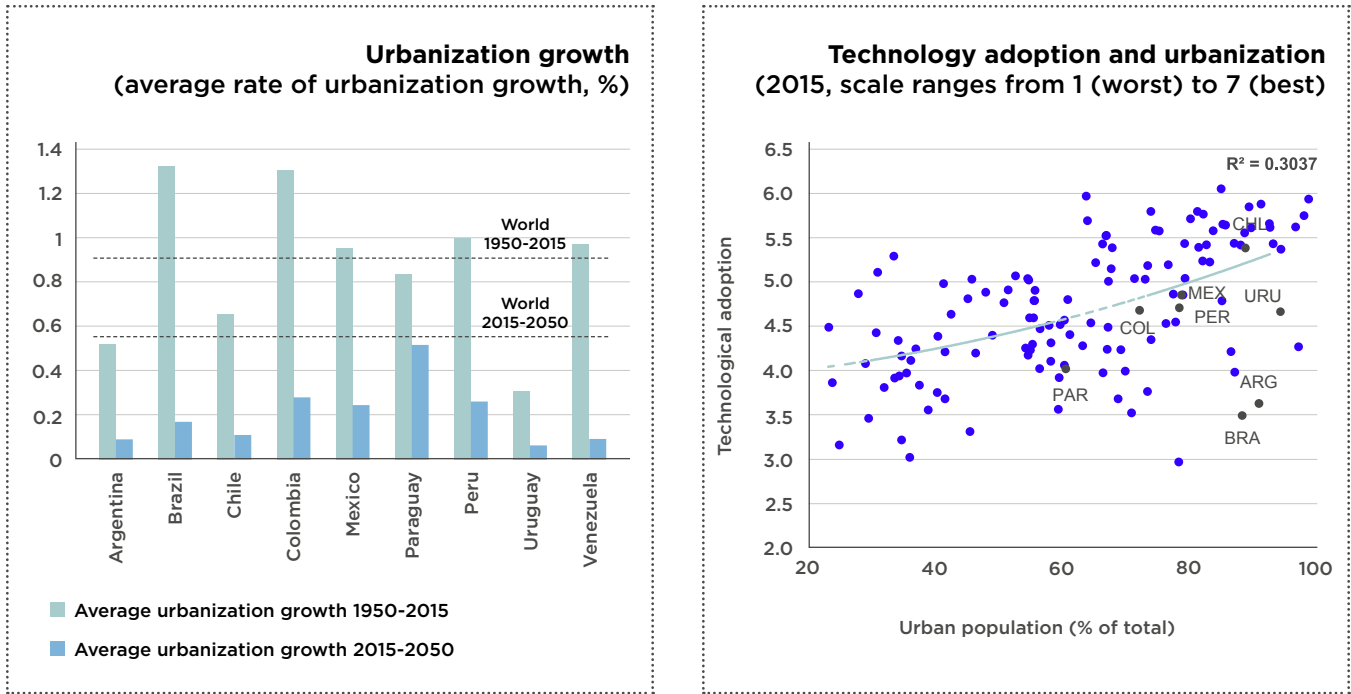
Urbanization: Booming economies, together with urban population growth in Latin American countries, bring additional pressure to the water supply side and inevitably lead to the need for changes in water management. Urbanization levels have increased significantly in the region since 1950 and are now around 80% in Latin American countries, more than in most other regions.

2

Digitization: Urbanization is also associated with digitization as the increase in population demands more efficient and scalable services (provided by digitization). Water utilities can use the demographic trends as leverage to boost digitization, introducing advanced systems of engagement on the customer side.

Attitudes towards technology have dramatically changed during the COVID pandemic. Deployment of tools and implementation of new digital solutions have exponentially accelerated technology adoption and the digitalization of day-to-day processes. With that in mind, the trend described in the chart below is still relevant and considered even more pronounced.

Figure 4:
Demography and urbanization in the LAC region



Source: BBVA Research (2017).

3

High internet penetration: Around 55% of Latin America’s population has fixed broadband connectivity, and only 9.9% has high-quality fiber connectivity at home, according to the World Bank. On the other hand, while 87% of the population lives within range of a 4G signal, actual usage and penetration remain low (37%).

4

Smartphone use: Smartphone connections in Latin America reached 500 million by the end of 2021, an adoption rate of 74%, according to GSMA. The next four years will see almost 100 million additional smartphone connections in the region, taking adoption to over 80%. Twelve percent of total connections in the region will be on 5G by 2025 (GSMA, 2021).

5

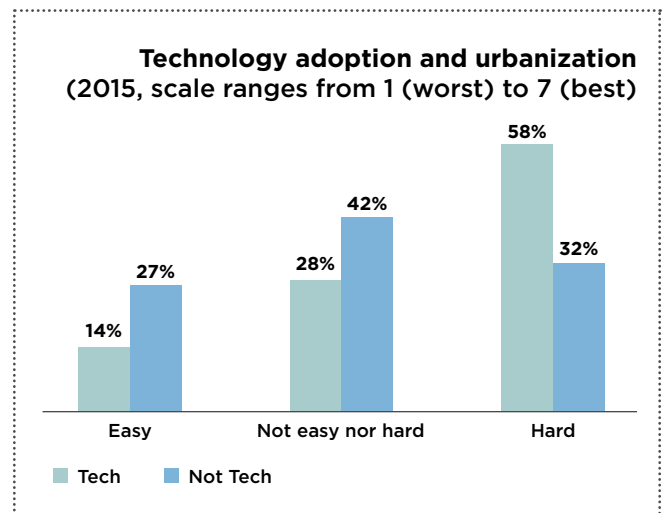
The increase in remote work: The COVID-19 pandemic accelerated the need to reshape employment models. More companies are extending remote work policies to provide flexibility for the benefit of both people and organizations. Most activities related to information and communications technology (ICT) passed to telework mode during the pandemic. Between 20% and 30% of employees were working from home during the lockdown period. In 2019, that figure was less than 3% (Maurizio, 2021).

6

The talent gap: Technology roles continue to be the most difficult to fill, according to a study from BBVA.⁶ Research (2017).

Figure 5a: The technology talent gap in Latin America

At the same time, the region is a very dynamic hub for tech talent. According to recent data on global growth of developers, the Latin American region is considered the second highest. The graphic below from Hireline,⁷ a recruitment platform specialized in technology profiles, shows that Brazil, Mexico, Argentina, and Colombia are the largest pools of developers in the region.

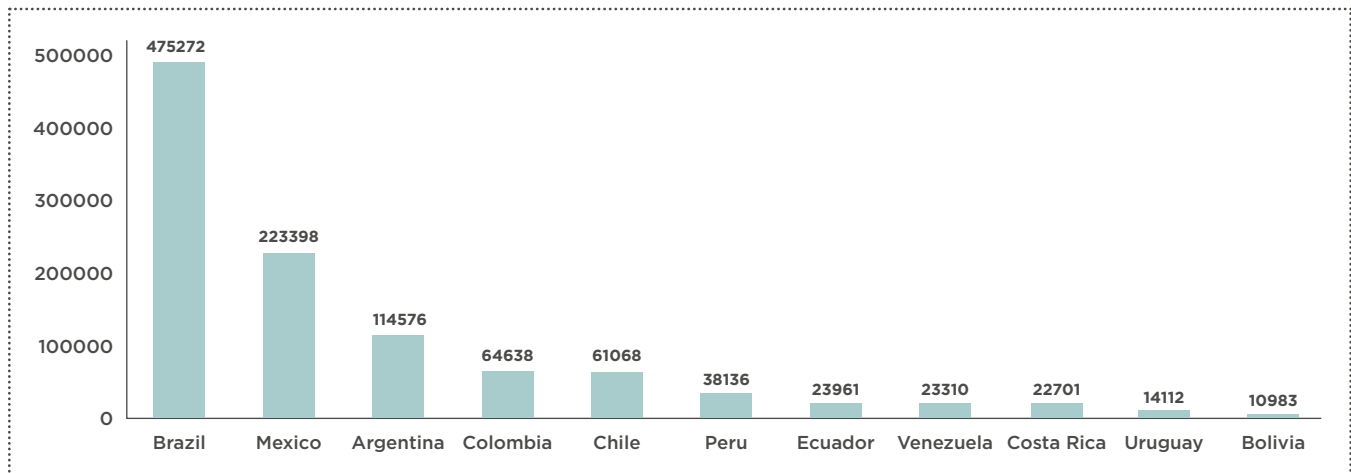


Source: BBVA Research (2017).

⁶ BBVA Research (2017) Urbanization in Latin America.

⁷ <https://latamlist.com/getting-to-know-the-latin-american-tech-talent-market/>.

Figure 5b:
Number of developers per country in Latin America's tech market



Source: Hireline's 2022 IT Labor Market Report.

Growth of the technology sector has increased the demand for the best professionals in the field, in a broad range of sectors including utilities. Hence, the search for IT professionals must be expanded to a wide area that extends beyond national boundaries. Hireline's 2022 IT Labor Market Report states that 23.5% of tech vacancies in Mexico are remote, which opens the door to the potential for these professionals to work anywhere in the world.

5.2 What is at stake for water utilities in LAC and how digitalization can help

Considering these trends, this section explores some of the main challenges facing the water sector and describes how digital transformation can help address them. Some of the most important of these challenges are droughts, climate change, lack of sewage waste treatment, human pollution, oil spills, and the dumping of industrial and heavy metal waste into waters, which are the leading causes of water pollution in Latin America.⁸

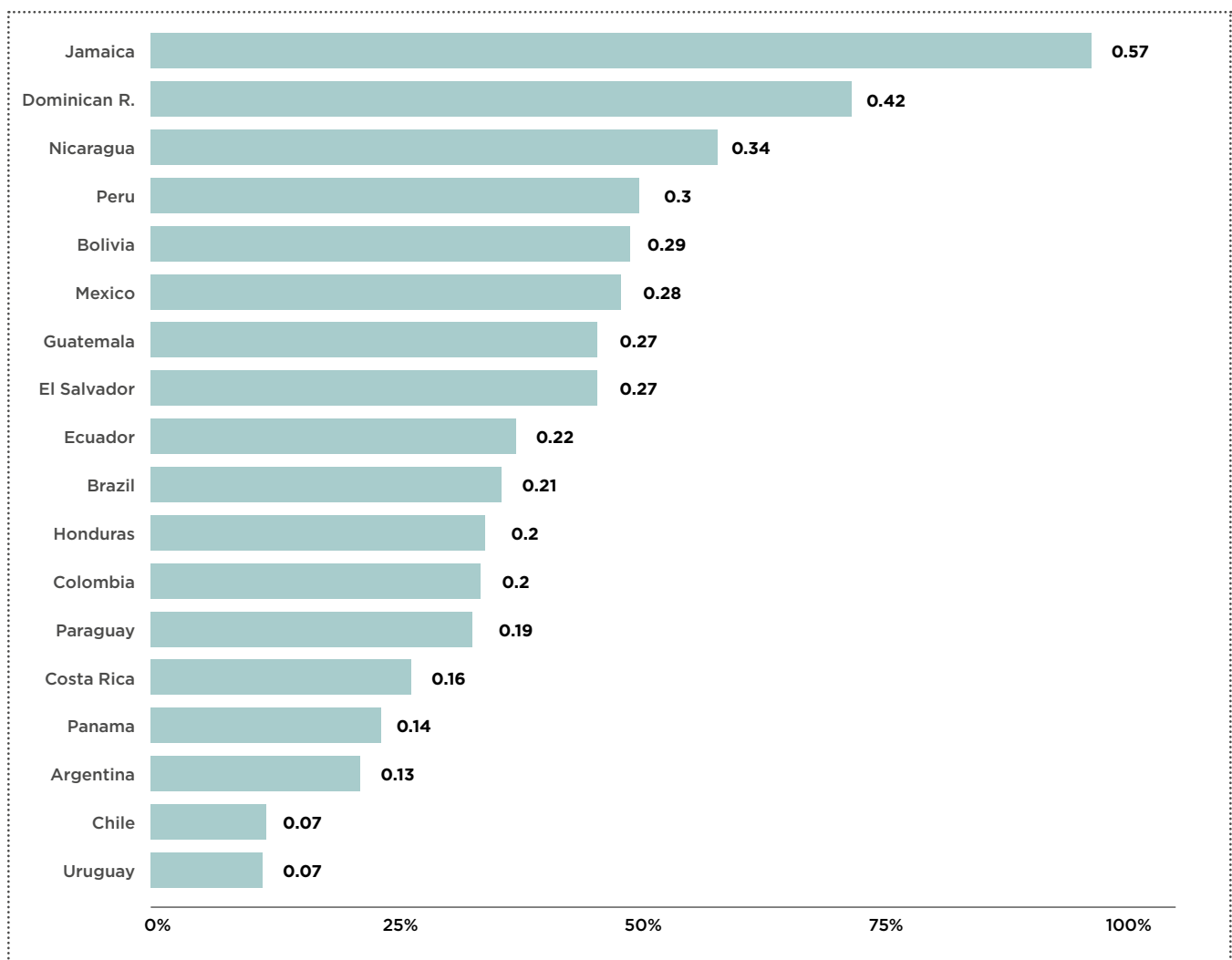
What follows is a selection of three examples of how digital innovation can help address these growing problems: drought and floods, pollution, and drive consumer behavior.

⁸ <https://www.americasquarterly.org/tag/water-resources/>.

Drought and floods

The impact of climate change on service provision is dramatic in some regions. Droughts and floods are climate change-related events that could greatly impact utilities' service quality, and subsequently alter the ability to achieve SDG targets. Data from an IDB survey (Vidal, Machado, and Datshkovsky, 2021) show that countries have already been impacted by these events.

Figure 6:
Exposure to drought in the LAC region over the past three years



Source: Vidal, Machado, and Datshkovsky (2021).

How can digital innovation improve reactivity to droughts and floods?

Digital innovation can support a disaster early warning strategy by using the wisdom of crowds: the aggregation of crowd-generated text messages, social media feeds, or recent imagery to develop data sets or geographic data and maps to provide near real-time, interactive information on events as they unfold.

Early detection of droughts is important for managing potential crop losses to prevent or mitigate possible related famines, and for dealing with increased fire risk. A range of technologies can help in drought monitoring by recording and tracking precipitation, temperature, evapotranspiration, soil moisture, and vegetation.

An example of an Early Warning System is FloodTags, an online media monitoring tool for floods and weather impact. The service monitors social media and websites and based on the combined data, detects old and new events, and provides immediate information.⁹

A similar approach is taken by Delft-FEWS, a freely available software that handles large amounts of forecast data, integrates the latest observations with the most recent meteorological forecasts, and provides data for visualization and reporting. Delft-FEWS has also set up a community to share insights and work on improving the platform used for flood forecasting, reservoir management, real-time operations, and hydrological data validation.¹⁰

9 More information about Floodtags: <https://www.floodtags.com>.

10 <https://oss.deltares.nl/web/delft-fews/-/2393372-58?redirect=%2Fweb%2Fdelft-fews%2Fcommunity-strategy-board>.

Pollution

Rapid urbanization and industrialization in Latin America have aggravated serious wastewater disposal problems in the region. Some of the most concerning sources of pollution come from the use of agricultural pesticides and micro-pollutants that can be found in the drinking water supply in many different countries (Woolery, 2021).

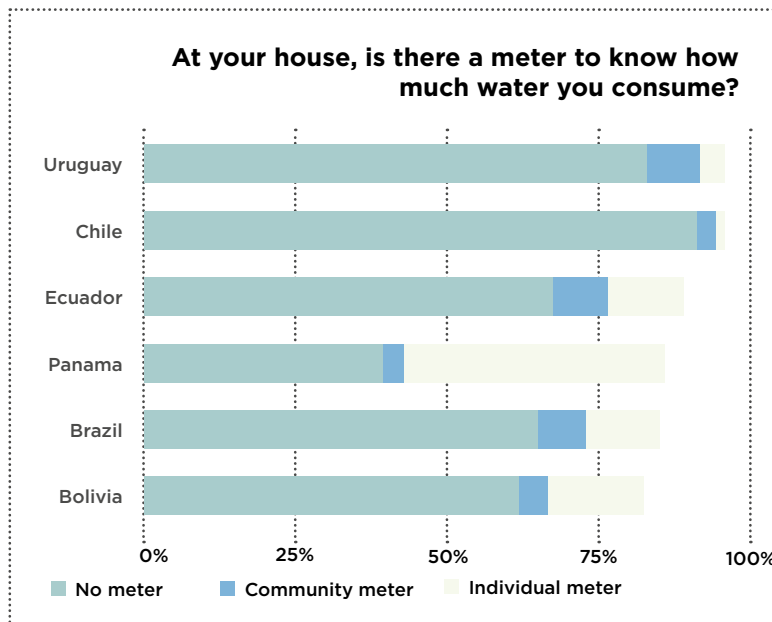
How can digital innovation help?

Water utilities are using IoT to develop operations for conducting real-time monitoring, creating early warning signals, and optimizing delays in responding to pollution events. Also, analysis of Big Data, leveraging data from sensors, and continuous monitoring detect abnormal trends and set up a proactive approach in managing pollution risks. Modern technologies can also help inform the public about pollution risks and how they affect their well-being.

Drive consumer behavior

Consumers' behavior and awareness of their water consumption is a key driver to achieving SDG 6. Individual meters not only help consumers monitor their water use, but also provide incentives to save water. An IDB study (IDB, 2021) suggests that consumers do not always have a clear idea about how much water they use, and consequently, how much they pay for their water service.

Figure 7:
Water measurement and public awareness in Latin America



Source: Vidal, Machado, and Datshkovsky (2021).

How can digital innovation help?

Smart metering at an individual level and modern systems of engagement, such as mobile apps, online alerts, and SMS, can improve communication with customers. Sharing real-time data about consumption and disseminating insights based on Big Data analytics via all communication channels and publications from the water utility can help raise awareness around water conservation and the best use of the resource locally.



Fresh ideas and practical steps to embrace change in LAC

The previous sections have presented some examples and case studies from various geographies where digital technologies and business transformation projects have helped address some critical challenges for water utilities or enhance performance. Some of these could easily be replicated in LAC, although two questions remain:

1

What are the practical steps utilities can take to start or accelerate the journey toward smart water management?

2

As digital transformation is an emerging topic, are there innovative ways to speed up collaboration with the wider water utility ecosystem?

This section answers these two questions by providing examples and feedback from practitioners from Latin America and other parts of the world.

6

6.1 Voices from the ground: Two examples, tips, and recommendations from two utilities in Latin America

AySA in Buenos Aires

AySA - October 22, 2021

Interview with:

Julio Aversano, Innovation, Transformation, and Data Science Manager

(<https://www.aysa.com.ar/>).

AySa at-a-glance:

Argentine Water and Sanitation (Spanish: Agua y Saneamientos Argentinos, mostly known by its acronym AySA) is a state-owned company established in 2006.

24,169 km: Length of the drinking water network

27: Groundwater treatment plants

20: Sewage treatment plants

6,040,628 m³/day: Average amount of treated water

3,278,725: Residential users

351,107: Non-residential users

“Don’t fear exploiting your data!”

“Working alongside employees is paramount to achieving the cultural paradigm shift.”



Aversano believes that water utilities' business environments need a paradigm shift to see the utility beyond the traditional boundaries of operation of assets. He says they need instead to leverage the power of data to learn and improve along the entire value chain through better decision-making.

While there are multiple priorities for water utilities to attend to, attention to customers is key. Digital innovation and new systems of engagement will make the service more transparent and accessible to end users, while simultaneously introducing useful tools such as online bots to strengthen online services in times of COVID and beyond.

The launch of a unit dedicated to innovation and data science responds to the need for a more coordinated approach. Such a department is the connective tissue in the system where emerging digital tools are being introduced alongside legacy R&D activities.

On the digital side, new projects are being initiated, fuelled by ideas from operations. This bottom-up approach is key for mobilizing people and aligning with business needs. The importance of working alongside employees is paramount to achieving the cultural paradigm shift, reinforcing the idea of adapting to continuous change and making small improvements that can add up to greater results.

Looking ahead, Aversano plans to build a wider team of experts, including programmers, data scientists, and project managers. He also wants to build bridges to the outside world and animate a broader community, including employees, to generate ideas and develop new skills in synergy with AySA's "University of Water."

Aversano's tips for other utilities in the region:

- Start by defining your objectives ... and jump into the change.
- Learn from things you are not prepared for.
- Open your systems and databases and don't fear exploiting your data.
- Face the cultural gap, train people, and start the journey ASAP.

EPMAPS - Agua de Quito

EPMAPS - October 29, 2021

Interview with:

Gabriela Maldonado, EPMAPS Innovation in Research and Development lead

Marco Bonila, IT manager

Fausto Cabrera, EPMAPS Chief of Analysis and Financial Planning

(<https://www.aguaquito.gob.ec/>).

EPMAPS at-a-glance: The Municipal Public Company for Potable Water and Sanitation of Quito (EPMAPS) (Spanish: Empresa Pública Metropolitana de Agua Potable y Saneamiento de Quito) is the institution in charge of providing water and wastewater services in Quito and was established in 1960.

“Partnerships with vendors and experience-sharing via communities of practice support the development of our digital journey.”

At EPMAPS, digital innovation has a clear focus on major transformative projects, such as the automatization of operations and the development of new systems of engagement with customers. EPMAPS started pragmatically, tackling small projects like online forms, a modern website, and a “virtual agency” accessible via a dedicated mobile app (that now has over 10,000 downloads). Data show that this approach has worked. Revenue collected by digital media between January 2019 and September 2021 has increased by approximately 20%. Looking ahead, the company will focus efforts on piloting a customer service chatbot.

The company, Ecuador’s largest utility, is already structured to plan and deliver digital projects under the direction of the IT department and closely connected to the innovation committee. This is an ample consortium of stakeholders that unites all the key leaders of the various business functions.

Partnerships with software editors and world-class IT vendors such as SAP, ESRI, Microsoft, IBM, and Schneider Electric, are a powerful tool for accelerating the introduction of new technologies. The adoption of new digital tools by employees and field workers is always a challenge, especially when the average age of company employees is 53. Hence, the appetite for change may vary from one department to another, with the operations department being the most conservative.

As the largest utility in the country, EPMAPS is keen to share experiences and learn from other actors in the region and beyond, with Colombian, Argentinian, and Spanish counterparts. Networking and creating a community of practice helps raise awareness and accelerate the learning curve.

Maldonado’s tips for other utilities in the region:

- Be consistent. We can’t afford to go back and forth. Robust, consistent leadership is paramount.
- Technology is your friend. Don’t be afraid of the change that comes with it.
- Don’t forget your mistakes; learn from them.
- Ownership is key to successful deployment of new digital tools. Pay attention to people and support the transition to accompany a cultural shift to new ways of working.
- Aim for open innovation and start engaging end customers and employees with new projects.

6.2 Think outside the box

One way to speed-up the digital transformation journey can be to embrace new types of collaboration and establish partnerships with external players setting the path towards innovation at different levels.

This section shares some examples of professional bodies and organizations from various locations around the world that have been successful in accelerating the adoption of digital innovations and have launched initiatives to connect and mobilize the digital ecosystem. The water sector can learn from this by:

- Working with a professional body
- Partnering with an institution to launch an innovation challenge
- Establishing one's own event to mobilize the local digital ecosystem
- Focusing on the younger generation with targeted events

GSMA, the worldwide mobile communications industry with a strong connection to utilities

The Global System for Mobile Communications (GSMA) is “a global organization unifying the mobile ecosystem to discover, develop, and deliver innovation essential to positive business environments and societal change.”¹¹

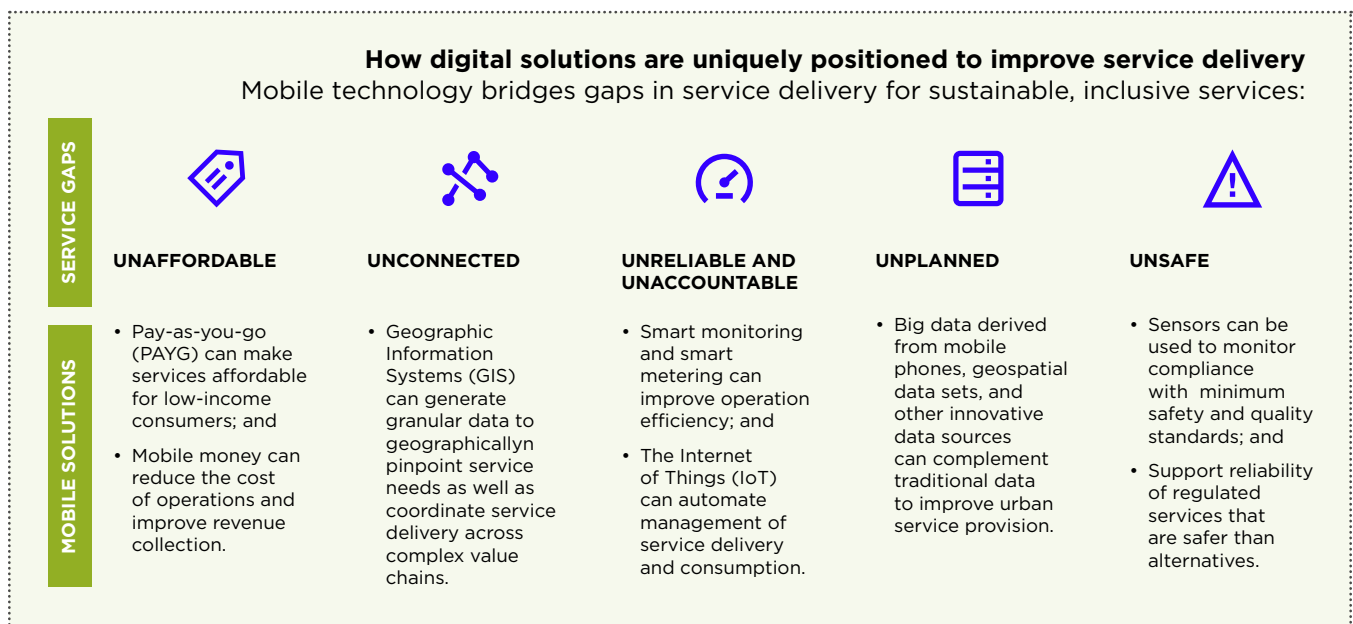
The GSMA represents the interests of mobile operators worldwide, bringing together more than 750 operators with almost 400 companies in the broader mobile ecosystem. GSMA has launched myriad digital innovation initiatives, and some of them are specifically dedicated to utilities as the case of GSMA Mobile Utilities.¹²

¹¹ <https://www.gsma.com/>.

¹² <https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2021/06/Digital-Utilities-programme-overview.pdf>.

The Mobile Digital Utilities program enables digital solutions and partnerships among innovators, mobile operators, and government providers of utility services. The program supports urban resilience by making essential urban utility services more accessible, affordable, reliable, safe, and sustainable. Figure 8 below is the scope addressed by the GSMA Mobile Utilities initiative.

Figure 8:
Scope of the GSMA Mobile Utilities initiative



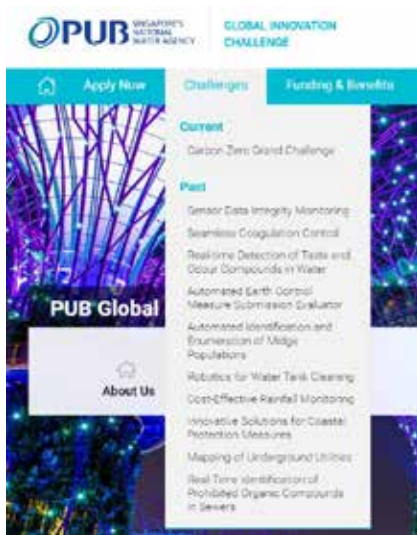
Source: GSMA (2021).

PUB Singapore, create your own launchpad for novel digital solutions

In July 2021, Singapore's national water agency PUB launched its second edition of the Global Innovation Challenge (GIC), "inviting companies and researchers around the world to co-create innovative water solutions that can improve their operational excellence and meet future water needs."¹³

In 2020, the first GIC had focused on garnering digital and smart solutions for increased efficiency, productivity, and safety in PUB's operations. The initiative received over 100 submissions from 20 countries in over just five weeks. Ten local and foreign companies were subsequently short listed to develop their solutions.

Figure 9:
Scope of the GIC in Singapore



This open innovation process allowed PUB to conceive its own digital launchpad over a very short period. In the past few years, 11 challenges helped connect with over 800,000 people, receiving more than 160 proposals backed by 8 deployed technologies.

The current PUB challenge (2022) focuses on zero carbon technologies and seeks to incentivize innovative solutions that can help achieve net-zero emissions by 2050. <https://www.pub.gov.sg/innovationchallenge/Pages/CarbonZero.aspx>.

Source: <https://www.pub.gov.sg/innovationchallenge>.

Cairo Water Week, initiate your own events to mobilize new actors

A hackathon is a sprint-like event for design with the goal of creating functioning software or hardware by the end of the event. Hackathons tend to have a specific focus, which can include programming languages, operating systems, or applications. Tackling water challenges is no exception, and many actors in the water sector organize such events to speed digital innovation in their business.

¹³ <https://idadesal.org/crowdsourcing-water-solutions-with-pubs-global-innovation-challenge/>.

For example, in September 2021, Cairo Water Week (CWW) launched a smart water hackathon. The event, sponsored by GIS firm ESRI, was an opportunity to put together a project team and bring to life ideas utilizing the Esri ArcGIS system to enhance water and irrigation management.¹⁴ The event was open to developers, industry experts, GIS experts, academics, and undergraduate, graduate, and postgraduate students.

In 2022, Cairo Water Week is scheduled for October 16–19, 2022

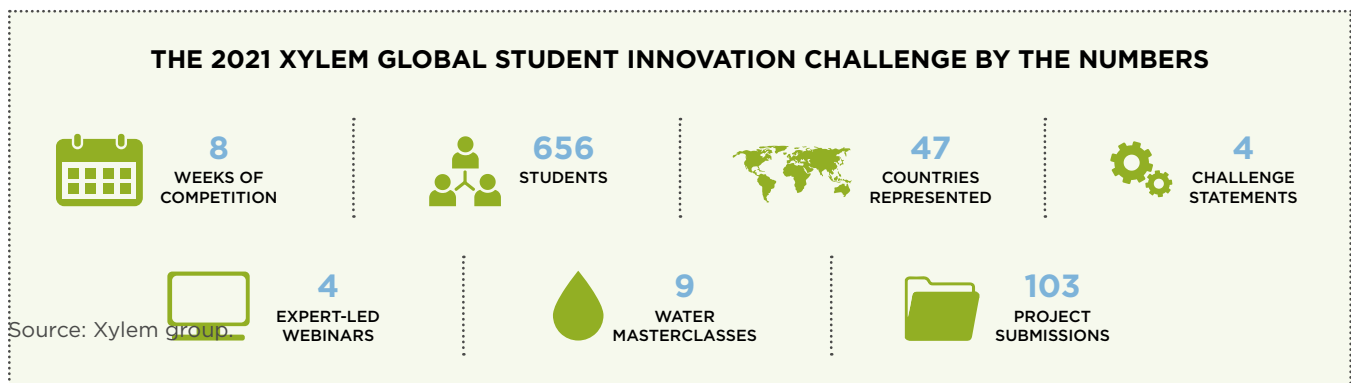
Main theme: Water at the Heart of Climate Action

<https://www.cairowaterweek.eg/>.

Xylem, Engaging the next generation of digital innovators

Global water technology company Xylem has created a series of events and challenges to empower the next generation to solve the world's greatest water challenges. “The Xylem Global Student Innovation Challenge is an eight-week event, inviting individuals, or teams of up to five people, to develop a project on one of four water challenges, with separate cash prizes totalling \$20,000 available to the winners of the high school and university tracks.”¹⁵

Figure 10:
The Xylem Global Student Innovation Challenge by the numbers



¹⁴ <https://www.cairowaterweek.eg/hackathon/>.

¹⁵ https://act.xylemsales.com/wp-content/uploads/2021/07/Xylem-Global-Student-Innovation-Challenge-fact-sheet_FINAL.pdf/.

6.3 Closing the dialogue gap between utilities and start-ups

Solving water challenges requires mobilization of a broad community, particularly to connect two very different actors: water and sanitation firms and start-ups. Emerging structures such as incubators or accelerators are specialized in working with start-ups and entrepreneurs from various fields, and provide access to an extensive network of experts, academics, corporate strategic partners, and investors. These kinds of actors can be fundamental in fostering collaboration and creating shared value.

Below are three examples of emerging structures that can help utilities increase their technological capabilities by connecting with innovative actors in the wider water nexus, thus finding funds to accelerate project development.

WaterInno, connecting with an accelerator that supports water entrepreneurs

WaterInno Accelerator provides an extensive network of experts, academics, corporate strategic partners, and aligned investors to offer professional advisory and strategic relationships aimed at solving pressing water and wastewater challenges. The accelerator focuses on working with start-ups to help them maximize their impact, scale their revenue and user base, and establish important partnerships with the water industry.

This is a snapshot of their current involvement in the smart water and digital innovation domains:

Table 6:
Snapshot of WaterInno Accelerator activities

Number of start-ups focusing on water technologies	20
Profile of entrepreneurs	From the US, Israel, Europe, and South Africa Mean age 40, 70% men 16 years of experience Backgrounds: Robotics Environmental engineering Serial entrepreneurs Academics Consultants
Examples of business applications	Water-related risk management (flood, coastal monitoring, drought) Water and wastewater infrastructure monitoring Wastewater treatment Leak detection Agricultural irrigation Algae detection Domestic water purification
Technologies in use:	Satellite imagery Radar system Wireless sensors Robotics (UAVs, drones) Data analytics Cloud storage Social media
Working with utilities and established players	These entrepreneurs mainly scale and bring their products to market through pilot projects. What is becoming more frequent is seeing these kinds of start-ups get funding and mentorship from incubators and accelerators or from governmental grants and training programs, such as American-Made Challenges.

Source: <https://www.waterinno.com/>.

Tips and advice to utilities wanting to accelerate their adoption of emerging water technologies:

“I recommend water utility managers attend conferences and conventions (for example, WEFTEC) or receive specialized newsletters (Water Online, WaterWorld, The Waterly) or contact or join water innovation hubs and networks such as the American-Made Challenges network, Imagine H2O, Venture Valley, the Water Innovation Advisors, or the Water Network by AquaSPE.” *Stuart Rudick, Founder and CEO, WaterInno*

SUEZ + Imagine H2O

Imagine H2O is a non-profit organization that empowers people to develop and deploy innovation to solve water challenges globally. Their programs transform start-ups into scalable businesses and unlock deployment opportunities for smarter water resource management. The organization was founded in 2009 and has accelerated 123 start-ups so far.¹⁶ To do so, Imagine H2O hosts a yearly competition to nurture a cohort of entrepreneurs. Every year, more than 500 entrepreneurs apply to its programs.

In its search for innovation, SUEZ has built a 10-year partnership with Imagine H2O. The collaboration between SUEZ and Imagine H2O began in 2011, with an initial commitment from SUEZ North America. The partnership then grew to the extent that, in 2016, SUEZ joined the judging panel for the Imagine H2O Accelerator. In 2017, SUEZ became a Core Sustaining Sponsor, and in 2019, it became a Founding Partner of Imagine H2O Asia.¹⁷

“Digital is the connective tissue for solutions across a full spectrum of water and wastewater technologies – so everything really has a digital component nowadays.

Barriers to adoption are probably similar in LAC as they are in Asia: quality of data; siloed nature of data; culture/change management; pricing/cost of piloting; cybersecurity.” Nimesh Modak, Managing Director, Imagine H2O Asia

Trial Reservoir, a new source of funding to accelerate technology adoption, promote pilots and address the carbon footprint of water operations

Trial Reservoir, launched in November 2021 by Isle Utilities, is a new source of funding to accelerate utilities’ technology adoption, which can help the water sector achieve carbon neutrality. By providing technology companies access to funding specifically for trials, Trial Reservoir enables water utilities to adopt technology with minimal financial risk. The objective is to “enable municipalities and local utilities to focus on the installation and operation of water and wastewater assets, and it allows the technology companies to preserve their ever-limited capital,” says Piers Clark, Chairman of Isle Utilities.

¹⁶ <https://www.imagineh2o.org/asia>

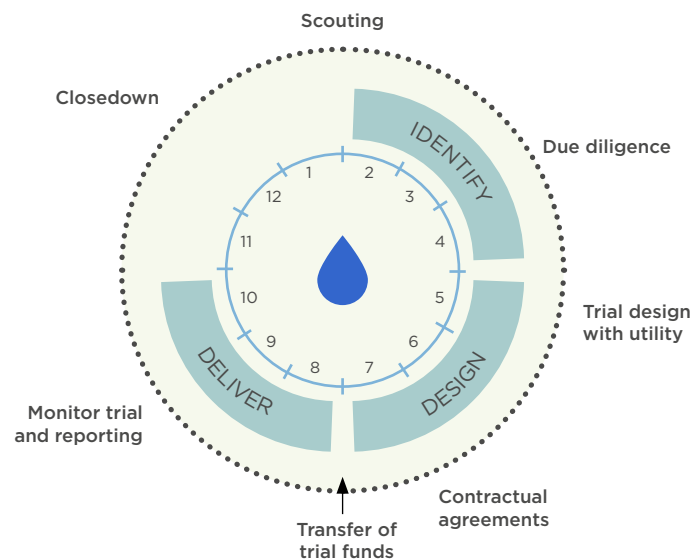
¹⁷ More details about this partnership can be found at: <https://www.youtube.com/watch?v=qozQxWrhjw0>.

Trial Reservoir works by giving water tech innovators access to capital for pilot projects. The initiative is open to technology vendors around the world, operating in high to low-income countries. The technology being tested must help reduce the carbon footprint of the water system, from local authorities/municipal utility to an industrial or commercial water user. The founders of this initiative believe that innovation and new approaches to water management are essential for cities and communities to solve water challenges and decrease their carbon footprint.

Money can be drawn down from the Reservoir to fund the trial, and if the trial is a success and meets pre-agreed success criteria, the utility will adopt the technology and the tech company that received the funding can then pay back the Reservoir.

The lifecycle of the program is documented in Figure 11 below.

Figure 11:
Life cycle of the Trial Reservoir initiative



Source : <https://www.isleutilities.com/trial-reservoir>.

What is transformative about the Trial Reservoir is that it is a win-win situation for both technology vendors and utilities. Tech companies get access to trial funding, and water utilities can adopt technology with minimal financial risk. This could be a winning formula to accelerate the adoption of new technologies, including in the digital space.



Getting started: A 13-question guide

This section proposes a simple 13-question guide to help structure discussion and accelerate the journey toward a digitally enabled water utility. Practitioners can use this guide to browse a variety of topics and evaluate their understanding of their maturity on the topic and identify areas that may deserve further exploration.

The list below can help initiate discussions among managers and practitioners across multiple business functions: IT, HR, procurement, operations, etc. Its purpose is to help explore some of the domains of the digital transformation journey, with no specific prioritization or degree of complexity.



Topic	Question	Why it is important	What to do next? Examples of actionable ideas or actions.
1. Strategy	Does your business strategy incorporate digital transformation at its core? Do you have a digital strategy?	The digital transformation journey is here to support the company's global strategy, and it impacts a variety of business areas. Having a defined strategy is necessary to prioritize work and evaluate benefits.	Document a digital strategy, starting with a vision. Establish key high-level goals and indicators. Communicate on this vision.
2. Governance	Does your organization have a committee to drive the digital journey, prioritize initiatives, and allocate the right level of resources?	Driving such change, prioritizing actions, and allocating resources require the involvement of top management, clear sponsorship, and the right organization to deliver a variety of projects over time.	Appoint a senior manager as sponsor of the digital transformation program. Install a committee (digital board) tasked with putting the vision into practices.
3. Business processes	Can you name the differences among dematerialization, digitalization, and modernization? How many of your business processes are currently dematerialized?	Before firms become agile and data-driven organizations, they need to start with the basics and prioritize efforts, beginning with dematerialization of their key business processes.	Map key business processes and identify those that are digitalized. Articulate the exercise with the development of the digital vision for the utility.
4. People and skills	Does your organization have a good understanding of the skills needed to accompany the digital transformation journey? Is it in line with the training strategy and recruitment pipeline? What about the pyramid of ages and tenure within the organization?	People are the heart of any company. Utilities are no exception. Digital technologies come with new skills and potentially new roles within teams. Companies need to identify needs and train or attract the right talent, as well as leverage experience to transition to a more connected and data-driven business.	List the key skills needed to drive the digital transformation journey. Run an internal survey to map the competencies. List existing training or plan learning/awareness activities.

Topic	Question	Why it is important	What to do next? Examples of actionable ideas or actions.
5. Change management, communication, and business readiness	When it comes to deploying new tools and reviewing processes, does your organization have a dedicated team, working together with business stakeholders, users, and implementers to support adoption and speed business readiness?	To deliver the benefits associated with the digital transformation globally, business areas must adopt not only new tools, but also review processes, integrate new profiles, and embed new ways of working. This requires good preparation for rapid adoption, that lasts.	Assure that each IT or digital project has a business readiness component, including communications and training. Track and support adoption.
6. Technology	Does your organization have an IT road map? Do you have a defined strategy on infrastructure (including cloud), testing, release, performance, procurement, and risks?	An IT road map documents the technology adoption plan across the company, and is a fundamental tool to anticipate changes, risks, and support related to integration of new pieces of technology.	Develop an IT strategic plan, or update the existing one, aligned with the digital vision.
7. Benchmark yourself	Can you name a company or business you think has great innovative digital service in place (in operations, CRM, finance, etc.)?	As more and more businesses embrace the digital transformation journey, benchmarking is important for identifying similarities and differences, and creating a road map that considers the organization's own identity.	Try to connect with peers or companies that can inspire yours. Plan a visit or exchange best practices.
8. Data	Do you have a data policy in place (including standards, security, retention, etc.)?	Data is one of the key pillars of digital transformation. A structured way to collect, store, and manage data, including compliance with standards and regulations, is paramount to creating a secure and future-proof system.	Ask IT to document a simple data policy and run a series of workshops and awareness sessions with employees on the matter.

Topic	Question	Why it is important	What to do next? Examples of actionable ideas or actions.
9. Customers	Do your customers have access to a variety of channels and platforms all along their “customer journey,” from contract initialization to their final move? How dematerialized are your systems of engagement with customers (billing, inquiries, payments, etc.)? What percentage of payments are dematerialized?	In service companies like water utilities, customers are the focus and service quality is assessed by customer satisfaction. Furthermore, the multiplication of systems of engagement is a reality in a variety of services in people’s lives. Water companies need to remain up to date in the way they serve their customers compared to the way other providers, including other public services, do so. Finally, in times of water scarcity or economic tensions, having an efficient and fluid system of engagement in place is key to optimizing the administrative cost of processes and creating a robust channel to educate customers.	Identify some key high-level indicators of the use of various channels and systems of customer engagement. Document a strategy to make the best use of the digital channels and quantify the benefits associated with it. Track periodically. Run a survey involving a sample of customers to better understand their needs and priorities in terms of engagement and use of digital channels.
10. Partners and suppliers	How dematerialized are interactions with your suppliers? From billing to payments, does the company propose an end-to-end fluid and integrated experience to vendors and providers?	Suppliers and partners interact with a variety of other companies and tend to adopt new ways of working quickly. It is important for the company to remain up to date to increase collaboration and enhance flexibility and efficiency with its vendors.	Assess the channels used with vendors and suppliers. Run a survey involving a sample of providers / suppliers / partners to better understand their needs and priorities (tenders, invoicing, payments, etc.).

Topic	Question	Why it is important	What to do next? Examples of actionable ideas or actions.
11. Innovation	How does innovation occur in your organization? Where do new ideas come from, and is there a structure to fund them, and to design, develop, and evaluate results before further generalization? How are vendors and suppliers associated with this? How are you connected to the external ecosystem (academics, start-ups, etc.)?	New ideas, emerging needs, or improvements need to be tested before they become widespread across the company. Pilots and prototypes, sometimes deployed in an agile way, are a good way to start implementing new technologies. But because of risks, size, and skills needed, some organizations need to put in place a specific environment (a lab, a team, a task force, a “digital factory”) to initiate these projects.	Nominate a focal point as a go-to person where employees can go when they have ideas. Establish a process to deal with bottom-up innovation – including connecting with the digital board. Communicate on all the new things (tools and processes) that the company has introduced. Work with communication and training to speed-up a culture of innovation.
12. Project management	Do your teams use a specific deployment method when implementing digital solutions, covering design, testing, support, etc.?	The digital transformation journey requires a myriad of projects across the company. Having a robust method in place to industrialize, learn, and efficiently deploy technology and processes is a key success factor to anchor the changes and realize the benefits in the longer term while minimizing risks.	Identify colleagues with project-management certifications. Propose project management training sessions. Refresh/structure a project delivery framework
13. Benefits and ROI	Does your company track the benefits associated with the implementation of new digital tools and IT solutions?	Digital transformation is not cheap. Designing, implementing, and running digital solutions comes with CAPEX and OPEX, including costs associated with training and reorganization. The technology road map is here to support a vision in terms of efficiency, productivity, reliability, etc. Therefore, a clear benefit case is needed. Ideally, a program should come with expected benefits and a mechanism to track them after deployment.	Make the digital board accountable for tracking the benefits of digital initiatives. Establish system-wide indicators for each project and communicate widely on their benefits.

Source: The authors.

8. Conclusion

Water utilities are facing multiple challenges, and the introduction of new technologies can be a powerful enabler for solving burning issues. Several applications are being deployed across the water utility value chain, from water production to customer engagement.

The expectations are high, and numerous are the efforts needed to implement digital solutions and embed the changes into the day-to-day of water utilities. Going from a company that operates in a planned and reactive mode to a real-time data-enabled organization is a journey that involves far more than technology. It means embracing a series of activities covering business areas such as organization, culture, skills, and overall collaboration.

This digital transformation journey of water utilities is a global trend and operators in the LAC region are no exception. Some actors are already leading the way while others are still in the elementary stages. Regardless of the organization's digital maturity, what is important is seizing opportunities associated with the most appropriate technology right now, by starting to plan the introduction of digital solutions with a credible road map.

The COVID crisis has been a catalyst that has accelerated the deployment and rapid adoption of new tools and digital platforms. It has enabled business continuity and remote work in the absence of employees in lockdown or quarantine, as well as maintained interactions with clients who were no longer able to visit offices.

Tangible examples are emerging of how digital transformation is reinventing water utilities, illustrating the need for robust collaboration, sometimes with new types of organizations or in the context of innovative and agile initiatives.

There is a lot to learn from peers. The variety of innovations already deployed around the world should inspire water utilities to begin or expand their transformational journey, one step at a time.

Finally, because digital transformation is more than technology, attention to adoption and users – keeping the focus on people – will facilitate the transition to more digital, connected, and data-driven water utilities.

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