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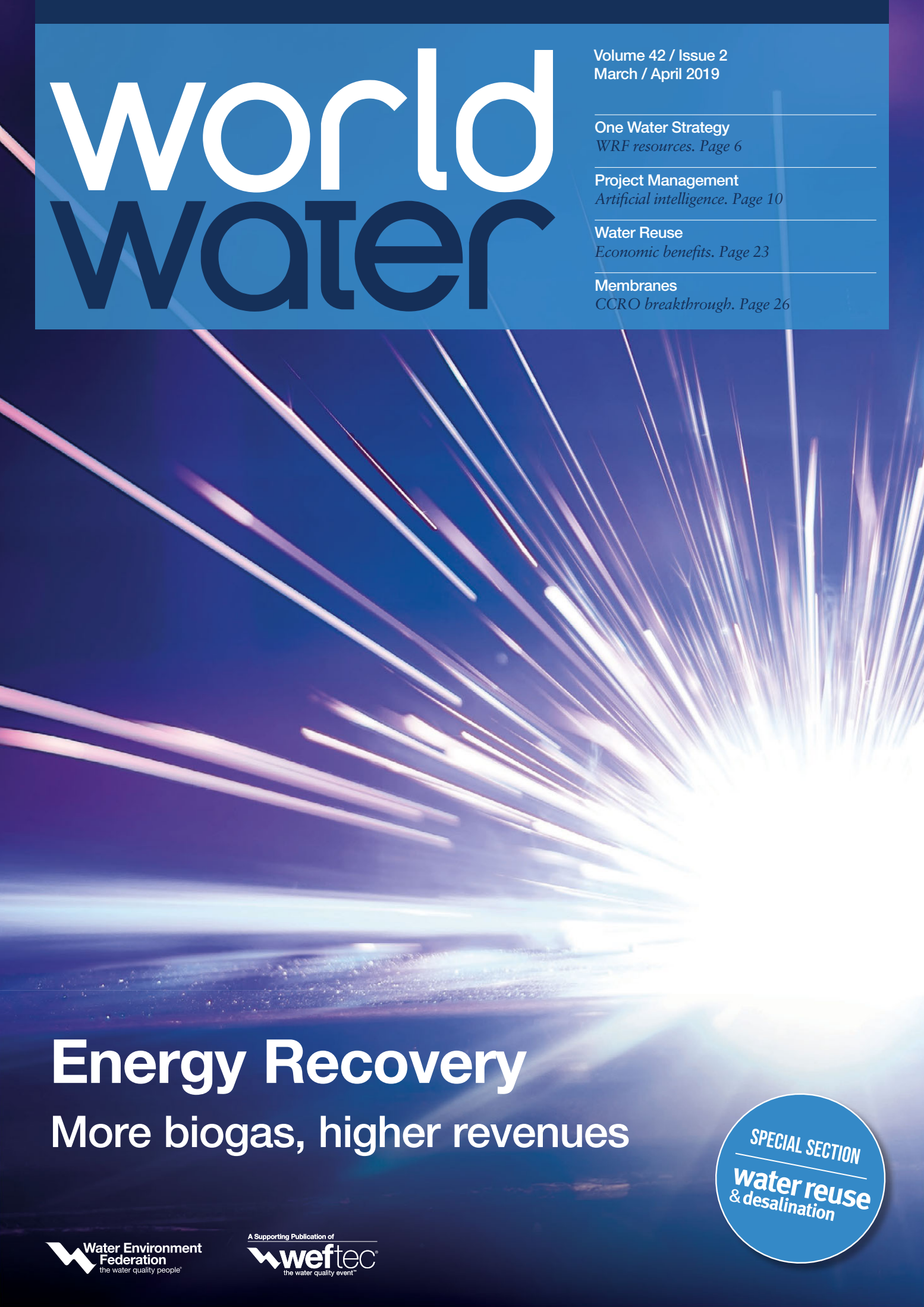

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Asking electronic assistants such as Amazon's Alexa about a project's analytical data is within reach. **Paul Taylor** at Stantec takes a close look at how artificial intelligence (AI) may change project and program management in the near future.

Need project insights? Ask Alexa

Walking into a meeting and asking the earned value of a project would traditionally be a question directed at a project manager. But times are changing. Now, this question could be asked of an electronic assistant such as Amazon's Alexa, Apple's Siri, or other emerging business intelligence applications that can interrogate a program's integrated information hub using natural language processing. And questions that we normally ask each other can also be interpreted by systems to help gain data insights.

Five to 10 years ago, this concept would have been considered far-fetched or something seen only in a movie. However, now within reach is the potential of insights being interpreted and delivered by artificial intelligence (AI) assistants that can help navigate and make sense of large volumes of information through the use of machine learning.

These assistants, and other emerging technologies, help usher the water industry further into the age of augmented analytics, or those that are automatically assisted through technology.

As infrastructure client and delivery organizations try to remain competitive, it is essential for them to reduce their management costs while still providing effective and timely information. It is a real possibility that AI support, such as voice-assisted analytics, is what many project and program managers may get for Christmas in the next 2 or 3 years. However, there are many fundamentals that need to be right before it's time to start unwrapping that particular present.

To put this shift into perspective, changes are most definitely coming – and far more rapidly than people expect. Given Moore's Law, which indicates the doubling of the number processors on a microchip every 2 years and the introduction of self-learning software, these AI developments are only a couple of years away, rather than decades.

These changes will affect how projects and programs are managed, and the higher profile infrastructure schemes will be expected to be at the cutting edge in using these kinds of technologies.

The most important part is retaining this vision of the future while ensuring that foundations – people, process, and information – are robust and can help deliver the promise of these technologies.

Developing project information maturity

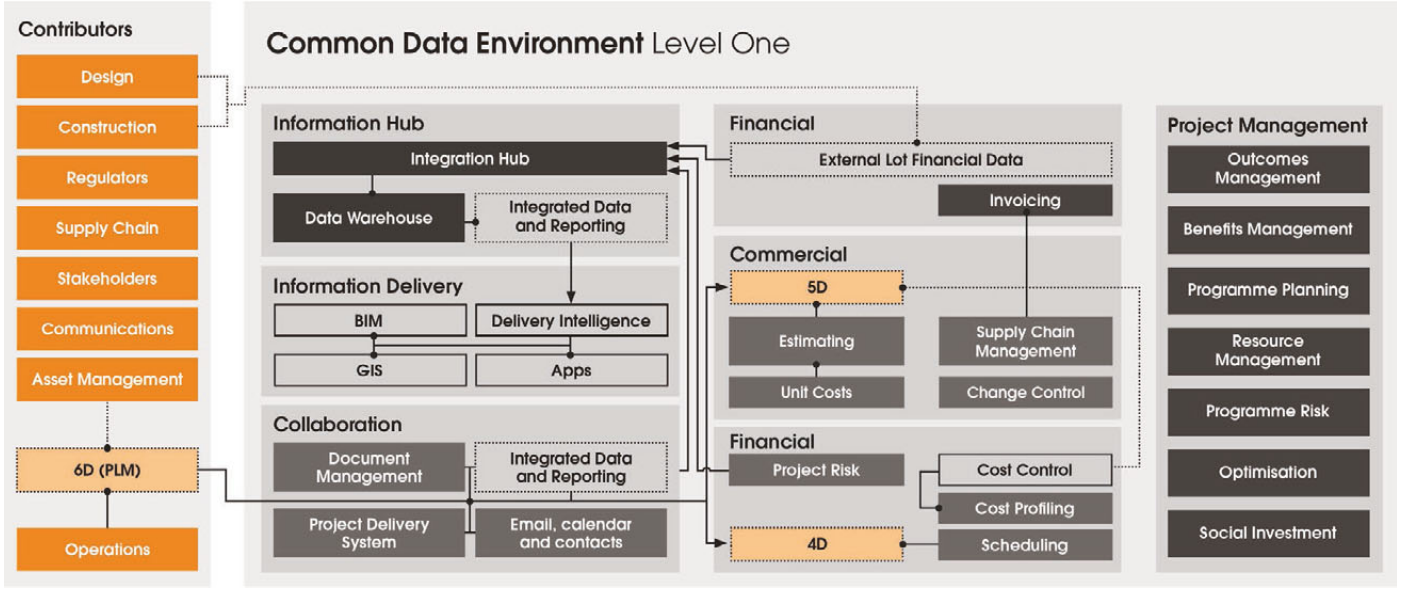
Achieving an AI environment is not an overnight process, as some reports suggest, but rather a series of interrelated and overlapping steps. A step-by-step approach with incremental improvements in processes and technology increases the adoption and overall success for the business.

Step 1: Cohesive business practices

Establishing a trusted foundation: For any information environment, especially with respect to management reporting, it is essential that the data can be trusted.

The insights gained from data can only be as good as the quality of the data going into any analysis. Simple performance metrics, such as averages across a program, can be skewed greatly if there is poor or missing data within a data set. When managing a program, this issue could lead to misguided initiatives or measures being implemented in hopes of improving the average, such as replacing project managers or changing delivery methods, when the underlying performance is, in fact, acceptable. This oversight can lead to great inefficiency and impact delivery without changing the root cause of the problem.

Typical Digital Delivery Environment



Step 2: Process integration

Changing the environment for digital delivery: Building information modelling (BIM) is commonplace within the utility and infrastructure sectors, but its use and value is not always at the breakthrough point. The hurdles that BIM face are:

- Resistance to upfront investment
- Limited capability when adopted (3D modelling only)
- Lack of integration and use within the supply chain
- Overuse of Excel spreadsheets for information storage
- 4D integration to schedule-based tools used as demonstration only, rather than the norm
- Many estimating systems do not interface with federation software, preventing 5D modelling.

Step 3: Integrated asset organization

Creating a digital asset twin: If all of the digital information collated by a delivery organization cannot be provided in a useable format to the client organization, then the business intelligence will not be transferred to the client, so the investment does not achieve its full added value.

The counter argument is that once the client organization has a digital capability, the requirement for the delivery organization to provide information in a digital format is a mandate, not a negotiation. Using BIM to create a digital twin, further augmentation will enable a fully integrated asset model (IAM) to be built.

These models will form the backbone of how utility and infrastructure asset owners manage their future operation and maintenance. Once a specific proportion of assets are stored in this format, it is expected that asset owners will move to convert other existing assets into this format.

Many would say there is nothing new about 3D models. Let's drill a little deeper into asset information and explore how the digital information from an asset model can be used as an example of the Internet of Things (IoT). A delivery organization might supply an intelligent pump with in-built diagnostics similar to those of a car. The diagnostics state that the impeller bearings are failing. This result then prompts attention and flags it within the IAM using threshold criteria built within the model. The pump is then allowed to raise the order for a new impeller and bearing assembly itself, directly from the manufacturer. The pump also informs the asset manager that digital twin maintenance is needed and provides delivery dates of the replacement impeller.

Robotic Process Automation Role Functions

Department	Finance	Project Management	Human Resources	Procurement
Functions	Payroll	Cost control	Recruitment validation	Purchase
	Expense validation	Risk analysis	Security checks	Contract formulation
	Invoicing	Reporting	General Data Protection Regulation (GDPR)	Automated re-ordering
		Material take-offs		Supplier onboarding

Step 4: Performance insight

Machine learning: With the vast amount of information collated in steps two and three, the process of machine learning and predictive approaches become more available. For example, if information from several large programs is stored in what is known as a "data lake," there is a wealth of cost, time, and scope information that can be mined to use for future predictions. A simple example is the collation of project risk data, which can then be categorised using attributes covering project type geography and other conditions. Recording how risks have been mitigated is also important. Once the data is of a reasonable volume, it can be collated into informative risk libraries. This approach allows remedies to be quickly disseminated to the project teams showing projected impact to cost, time, and schedule.

Step 5: Augmented analytics

Artificial intelligence support: AI can be viewed in several different formats, but two specific approaches are robotic process automation (RPA) and AI Augmentation.

Type 1 robotic process automation (RPA): One early stage of AI expected to develop is the introduction of RPA. At present, RPA can replace a proportion of human tasks, but there are still gaps. The expectation of large-scale staff reductions in the initial stages of RPA introduction into the workplace is therefore unlikely to materialize. As the software advances, some roles may disappear, but others are likely to emerge.

Type 2 AI Augmentation: Predictive analytics is a key area being explored by some software development companies. The approach involves AI software importing data from multiple sources to provide the project and program team with the predictive analytics capability. AI packages used in these instances work independently of the program and project management systems. It is expected that AI tools will be able to integrate seamlessly with the base products within the next few releases.

As this approach is less intrusive compared to the RPA approach described above, there is likely to be less resistance in the workplace. This projected result is due to the probability that it will be seen as supporting individuals in their delivery rather than replacing them.

Future outlook

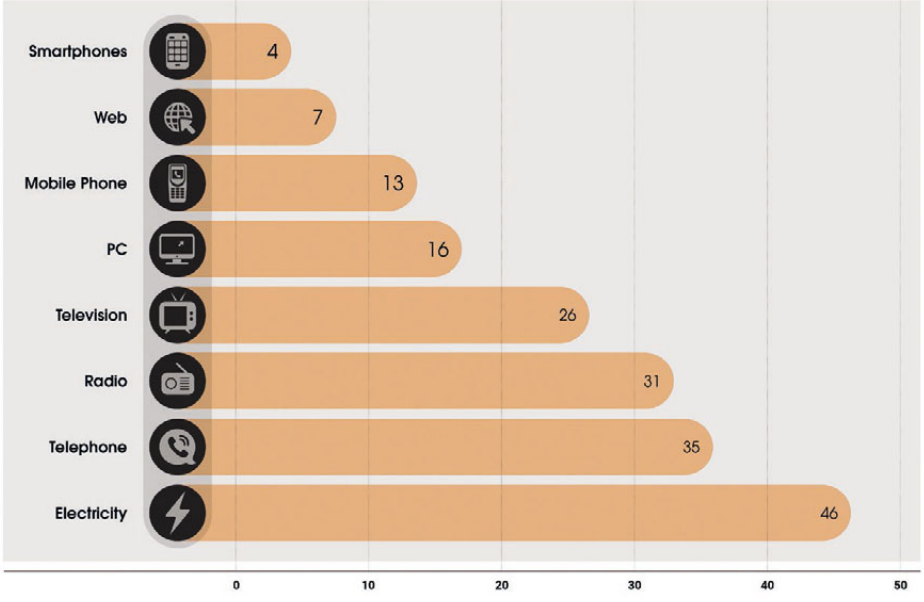
It yet remains unknown whether the introduction of AI will create more employment or rather create more diverse opportunities, as with computer-aided engineering in the late 1980s. It also remains to be seen whether the changes AI brings will reduce employment opportunities while satisfying investors and shareholders.

In resource-intense businesses such as design and professional services consultancies, AI will fundamentally change overarching business models as the emphasis moves away from a cost per person to a service cost.

If we think that these projections are not realistic, then we need look at where investment is being expended and at what industries are attracting the world's financial investment. In 2008, the most valuable companies in the world were the likes of Exxon and General Electric, with Microsoft and AT&T as the only technology businesses in the top five. But by 2018, Apple, Alphabet, Microsoft, Amazon, and Facebook had joined the table and were dominating the market. These tech giants are investing on a huge scale and pushing AI boundaries into the future.

Technology Adoption is Accelerating

Source: US Census, Wall Street Journal



Author's Note

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