DIGITALIZATION OF UTILITIES OPERATIONS

TRIGGERING VALUE CREATION
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$1.3T
Value to be captured globally through digital transformation of electricity sector from 2016 to 2025

$299B
Digital Utility market size by 2025

$330B
Utilities average investment in the digitalization of power plants from 2012 to 2017

45%
of utilities' investment in analytics will be used in operations and maintenance of plant and network infrastructure
Introduction

The digital transformation is a centerpiece of many companies’ strategy. A transformation aims at reshaping and reinventing organizations to fit new ecosystems, to keep creating value and successfully address new business challenges. But behind the concept of change, there lies also the notion of urgency: the future of the company may rely on its ability to manage a shift, sustainably. The digital era is calling companies for transformation.

Power utilities are no exception. But more than a corporate strategy, what does digital mean for operation and maintenance of industrial assets? What value is targeted through transformation to the new ecosystem? And how can companies succeed in the shift?

This topic lends itself to any number of articles and testimonials. In this one, we will discuss specific cases of digitalization of industrial asset O&M (1), challenges, opportunities and ingredients to succeed in creating value.

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(1) Operation and Maintenance
A new digital world

The digital revolution has been impacting our daily life for many years, and perspectives of benefits through major changes in the near future are outstanding.

B2C players have rapidly embraced digital tools: they have reached a very high level of customer adoption and high digital maturity. Moreover, the digital era is impacting business models and structures: UX designers, data scientists and agile teams are commonly integrated into IT or business teams to reinvent or create services and build new experiences for customers.

For power utilities’ operations and associated B2B services, the potential of empowering operations with digital tools is now commonly explored. Executives and operation officers see data driven operations, predictive maintenance and digital twins as high-priority topics. Indeed, digital is a key enabler for operational excellence and new revenue streams in a changing world where utilities are undertaking the shift of decarbonization and decentralization of their sources, and where commoditization of their core expertise requires augmented value in a fiercely competitive market for B2B services. For nuclear operators, digital helps master plant lifecycles, from design to dismantling. For any operator, digital brings solutions to:

- **Work safer**: For constant tracking of unsafe situations and excellence in crisis management, digital is a game changer. It brings to the field new user-friendly tools to ensure full situation awareness via geotracking, co-activity management, real-time alerts with photo or video reporting, remote monitoring of vital signs and contextual assistance in case of emergency. Digital as a “single source of truth” also provides an important safety barrier to prevent miscommunication and incidents.
- **Work better:** Improve O&M to reach a new level of performance by implementing solutions from "anytime-anywhere" technical data access and data input allowing for loss-free knowledge management or more advanced data analytics, to identify actionable insights and parametric optimizations.

- **Work together:** Provide tools for communities, operators, experts & managers, merge experiences in collaborative platforms, provide new management approaches based on sharing and connecting people. Digital aims at breaking silos, improving knowledge management, stock management (market places), asset optimization. Most power utilities will target a next level of business intelligence through a “business value dashboard” with concatenated data visualization allowing for fast and valuable decision-making at the plant, fleet or portfolio level.

- **Work greener:** A precious ally in meeting CO2 emission abatements and achieving fuel consumption reductions, digital enables asset management and optimization at scale, introducing new solutions and business designs to successfully bring about the shift to renewable energies and compete against new digital natives.
From decision support to fully (artificially) intelligent production systems talking - exchanging processed data - to each other with the aim of optimizing production, **digital provides operational value at any stage of the O&M process and is easily flexible to any environment and way of working.**

Nuclear operators can certainly relate to quicker and safer operation, also given the fact that digital does not necessarily mean "online." Indeed, many offline solutions are available: the storage and computing capabilities of mobile devices are increasing dramatically, and hardened components are available on the market.

Digital introduces new ways of working and can largely address the big challenges of power utilities: fierce competition, costly legacy assets, and growth of decarbonized and decentralized sources.

Nevertheless, digital maturity of utilities operational business units can be rather low, both in term of technology awareness and management of digital transformation, and for power utilities with worldwide footprints, maturity can be extremely heterogeneous. Large discrepancies are observed between countries in the use of digital tools for day to day operation and maintenance activities, with variable appetites to experiment new digital assets. As a result, **power utilities make up a highly irregular landscape of adopted solutions and digital maturity,** which also depend on the local business and regulatory context.
From scattered local point solutions addressing specific operational pain points, major energy purveyors are aiming to scale up, rationalize and achieve full and global digital operations, with great expectations. They intend to master digital for most activities and trigger massive cost reductions and new revenue streams. However, for historical power utilities, the effort involved in switching to fully digital Operation and Maintenance is significant. In addition, the new energy market comes with a new competitive landscape. The digital transformation is also a matter of time.

Finally, the digital explosion, with its "tsunami of data," shares overlapping stakes with energy markets, and their futures are closely linked. Recent studies predict that the ICT (Information & Communication Technologies) industry could consume 20% of all electricity and emit up to 5.5% of the world’s carbon emissions by 2025. Thus, the near future of energy supplies will have to deal with this new paradigm of producing for a more demanding digital world, while dealing with more data to compete with newcomers in the renewable market, improve legacy fleets and reduce CO2 emissions…
A new energy world, a new competitive landscape

Together with a new digital world comes a revolution in renewable power generation: historical assets are ranking lower in the merit order and moreover, most renewable assets are not owned by the utilities. Competition is opening up to a broader range of competitors including digital solution suppliers aiming to provide tools to manage large fleet of solar of wind assets. Some of these tools offer powerful features to manage maintenance, contracts, and data analysis for O&M optimization (Breeze, Quantum, Energy Studio, etc.), thus paving the way for optimization and increased availability.

As longstanding and experienced actors, OEMs are well placed to embrace this transition, enhance their market position and take ownership of the process. Utilities, which used to be active throughout the value chain, are now being overtaken by OEMs, which are spreading their wings by claiming data ownership and building end-to-end solutions built on data acquisition, data analysis and data intelligence (e.g. Ensight by Envision).

Moreover, competition is also on the rise from more disruptive solutions based on new digital technologies such as Virtual Power Plants (VPP) and remote plant monitoring that offers real-time management and optimization of a virtually aggregated portfolio of generators with regards to consumers, suppliers and grid operators. For example, the e2m company has aggregated a portfolio of 3,400MW.

To successfully bring about the digital shift, time is of the essence for utilities. Digital native competitors will have the advantage of shaping their organization and adapting to the changing energy market in a heartbeat: commoditization, new businesses opportunities, new digital-driven uses. Utilities are facing a complex challenge to reduce their legacy asset cost base, homogenize and rationalize their global digital footprint, but they also have the opportunity to leverage their in-depth knowledge acquired from a very long operational history, as well as their ability to exploit their most valuable digital asset: data.
Given the potential of digital tools to reach operational excellence & value creation, business units may be tempted to deploy expensive digital solutions and beat the clock. However, they pose risks of low return on investment and discouragement in the digital journey.

Below, you will find some ingredients to trigger value creation in a time-trial digitalization journey.

**Define a vision and establish clear governance**

As in any transformation exercise, the first step is to define the future state and set out the path to achieve it. This is the first requirement for a successful digital transformation - defining a roadmap that outlines use cases, technologies and work horizons, while including an organization that clearly identifies the authorities and decision-makers involved. As a key success factor of the roadmap, **digital value must be outlined as operational gains with measurable results.**
“Data is the new oil” is a commonly used comparison, which nonetheless has its limits. This metaphorical approach presents the advantage of pointing out the fact that digital value for power production professionals lies in exploiting data directed at data-driven O&M. However, the parallel ceases to apply when considering that the value of oil comes also from its scarcity and uniformity. Data is heterogeneous, abundant and accessible everywhere. **The data exploitation process becomes valuable when it is selective and "context dependent."**

For most power utilities, data flowing into the OT/IT systems of industrial assets remains an untapped and extremely valuable resource, capable of triggering huge benefits through predictive maintenance, production performance optimization and even "basic" anytime-anywhere data access for operators or managers wishing to optimize their performance.

As a result, the first concern for power utilities must be to focus on their capabilities of collecting, gathering and curating carefully chosen data from their assets and enriching data collection through additional sensors. **Data mining is key and must remain an unwavering and selective pursuit, as value will come out from in-depth business analysis.**
Test & learn - take risks

There is no guarantee of value from digital tools without plunging into business mechanisms and user journeys. The capacity to realize potential depends on the ability to identify specific, valuable use cases or actionable insights revealed by analytics, in a business-oriented manner. However, revealing business opportunities might not be straightforward, and exploration phases, iterations and tests are important in the quest for digital value: staying agile and failing fast will avoid spending too much on expensive projects and business studies.

Identifying pilot sites or assets for quick small-scale tests on what could be a digitally augmented O&M with connected assets, operated by enhanced operators, will help in creating a fast-growing digital community and testing solutions before reaching scale.

Having business teams and field people involved in the process is essential to break down costs, revenues, and express specific pain points. Once an opportunity is identified, take time to prototype solutions by targeting minimum value products with dedicated features and technology.

Know your people - stay user-centric

Centerpieces throughout the transformation, user-centricity and agility are key to allow exploration and tests, and ensure a match between expressed needs, identified value opportunities and the solution that is built. The transformation must be made with an approach grounded in operational excellence, and solutions must be desirable. This kind of action-oriented mindset is focused on solutions rather than problems, looking to create a better future. It implies adapting the service to the status of the customer: end-user, operator, manager, supplier.

It is also important to consider the whole user journey: before, during and after service. This approach can lead to major changes in the way operators or managers perform their tasks: digital also introduces new ways of working. For instance, digitization of power plant round shifts (or walkarounds), switching from paper entry forms to a fully digitized process makes it possible to introduce a new analysis phase "in front of the equipment" and new "safety-oriented" tasks, thus leveraging operators' deep technical knowledge of the environment and technologies available on smartphones: NFC, video etc.
Utilities, and industry in general, need a structure to embody transformation, a structure that hosts methodologies and best practices for digital transformation. This "hub" must also be the automatic point of reference for any digital opportunity to be created or tested. Moreover, as sharing common objectives and common targets is key for the transformation, momentum must be distributed continuously across operation and business units.

Transformation is only real when you can see it, so you have to make it visible. The digital “Hub” or “Lab” must be and remain the place where the digital transformation lives, and where new methods and lessons are transmitted and taught. Dry runs of digital creation processes, workshops and special events must be facilitated by this place and its dedicated staff. Introducing designers in the process is a topic that is already extensively discussed in the current organizational literature, and one of the concrete achievements of this change is the initiative of hosting of designers in the digital hub/lab.
The final decisive ingredient of any digital transformation project lies in the ability to surround yourself with the right talents. Embarking on a digital transformation project is very disturbing for many power utilities, as effort is focused on non-core skills: they need to develop applications, understand and leverage IoT technologies, create value-driven artificial intelligence, etc. Power utilities must identify the resources they lack and create - both internally and externally - an ecosystem of partners that are involved in the digital journey with utility operations. As trusted third parties, partners will have the role of keeping a calm eye on internal mechanisms and habits, open and connected to an extended external ecosystem.
About the author

Rémi Dachicourt holds a PhD in Physics. He has worked for many years in the field of innovation in energy production: next-generation nuclear reactors, optimization of dismantling operations, etc. He now leads large-scale innovation and digital transformation programs on the strength of design-thinking methodologies.
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