VALUE REALIZATION FROM DIGITAL TRANSFORMATION IN UTILITIES

How the utility sector can leverage opportunities to deliver real value?

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The past decade has seen major transformation in the Power and Utility industry, and we have come a long way from the central power generation model of the 20th century. The call for 'major transformation' is merely a cliché phrase in the present scenario. While changes in fuel mix due to clean energy sources and renewables dominated the first half of the past decade, the second half saw traction on distributed generation, load and grid defection, call on resilience, environmental regulations, pricing reforms, promising progress in energy storage and improved customer-centricity.

Looking at the next decade, we will see how newer business models will emerge due to digital information and communication technologies. While the transformation is global, the level and speed will vary by region, influenced by regional policies and regulations, geopolitical scenarios and degrees of adoption of digital technologies such as Industry 4.0. It will also vary across business functions. While retail customers increasingly adapt digital technologies, generation function continues to lag in digital adoption. Even among a specific function like power generation, digital influence is quite diverse between long-term nuclear business and recent business models engaging in distributed generation and renewables.

The 2019 Utility Digital Experience Study reveals that **utilities remain among the lowest-performing industries from the digital experience perspective.**[1] However, many utility companies have undertaken significant efforts to digitalize in areas such as customer experience, safety, maintenance, reliability, and regulatory compliance. This has paved the way for the inculcation of the "digital mindset" across the value chain. While the mantra for many industries such as financial services and retail has been "customer-centricity", this perspective has only just started percolating to the utility industry. The digital laggards are seeing opportunities to manage assets intelligently, operate more efficiently and reduce costs. In this paper, we will explore how utilities can pivot on the technologies of the Fourth Industrial Revolution such as industrial internet of things to address business challenges, achieve sustainable growth and drive end-to-end customer experience change.

Five Key Trends in Utilities

New Business Models: The energy-as-a-service model is set to disrupt the industry. 43% of utility companies plan to implement data analytics driving the service model. Community Choice Aggregation (CCA) allows communities to choose their energy sources and aggregate procurement.

Renewables: The EU targets the adoption of renewables to be 32% by 2030. The U.S. already ensured that 23% of its power is generated by renewables in 2019.

Distributed Energy Resources (DER) and Grid Modernization: Roughly one in every five utilities plan to invest more than $200 million on grid modernization in the next three years.

Non-Wires Alternatives (NWA): The US is a global leader in reducing grid expansion costs by NWA. It is said to see a 20% annual growth until 2028.

Smart Cities and Electric Transportation: Utilities are shaping up to be operators for smart cities focusing on transportation electrification strategies. The electric vehicle market is likely to reach 26 million globally by 2030.

Transformation programs do fail

While businesses today consider "Digital Transformation" as the key to sustain and thrive in the current landscape, majority of them – including some of the most innovative and profitable companies – have failed miserably in their efforts. In 2018 alone, the **spending on digital transformation was close to $1.3 trillion with about 70% attributed to failed programs.** These statistics included conglomerates such as GE and Ford.[2] There has been substantial research to understand the underlying reasons for this failure. Here are a few factors pertinent to the utilities industry.

- **Obscure vision and definition** – The gap in connecting digital strategies to business values due to the lack of a clear definition of the end-point. For example, GE in 2015 built a new business unit called "GE Digital" to leverage on data and turn GE into a tech giant. While the company poured enormously into the unit from financial and man-power perspective, the products suffered, the company's stock price fell and the CEO was forced out eventually. GE clearly, focused heavily on numbers without a strong direction towards log-term innovative goals and returns.[3]

- **Improper scaling** – 'Pilots never fail; pilots never scale' said Lennart Woltering in his article while elaborating on the need for a realistic approach to scale successful social and environmental transformation pilots.[4] Research reveals that **less than 50% of the successful digital pilots provide the desired returns when put to scale**. Outsourcing of innovation, misaligned management and, premature infrastructure primarily thwarts scaling of pilots.

- **Technology-first purview** – It is crucial for a digital transformation program to **fit technology on a problem and not the other way around.** A utility firm aiming to carry out large legacy-replacement activities would end up consuming a lot of resources and money. For example, a company halted its enterprise-wide ERP roll-out owing to mismanaged workforce and cultural inhibitions. This left just a few plants upgraded and the rest running on a legacy system.

- **Aging workforce** – Solving the aging workforce conundrum has been the biggest challenge the energy and utilities industry has been facing for a decade. **More than 72% of the energy employers find it difficult to find talent with the desired skillset.** It is also true that over half of the current utility workforce is expected to retire in the next 6-7 years.[5] Companies are working out ways to combine millennial tech-savvy employees with seasoned professionals and the right organizational change management interventions to drive today's digital re-inventions.

- **Broken communication** – While people and culture form a major challenge to transformation, the bigger challenge comes from the organizations' inability to communicate the right message to the right people at the right place and time. It is quite straight forward to identify processes and tools for the transformation. But, many companies fail to articulate how these will benefit employees.

But the opportunities are exciting

As digital prepares to reshape the utility value chain, many companies have adopted an aggressive stance to secure market share by closely competing with new disruptive entrants, operating and managing costs efficiently and transforming the existing landscape. The business of energy generation will evolve to effectively manage demand and supply in real-time using advanced analytics, comprehensively monitor processes with smart metering and strategically decentralize networks powered by artificial intelligence. The transmission and distribution networks will further leverage big data and analytics for asset lifecycle management and predictive maintenance, cognitive computing for network efficiency and outage management, mobility for safety and field operations.

Exhibit 1 depicts the technologies of the Fourth Industrial Revolution as enablers along the utilities value chain. It also specifies the digital maturity indicator along each business area and identifies scope for potential value creation.
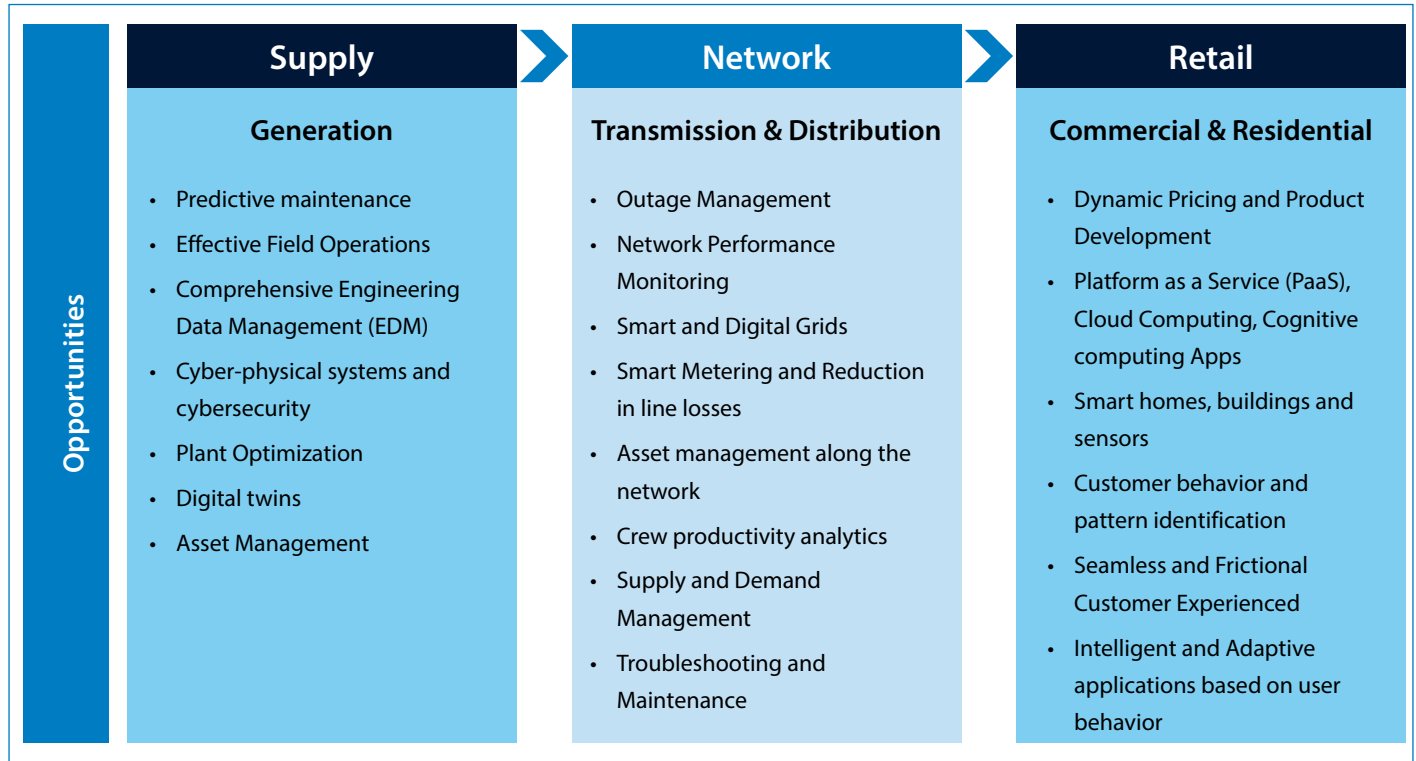
Supply	Network	Retail
Generation	**Transmission & Distribution**	**Commercial & Residential**
• Predictive maintenance • Effective Field Operations • Comprehensive Engineering Data Management (EDM) • Cyber-physical systems and cybersecurity • Plant Optimization • Digital twins • Asset Management	• Outage Management • Network Performance Monitoring • Smart and Digital Grids • Smart Metering and Reduction in line losses • Asset management along the network • Crew productivity analytics • Supply and Demand Management • Troubleshooting and Maintenance	• Dynamic Pricing and Product Development • Platform as a Service (PaaS), Cloud Computing, Cognitive computing Apps • Smart homes, buildings and sensors • Customer behavior and pattern identification • Seamless and Frictional Customer Experienced • Intelligent and Adaptive applications based on user behavior

(Opportunities)

Exhibit1: *Potential Opportunities for Industry 4.0 along the Utilities value chain*

It is not as daunting as it appears . . .

Digital transformation appears to be a challenging affair for even large power companies, especially when it comes to justifying the business case for the investment. However, a well-planned path to digital adoption with new workflows incorporating the right blend of manpower and necessary technology is the success recipe. Utilities will need a recursive and incremental approach with a close analysis of what can potentially yield the best return on investment. It all begins with answering the below three questions before a deep dive.

- Is the organization prepared to walk a digital transformation path?
- Are the areas identified for the digital makeover with clear business cases?
- Is there a clear strategy in place for implementing change?

Be prepared

The process starts with the development of a "digital DNA" at all levels of the organization. It is important to push this thought from the C-suite with a clearly defined vision for technology adoption and its strategic implications. Many utilities appoint an executive director under the CEO to oversee the digital transformation initiative across the value chain. It is also worth engaging in conversations with leading technology consulting firms to understand the trends and developments in the digital economy.

Special focus is needed on the preparedness of the cultural change. For Electric Ireland, the **biggest challenge was repositioning from an engineering way of thinking to a customer-centric outward-focused mindset.**[6]

Make the right choices

Industry 4.0 bestows a host of opportunities in terms of Augmented Reality (AR), Industrial Internet of Things (IIoT), Big Data, Cloud solutions, and Robotics. Many of these technologies have excellent use cases in generation, transmission, customer operations, product lifecycle management, and service offerings.

What is the right blend of technologies for the best return on investment? Most power companies spend substantial time in answering this question. It is vital to identify the enabler and the function. For example, a major European utility used technology as a part of its effort to reduce its environmental effects.[7]

Another company, ERDF, is leveraging on open data strategy with the CEO observing that the company had a **concrete roadmap for open data in the era of digital social media**[8]**.** PG&E, the single largest operating utility in the US, has made attempts to **reduce costs by focusing on "affordability and flexibility"** and in-turn improving the customer experience.

Develop the plan

To thrive in the digital era, utilities need to embrace agility – identify challenges and opportunities and quickly modify the organization without destabilizing the already running engines and assets. This needs a well-crafted implementation plan supported by the leadership and eventually, the entire workforce. For example, a utility service provider in Europe chalked out an elaborate plan to manage outages by harnessing data - using advanced metering, GPS, analytics, social media and **achieved a 3% reduction in outages.**[9]

Exhibit2: *Terminus a quo for digital transformation*
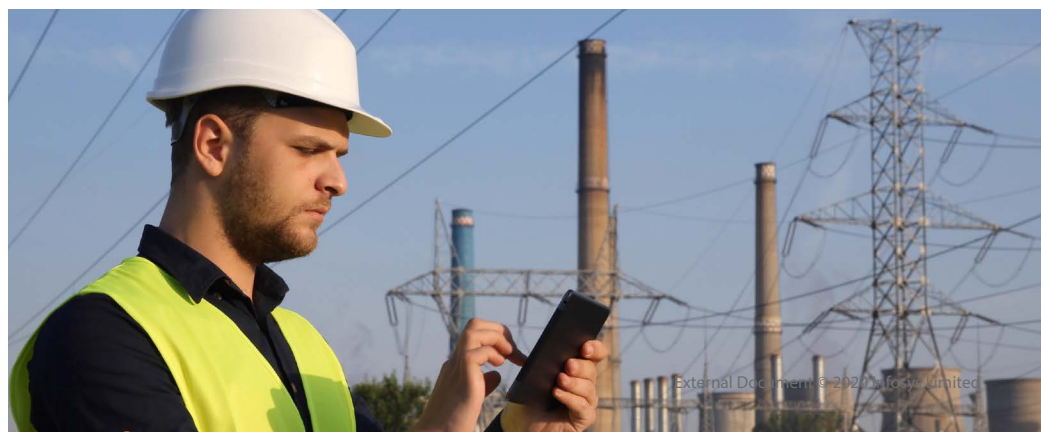
Essentials for digital transformation in utilities

1. Charter the Roadmap

With the utilities decision on where to invest in digital technologies depends on its business model, market structure and position in the value chain, the primary step to draw a pragmatic roadmap.

Here is a framework that can be used in the strategic planning process. It traverses a sequence of steps – strategic vision creation, business maturity evaluation, target operating model definition, charter creation, value realization.

Strategic Vision Creation	Align the transformation with the strategy
Business Maturity Evaluation	Evaluate the current business for gaps
Target Operating Model Definition	Define a to-be state with digital enablement
Charter Creation	Delineate a plan for the transformation
Value Realization	Map the output to business value -added
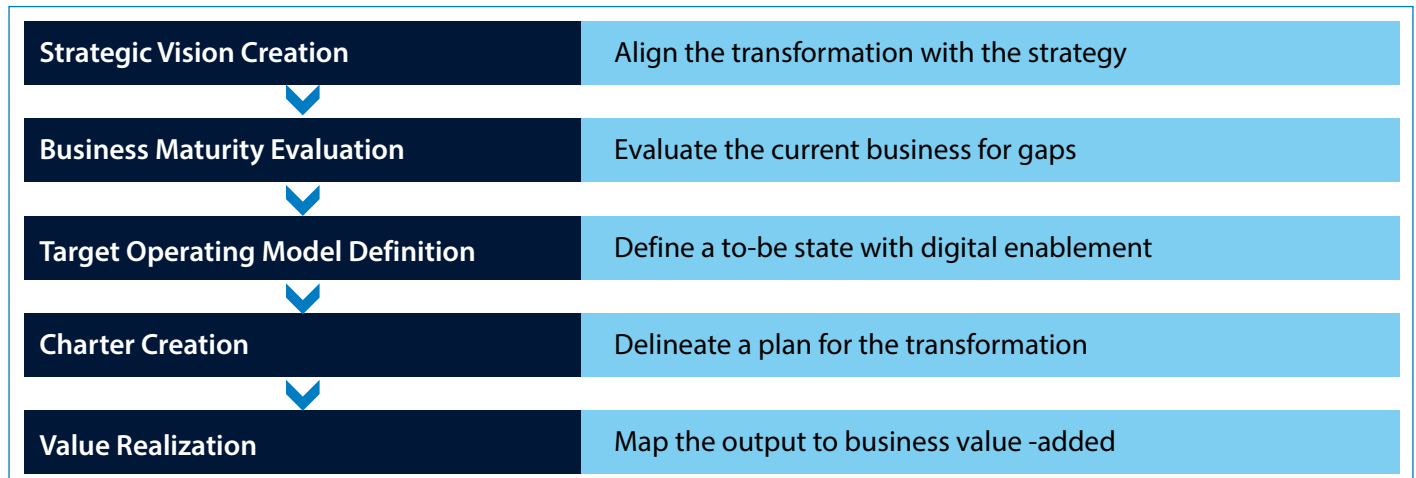
Exhibit3: *Framework for Digital Transformation Roadmap Creation*

For example, if the strategic digital solution is to create an app as a one-stop solution for the customers to manage their utility needs, the roadmap should consider what components in the mobile app would boost engagement and enhance value in the overall ecosystem. The app should drive stickiness among the users and be an essential part of the customer service proposition. The plan should also define KPIs to track the value experienced after implementing the solution.

2. Draw information from data

Of all the industries, **utilities anticipate the highest returns on data management investments (~ 78%).** With the adoption of the smart metering system, the **industry is said to generate 280 petabytes of data every year.**[10] As this data haystack builds, useful information is lost and data management initiatives aim at assimilating, streamlining, and analyzing this tsunami of data to locate information and draw insights for sound and meaningful business decisions.

Most utility companies now need to seriously translate available "data points" to "business value", be it at generation, field operations, or customer behavior analysis. A classic use case for data improvement is predictive maintenance along the utility value-chain. **GDF Suez, has set up a two-** year strategic roadmap to improve data enabled by connected sensors (IIoT) and big data. They are targeting a reduction in asset failures and production optimization.[11]

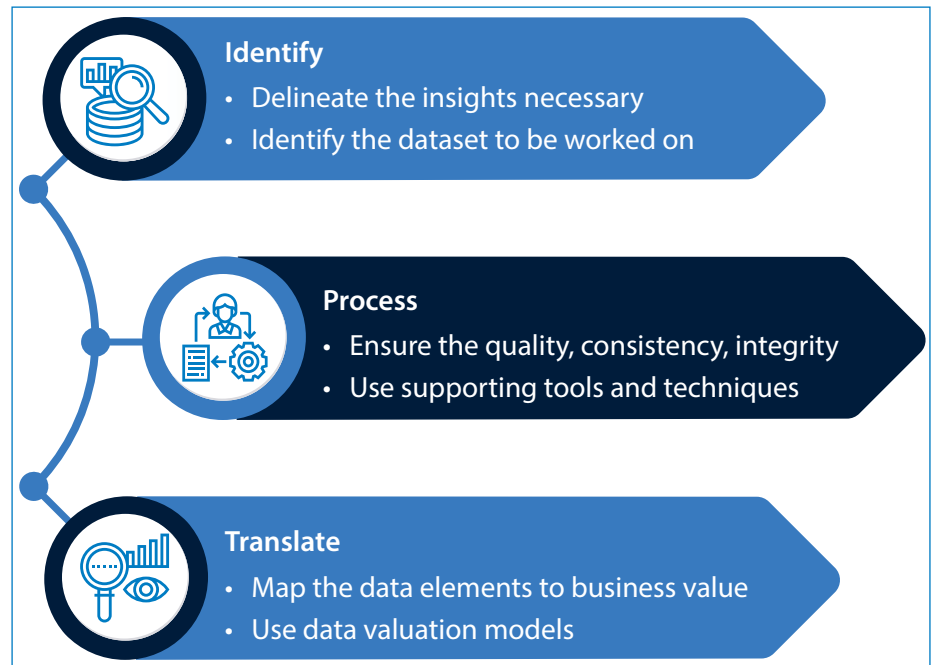**An Identify-Process-Translate framework is effective for data handling and management**

Identify
- Delineate the insights necessary
- Identify the dataset to be worked on

Process
- Ensure the quality, consistency, integrity
- Use supporting tools and techniques

Translate
- Map the data elements to business value
- Use data valuation models

Exhibit4: *An Effective framework for Data Management*

3. Drive pilot initiatives, gather feedback and adapt

While a digital transformation program in utilities could be large and broad in scope, scale, and size, it starts with a pilot project that strictly fits the defined budget and has a compelling case for scale. Retaining the cost-benefit is imperative for any pilot project implementation.

We propose that the following key points and actions be noted to ensure the pilot works effectively.

- **Identify the right pilot segment, asset, and site**- Selection of incorrect areas and segments is the primary reason for an unsuccessful implementation of a pilot project. At the minimum, the segment should be representative of the population – regulators, employees, suppliers, customers – and the assets should be the one that would yield the best overall return.

- **Indulge team in the business and user journey** – Along with the pilot initiative, the utility should build an ecosystem that is self-driving and empowered. For example, partner with a start-up to bridge the capabilities gap in-house. Immerse the entire team in the pilot to open new ways of thinking that would eventually prepare the team to flourish as digital ambassadors and serve as key entities in the transformation program.

- **Develop a minimum viable solution**– A perfect solution just sufficient to close the gap qualifies as a minimum viable solution. **E.ON launched a new smart meter management app – "E.ON See"**[12] as a minimum solution to provide users with real-time usage details whenever and wherever they are. Market research, right team, design thinking, customer co-creation, prototyping and analysis for scalability – all form essential components for minimum viable solution development.

Once a pilot program is in place, organizations should seek feedback from all sources before the scaled rollout. This is important in the legacy utility industry with aged manpower and stagnant capabilities of resources.
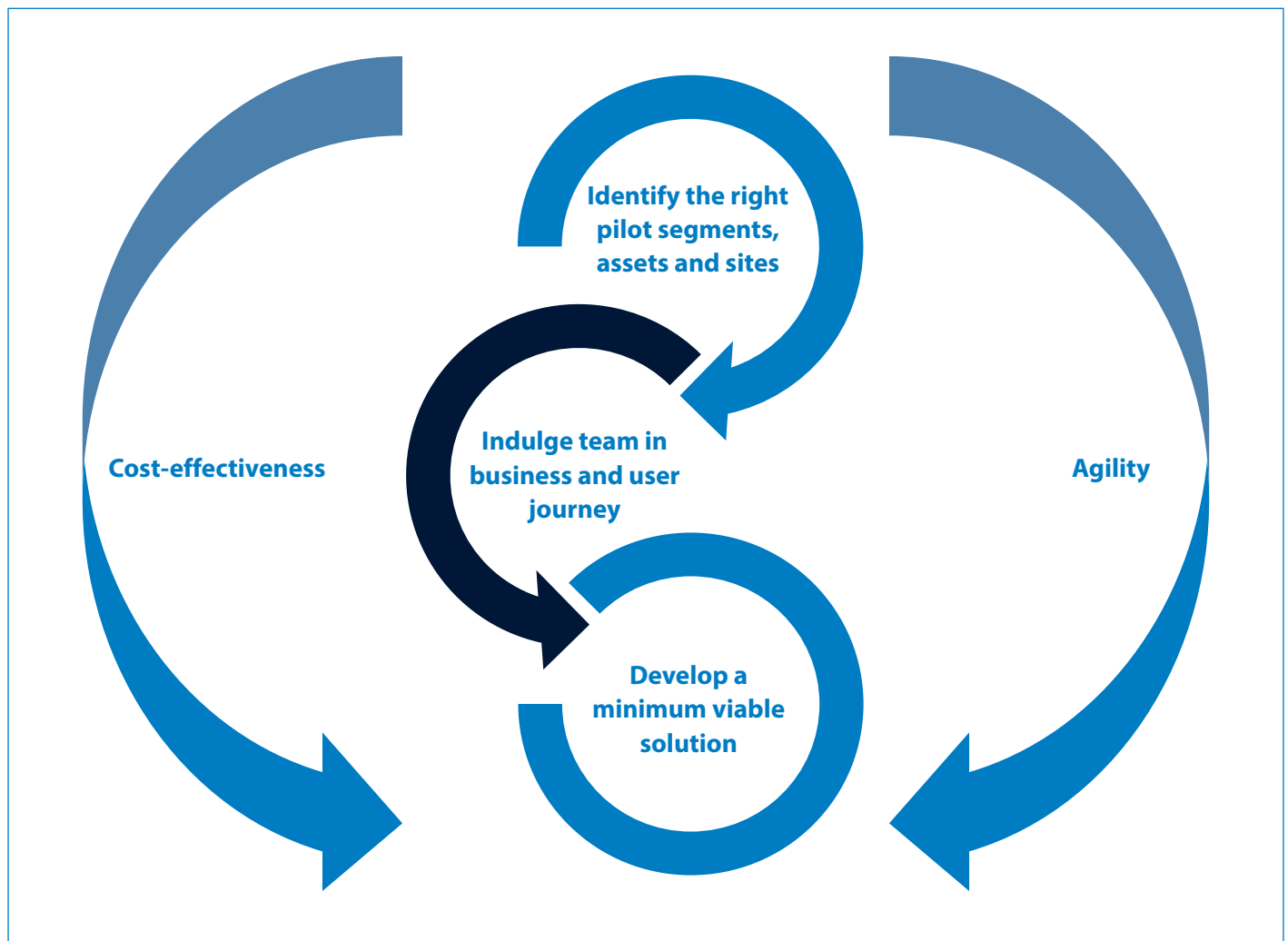

Exhibit5: *Framework for effective pilot project curation*

4. Establish Digital Factories

Digital factories or foundries should typically drive digital projects from conceptualization to implementation. These digital factories enable an organization to fuel innovation by creating an integrated, flexible, adapting and self-organizing ecosystem for creating value across the chain. Resources involved in the digital factories inculcate new ways of thinking that include a few discussed earlier such as customer co-creation, agile methodology, and design thinking. Partnering with leading technology businesses helps in augmenting digital capabilities rapidly. For example, a number of utilities in Europe have partnered with IBM, Cisco, and Hirschman to capitalize on opportunities from cybersecurity, to convergence of Operational Technologies (OT) and Information Technology (IT). Companies such as Duke Energy and EDF Energy are working on **implementing Augmented Reality to help field personal pull necessary data and information** without having to use manuals and computers by partnering with such start-ups as Atheer, DAQRI, Magic Leap, and others.[13]

Given the nature of utilities operations, multiple digital factories can be set up across business units. These centers should be spearheaded by leaders who can allocate resources and budget effectively and ensure visibility to the C-suite.

Conclusion

Value Realization from Digital Transformation in Utilities	Charter the Roadmap	Quantify steps to tangible results
		Outline use-cases and technology
		Involve decision-making, establish governance
	Draw Information from Data	Identify the target and dataset
		Process data to draw insights
		Translate insights to business value
	Drive Pilot Initiative, Gather feedback and Adapt	Identify pilot segments, assets, sites
		Indulge team in business and customer journey
		Develop a minimum viable product
	Establish Digital factories	Build an autonomous body
		Appoint a strong leader and ensure visibility
		Focus on Continuous improvement

Exhibit6: *Essentials for Digital Transformation in Utilities*

Digital transformation in the utility industry is elaborate, especially when one notes the differences in dynamics and the digital maturity levels among key business functions such as generation, transmission, and distribution. It takes years to revamp a utility to take full advantage of the technologies and new business models around. However, there are several opportunities for quicker value realization for both long-term investment in nuclear-driven players and players venturing into the area of dynamic distribution, generation, and transmission. We believe that it is a worthwhile effort given the outcome, in which, utilities can deliver greater value despite their dependence on capital-intensive assets and an aging workforce, by focusing on customer centric growth opportunities amidst the changing economic and regulatory landscape. To reach this final state, companies should build a "Digital DNA", focus on the right areas and technologies and charter a strategic roadmap for implementation. This will not only ensure a better market share but will also increase productivity and reduce costs.

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