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## AI-Driven solutions for industrial sustainability: The capabilities you need to succeed

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# AI-Driven Solutions for Industrial Sustainability

## — The Capabilities You Need to Succeed

By David Sjödin,  
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Artificial intelligence opens the door to offering more sustainable and circular solutions for industrial manufacturers—but only if firms develop the right capabilities to sense opportunities, co-create solutions, and scale value over time.

At its core, industrial artificial intelligence (AI) refers to digital systems that can process vast amounts of data, recognize patterns, and support or automate decisions—often in real time—across complex industrial environments. AI-driven solutions can take many forms—for example, digital fleet management systems that leverage AI algorithms to reduce emissions by optimizing routes and maintenance, or autonomous vehicles that operate more efficiently and reduce material needs by eliminating human interfaces. These solutions not only improve sustainability but also redefine how industrial firms create and capture value.

Across industrial sectors, companies are embracing AI with the hope of boosting efficiency and accelerating progress toward sustainability goals. Yet despite major investments in data infrastructure, connected equipment, and advanced analytics, many firms struggle to translate technological potential into scalable impact. The recurring challenge is not access to AI technology itself, but the ability to transform insights into solutions that deliver both environmental and economic value.

In short, the barrier is not primarily technical—it is organizational. Firms must develop new capabilities to work with customers, manage data, and coordinate AI solutions across ecosystems. Through a multi-case study of six leading industrial firms in sectors such as mining, shipping, construction, and transport, we found that firms succeed with AI-driven solutions not because of superior algorithms, but because of specific dynamic capabilities they cultivate. (Figure 1: A capability framework for realizing AI-driven solutions for sustainability) These capabilities empower firms to discover opportunities, develop solutions, and continuously improve and scale them over time—unlocking new forms of sustainable value through customer co-creation and ecosystem orchestration

### **Value Discovery: Sensing opportunities for dual value creation**

The first and perhaps most foundational capability for AI-driven solutions is the ability to systematically identify new opportunities for value creation. We refer to this as value

discovery capability. In essence, it allows firms to sense relevant problems that can be addressed through AI to deliver dual value—both sustainability and economic impact. An informant described: “The key to AI success is the customer. You start from their operations, find the problem, and build the solution from there.”

Firms with strong discovery capabilities invest in understanding customer operations in detail. One heavy equipment manufacturer, for instance, began by connecting sensors to its installed base of machines on customer sites. This enabled continuous data gathering on usage patterns, energy consumption, and downtime. Over time, the firm developed a much clearer picture of where inefficiencies—and thus circular gains—were hiding. They discovered that large fleets of equipment were operational only 30–35% of the time. Through detailed data analysis, it became evident that inefficiencies were not due to any one machine, but rather how systems of machines interacted on complex sites. This realization provided the spark for an entirely new class of optimization services aimed at improving overall site efficiency.

In another case, a ship systems provider used machine learning to analyze performance data across various customer vessels. The resulting insights were used to design decision-support tools that helped operators reduce fuel consumption and emissions. Importantly, these solutions emerged not from a top-down push, but from a process of listening closely to operational staff and exploring patterns in customer data.

Beyond technical insight, value discovery also involves identifying potential partners in the ecosystem. No firm can deliver complex AI-enabled solutions alone. Leading firms regularly scan their ecosystem for startups, tech suppliers, or service providers that can help them configure broader solutions for customer problems.

### **Value Realization: Building and Delivering Solutions**

Once opportunities are identified, the challenge shifts to realizing value through co-creation. Value

realization capability refers to the ability to develop and deliver solutions collaboratively with customers and partners, while aligning roles, responsibilities, and incentives.

Realization begins with joint problem framing and solution design. Several firms in our study emphasized the importance of involving customers early—often in workshop or sprint formats—to define what success would look like for them. Rather than delivering a fully developed AI product, they instead initiated a learning process with the customer to test and refine hypotheses. A construction equipment provider collaborated closely with a key customer to improve the sustainability of site operations. Rather than delivering a ready-made AI product, they started by co-developing a basic load optimization service module that reduced fuel use and idle time. By collecting and analyzing operational data together, the solution was refined through multiple feedback loops. As trust grew among actors and results were proven, the offering was expanded into a full site digital optimization platform—eventually integrating electrified machines, predictive maintenance, and energy-aware scheduling.

However, co-creation also involves negotiating how value will be delivered and captured. This means determining who maintains the AI solution, how service processes are organized, how data is shared, and how revenues should flow between partners. For one mining solutions provider, building a viable solution required setting up new maintenance teams, educating sales staff, and training operators on how to interact with the AI-driven system. Without these organizational changes, the technical innovation would have stalled.

Aligning incentives also proved critical. A firm offering energy optimization for buildings worked with energy partners and platform providers to ensure that everyone in the chain had a stake in the solution's success. They shifted from selling products to delivering performance outcomes, such as reduced emissions and energy costs, and shared these benefits across the ecosystem.

## CAPABILITIES FOR ENABLING AI-DRIVEN SOLUTIONS FOR CIRCULARITY

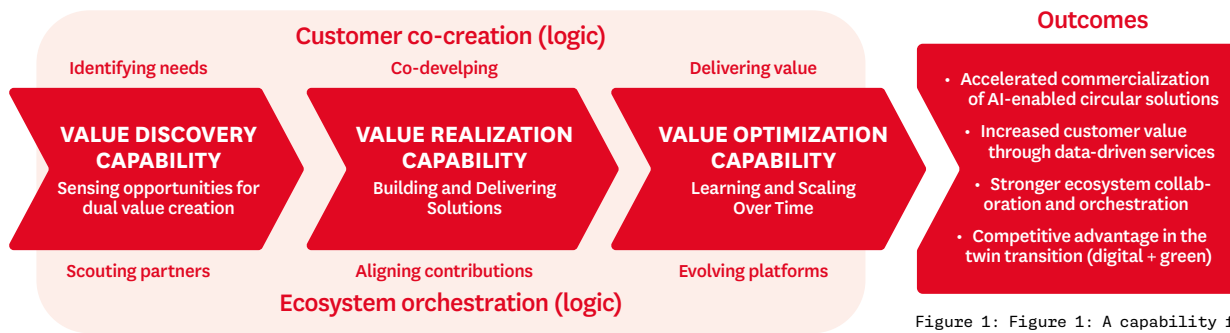


Figure 1: Figure 1: A capability framework for realizing AI-driven solutions for sustainability

### Value Optimization: Learning and Scaling Over Time

Developing and delivering an AI-driven solution is not a one-off project. Firms must continuously refine, scale, and adapt their offerings for the customer over time. This requires value optimization capability: the ability to use operational data to improve solutions, extend their reach, and develop platforms to accommodate new needs and partners in step with changes in customer operations. An informant described the importance of this phase: “Once the solution is live, the real work begins. We use the data to refine the model, add features, and grow the value proposition over time.”

One mining equipment provider in our study established a remote monitoring center to track equipment performance across all customer sites in real time. This data enabled continuous learning and solution refinement. Over time, predictive models improved, maintenance scheduling became more precise, and customers experienced fewer disruptions. The firm used these insights to improve its service packages, bundle new features, and gradually increase pricing based on demonstrated value.

Platform thinking (i.e. enabling value creation through ecosystems) played a key role in scaling business. A provider of industrial control systems developed its AI optimization solution as a modular platform, allowing third-party startups to add specialized applications such as fault detection, energy management, and predictive analytics. This expanded the value proposition for customers and enabled faster innovation. Rather than attempting to develop every feature internally, the firm focused on orchestrating a broader ecosystem of capabilities. This move transformed it from a product supplier to an enabler of platform ecosystems

Another firm used customer data to identify new use cases, such as dynamic route planning for electrified vehicles based on energy availability. Because they had already established digital data pipelines and service routines, they could quickly introduce new digital services.

Critically, optimization also involves rethinking metrics. Several firms found that initial key performance indicators (e.g., uptime, cost savings) were too narrow. As digital maturity increased,

both providers and customers began measuring sustainability outcomes, such as CO<sub>2</sub> reductions, material recycling rates, or energy self-sufficiency. These new metrics reinforced the value of AI-enabled solutions and helped secure long-term customer commitment.

### Implications for Industrial Managers

The shift to AI-driven solutions is not only a technological transition—it is an organizational one. To succeed, industrial firms must develop dynamic capabilities for discovering, realizing, and optimizing value. This means building new routines for engaging customers, analyzing data, collaborating across ecosystems, and continuously evolving offerings based on real-time feedback.

In a nutshell, managers should consider the following actions:

- **Anchor AI initiatives in real customer needs**

Collaborate closely with customers to identify critical operational challenges where AI can create both sustainability and business impact.

- **Experiment early, scale deliberately**

Use initial AI solutions as learning platforms to test assumptions, refine concepts, and validate value—before expanding across sites or markets.

- **Co-develop AI solutions across boundaries**

Engage cross-functional teams and ecosystem partners from the outset to align technical, commercial, and operational perspectives.

- **Leverage ecosystems to accelerate innovation**

Build modular platforms that invite contributions from startups, data providers, and other collaborators to enhance AI solution functionality.

- **Institutionalize continuous improvement**

Create feedback loops that transform real-time operational data into actionable insights for ongoing AI solution refinement and scaling.

Firms that succeed with AI-driven solutions for circularity don’t necessarily rely on the most advanced technologies. What sets them apart are the routines and ways of working that allow them to learn faster, adapt quicker, and scale more sustainably.

Looking ahead, firms that build these capabilities will not only enhance their competitiveness but also lead the industrial shift toward the twin transition—where digital and green transformation go hand in hand. By embracing this path, companies can position themselves as innovation leaders in a rapidly evolving sustainability landscape.



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