HONEYWELL
INDUSTRIAL AI INSIGHTS

Honeywell

TABLE OF CONTENTS
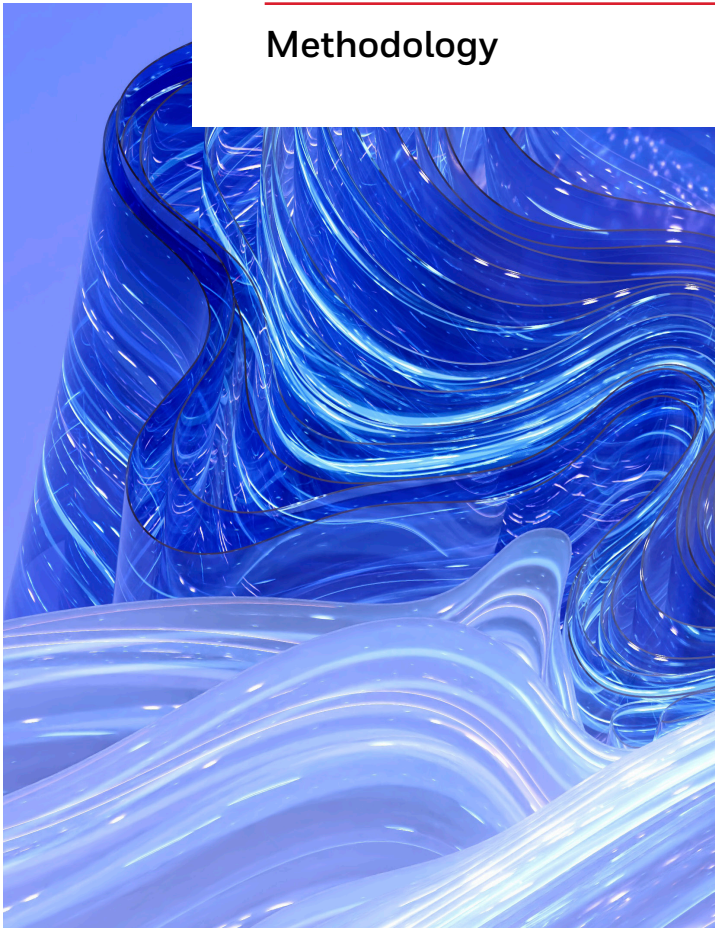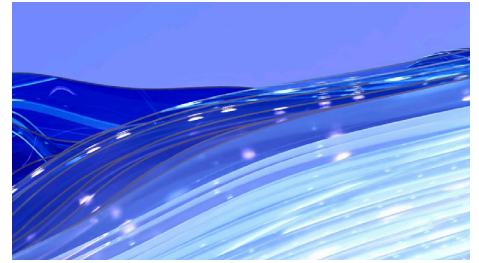
A PIVOTAL MOMENT
FOR INDUSTRIAL AI

> If you're in a conversation about the future course of your business, inevitably a portion of that dialogue – if not most of it – will center around the potential for AI to radically impact how you operate.

It seems as though everyone from the owner of your local ice cream franchise (who is responsible for purchasing, supply chain, staffing and scheduling) to the leadership of multi-billion-dollar oil refining operations (data analytics, emissions management, preventative maintenance and much, much more) can suddenly imagine multiple use cases for AI in their operations.

There is continued buzz about an AI revolution, but, at least in the industrial space, this "revolution" is a myth: we've witnessed an evolution in automation and the use of artificial intelligence techniques over the last several decades. In that time, control science has grown in sophistication and capability, moving from basic process control to plantwide optimization to current methods of applying AI to predict equipment degradation and put proactive measures in place. As a result, factories, oil refineries and other complex operating environments can see a significant improvement in throughput and yield while also reducing downtime[1] (This is less true for ice cream shops, but their time is coming.)
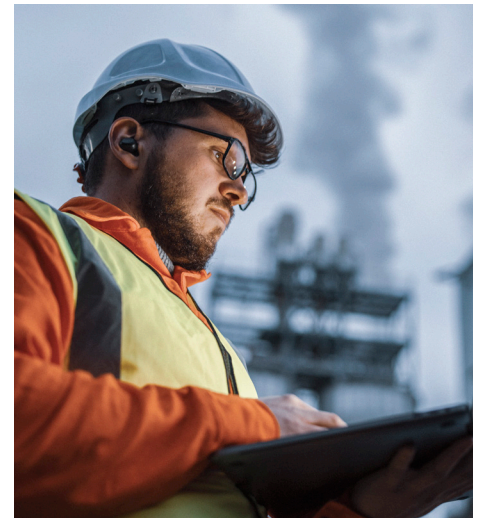
This evolution has also brought us to a pivotal moment, an inflection point, leading to a range of new possibilities in the industrial space.

In fact, it is akin to the late 1960s, when a group of scientists and engineers embarked on an effort to enhance data sharing among defense and academic institutions by linking disparate computers over long distances. They first called it ARPANET, and it opened a whole new world of collaboration. If you had told them that one day their creation – ultimately called the internet – would transform modern life, they probably would not have believed you.

The industrial world is on the cusp of a similar moment in history: our technological sophistication is at a point of critical mass and the potential of AI is limited only by our capacity to imagine it. As with the ARPANET-to-internet analogy, some will couple that imagination with wise decision-making and take the lead along the path to autonomy, while others will move too slowly or not at all and fall behind.

1. https://www.mckinsey.com/industries/metals-and-mining/our-insights/ai-the-next-frontier-of-performance-in-industrial-processing-plants
Sept. 2023

THE OPPORTUNITY
IS HERE TO SEIZE

> As we advance in the fourth wave industrial revolution through automation, the next decade promises a surge of ideation and investment in AI-driven systems and processes. While many initiatives may prove too cautious or insufficient, the successful ones will be those where leaders have stepped wisely and scaled up intelligently. They will be celebrated in the history of this pivotal era.

The distinction between the two will hinge on countless decisions—both large and small—made by individuals on the front lines of AI adoption and expansion. While the possibilities are amazing, recent Honeywell research shows decision makers in the industrial AI space are dealing with a combination of well-placed enthusiasm coupled with some degree of uncertainty. We interviewed 1,600 industrial AI leaders across 12 global markets, whose companies are currently using deterministic AI to automate industrial processes.

Of those surveyed, **82%** consider their companies to be pioneers or early adopters of AI.
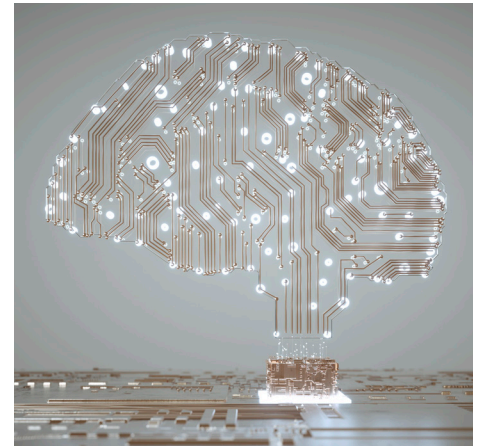
Their enthusiasm is palpable. **Even though a little more than a third of our respondents (37%) expressed concern that their C-Suites do not fully understand AI, they and almost all their peers (94%) said their corporate leadership is all in.** They believe their organizations will continue or expand AI use in the coming years. In fact, one-quarter (26%) of them say those decisions have already been made following their initial implementation of AI. Of those respondents who are in the C-Suite, more than half (51%) say they have already decided to expand use of AI after initial implementation.
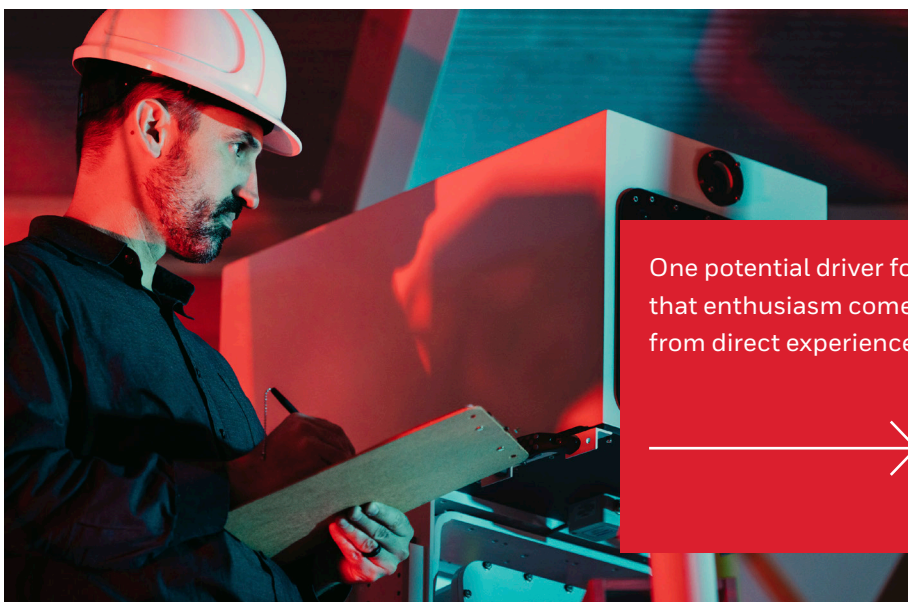
One potential driver for that enthusiasm comes from direct experience.
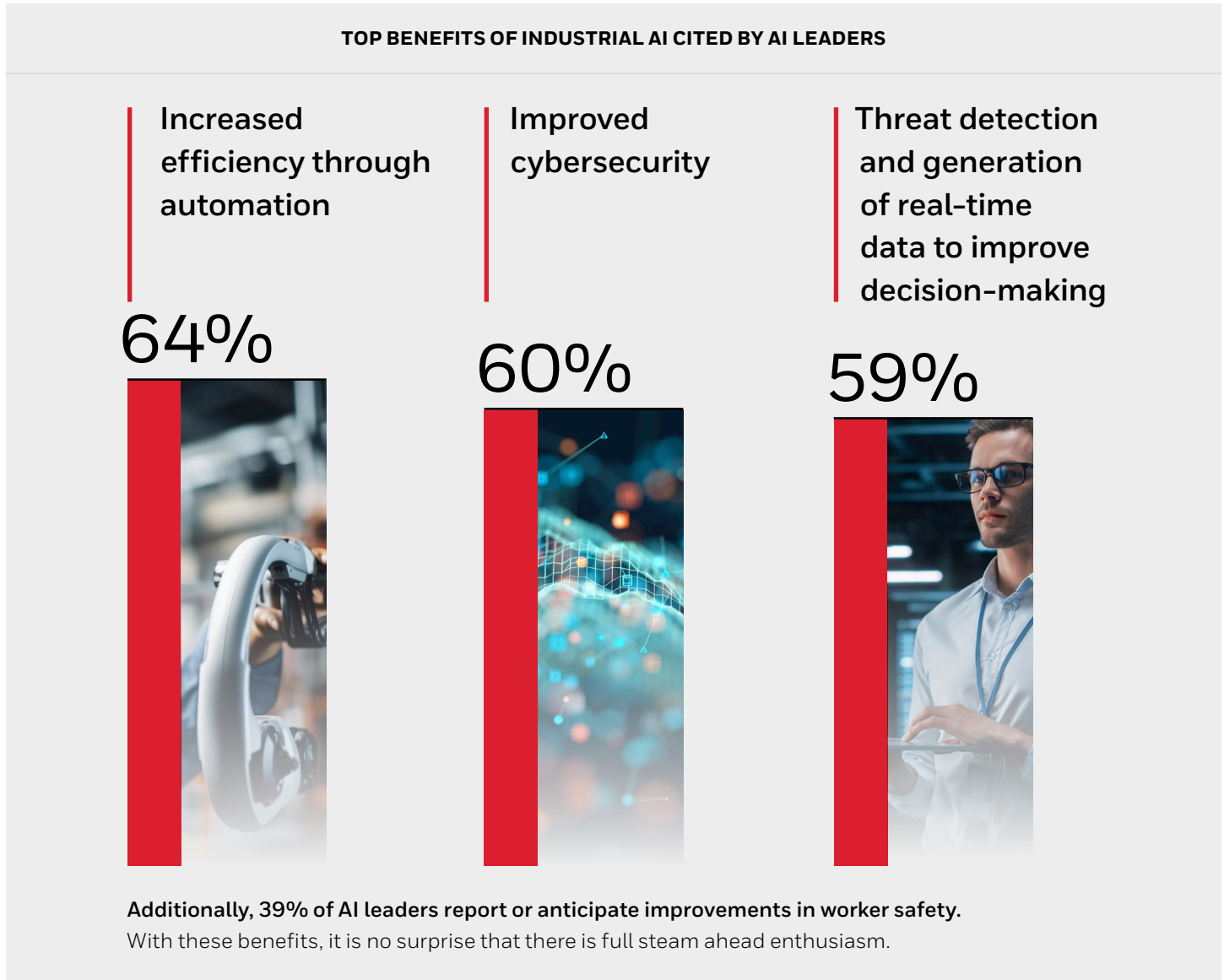
More than
9 in 10
91%

have discovered use cases for AI not initially planned for when automating processes and tasks.

The AI leaders also reported that the **top three benefits** of AI implementations are:

TOP BENEFITS OF INDUSTRIAL AI CITED BY AI LEADERS

Increased efficiency through automation

64%

Improved cybersecurity

60%

Threat detection and generation of real-time data to improve decision-making

59%

Additionally, 39% of AI leaders report or anticipate improvements in worker safety.
With these benefits, it is no surprise that there is full steam ahead enthusiasm.

Uncertainty shows up in discussions of capital costs.

48%

Nearly half of our respondents report that they are constantly having to justify or request sufficient resources to implement AI plans.

Two-thirds (63%) of our respondents say a quarter or more of their equipment isn't properly enabled for AI compatibility

| 63% | 100% |
| 25% | 59% |
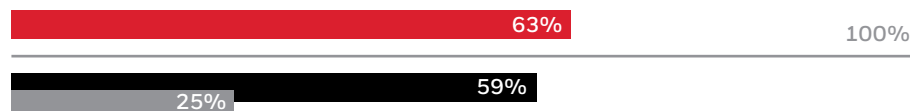
yet most of them (59%) plan to let non-AI compatible equipment run through its lifespan before replacement including 25% who don't plan to upgrade AI-compatible equipment even then.

FOLLOWING
THE PATH
TO AUTONOMY

For many companies, including those who see themselves as pioneers or early adopters, the journey to autonomy is still in its earliest stages.

> **Just 17% of those we surveyed have fully launched their initial plans for AI, and many are still in the scaling (43%) or prototyping (12%) stages.**

To better plot where companies are along the journey, Honeywell has developed and been applying a six-step **"Autonomous Maturity Model."**
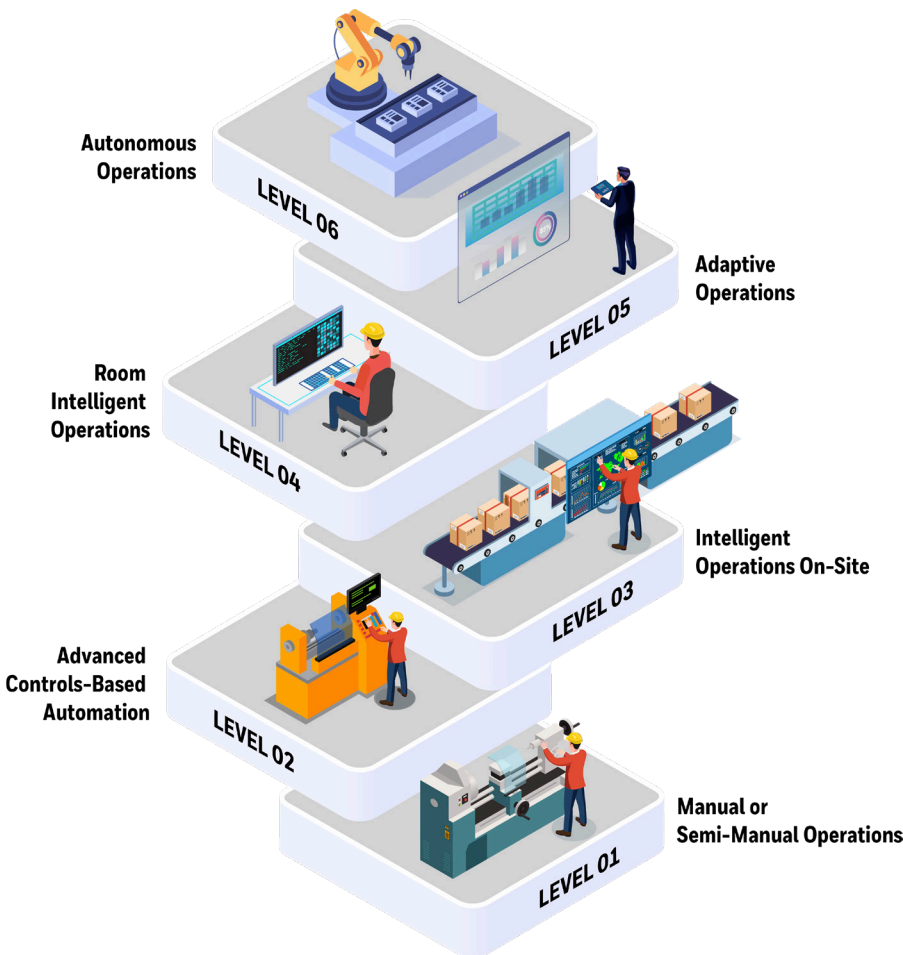
The starting point for each business will be different. Some need to expand the use of sensors and more automated processes. Other more advanced sites have comprehensive site-wide optimization and are looking to improve insights into assets or move to more remote operations.

So, how do we accelerate the pace toward autonomous operations?

When considering the approach to achieving success with industrial AI, Honeywell recommends that three key areas should anchor a company's decision making: Data, Design, and People.

Autonomous Operations — LEVEL 06

Adaptive Operations — LEVEL 05

Room Intelligent Operations — LEVEL 04

Intelligent Operations On-Site — LEVEL 03

Advanced Controls-Based Automation — LEVEL 02

Manual or Semi-Manual Operations — LEVEL 01

DATA

Every well-functioning, complex operation creates both the intended end-product and reams of data. The more complex the operating environment, the more diverse and detailed the data stream. This is a gift — and taking advantage of AI's ability to digest, manage, and unlock that flood of data is one part of the path toward our industrial AI future.
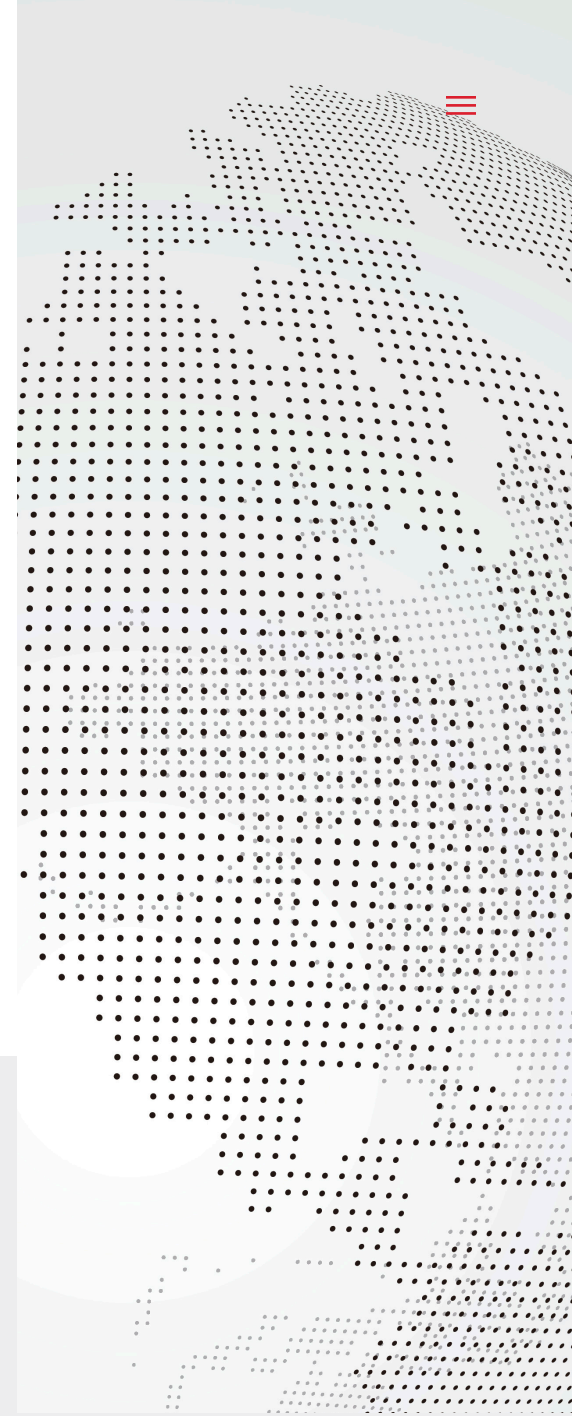
400
REFINERY PROCESSING UNITS

40
COUNTRIES
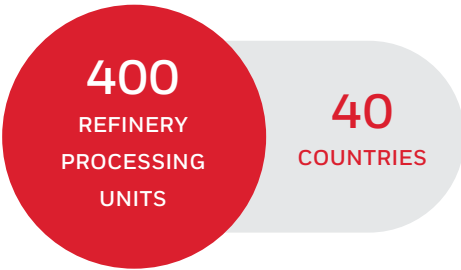
An example is the work Honeywell UOP is doing in oil refining, where we've brought digital solutions to our customers, connecting **400 refinery** processing units across **40 countries** to the Honeywell Forge digital platform.
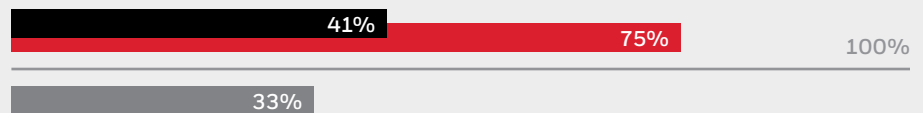
We're helping to gather near real-time information from millions of datapoints and benchmarking that information against our proprietary model. As a result, we can collaborate with our customers to optimize every aspect of their operations, triggering preventative maintenance when needed and helping to maximize each unit's overall performance, availability and profitability.

DESIGN

Whether it's a factory with autonomous components, an airplane cockpit designed so that the pilot has improved access to onboard AI support, or even an AI-enabled skyscraper, designing with this technology in mind is central to building muscle in companies around the world. While AI's importance seems clear, it can also be expensive if you're working with an existing physical plant or technological backbone.

75%

Most AI leaders believe that their organizations will replace non-AI compatible equipment.

▶ but only **41%** of them will do so early to maximize the benefits from AI.

41%	75%	100%
33%		

The other **33%** will wait out the lifespan of the legacy equipment.

However, it should be noted that AI can be integrated into existing equipment by using connective strategies such as AI-powered sensors and cameras. AI also can be integrated into process by its use in forecasting demand, optimizing supply chains and improving quality control outputs.
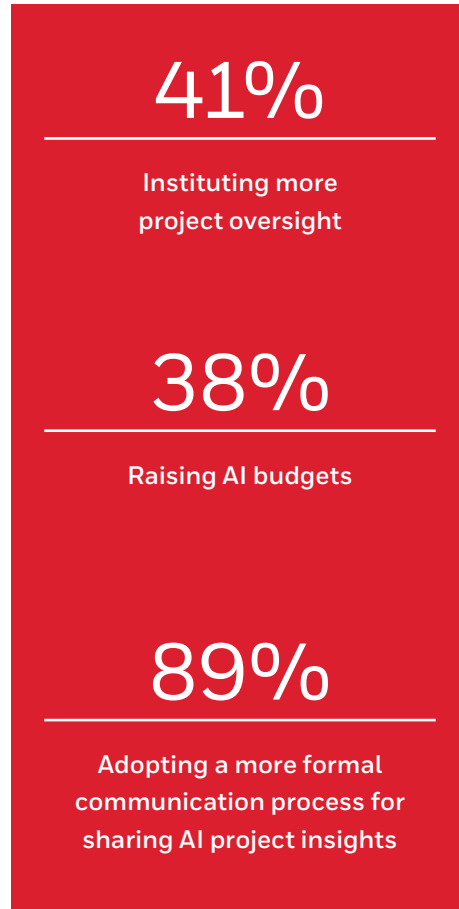
Aside from decisions to be made about equipment, AI leaders also found obstacles such as budget overruns and lack of adequate training in executing AI implementations, which are not atypical from most project rollouts.

The most reported challenges that AI leaders do not want to repeat in future implementations were lacking verification of AI outputs, trying to do too much in-house, and rushing development to meet internal deadlines.

(cited by 31%, 30% and 30%, respectively)

C-Suite respondents were more specific in how they would handle challenges in upcoming AI implementations saying they are:

41%

Instituting more project oversight

38%

Raising AI budgets

89%

Adopting a more formal communication process for sharing AI project insights

It is also critical to remember that autonomy doesn't mean elimination of humans. It means the enhancement of human capability. Think of autonomous vehicles. If your road system is designed, as it is today, to enable safe driving at 55 miles per hour, autonomous driving is an expensive luxury. But if you want a system in which everyone can safely drive at 150 miles per hour, the amount of data the human brain must process in a very short of period is simply overwhelming.

In that case, autonomy is essential, but the car is still supposed to be moving a human from point a to point b. That human must still be part of the driving experience – able to take back the wheel when he or she wants to stop for food, or when that strange persistent rattle in the left rear tire is getting a little bit too concerning.

Autonomy in industrial operations must be designed around the same principle. The human capability to respond to unforeseen external circumstances is essential to successful industrial AI. When you commit to making the right investments in equipment, systems, and processes to enhance the human experience in your physical plant, you will be well on your way up that maturity ladder.

One of the most crucial investments in industrial AI and autonomy today is in people. With a growing skills gap and the retirement wave of the baby boom generation, employers increasingly rely on AI to bridge the gap.

2/3
(64%)
SAY INCREASING WORKER EFFICIENCY IS THE MOST PROMISING USE OF AI
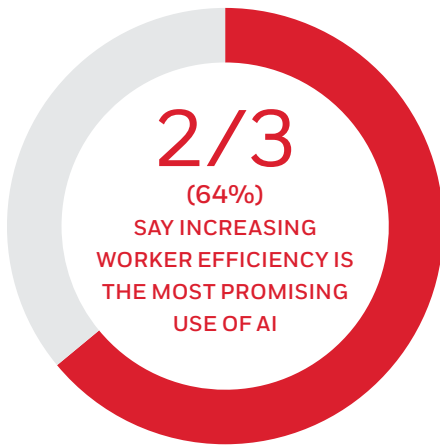
yet there is a gap with its use today as

15%
ARE LOOKING TO AI TO ADDRESS THE LABOR SHORTAGE

Whenever this topic is introduced, a fear that intelligent machines will reduce the need for human workers arises. However, this situation is not materializing as expected. **According to this research, only 15% of respondents are currently looking to AI to cover existing labor shortages, while many others are focusing on increasing worker flexibility (49%), job satisfaction (45%), and creating**

more time for skills development (44%)—all valuable for retention. This also suggests that AI's true potential lies in reskilling and upskilling workers to create an elite workforce. At the same time, realizing AI's benefits requires accounting for the cost of training. Additionally, the AI leaders surveyed cited numerous additional people related benefits. Among others they cited were improved worker safety

and efficiency, speedier onboarding, and more time for skills development. This enables job flexibility and provides workers more opportunities to think creatively. **One note of caution, however, 81% of our respondents noted that they underestimated the training resources they needed to introduce AI to the workforce.**

49%
Increased work flexibility

44%
More time for skills development

41%
Less time doing manual work

45%
Increased job satisfaction

**43%**
More opportunities for creative thinking

39%
Safer working conditions

Given these benefits, AI quickly transitions from a "nice-to-have" to a "need-to-have." A happier, more productive and stable workforce generates revenue, making AI a topline benefit, not just a cost reducer.

NAVIGATING THE NEXT PHASE OF INDUSTRIAL AI

The use of intelligent platforms to process vast amounts of data is advancing rapidly, and AI's potential to bridge the skills gap and benefit the workforce is becoming clear. However, investments in AI-oriented infrastructure face resistance, often due to high capital costs.
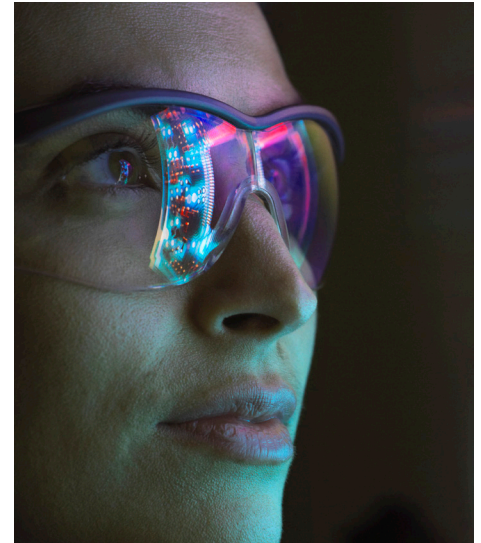
Leading organizations are considering possibilities across all three factors—data, design, and people—and are collaborating with partners to chart a reasonable path to an autonomous future.

The potential for creativity is immense. As noted previously, nearly all AI leaders in our research reported discovering new AI use cases simply by implementing it. This is exciting but also represents pioneering work, and each company must decide its own appetite for opportunity and risk.

While we are all likely to agree that AI is not a cure-all, in this pivotal moment, where every company is at a different place on the path to autonomy, leaders must focus on what the next steps mean for their organizations. Circling back to the ice cream shop, it might be piloting AI for personalized marketing promotions and streamlining scheduling, while for the oil refinery it might be harnessing AI to capture and analyze real-time data on emissions. By prioritizing data, design, and people, decisions remain, but that path can be both profitable and productive.

Embrace the journey ahead and unlock the full potential of AI in your organization.

METHODOLOGY

Honeywell commissioned Wakefield Research to survey AI leaders around the world. The online research, which was conducted from April 22 through May 2, 2024, involved 1,600 executives in 12 global markets (US, Brazil, Canada, China, France, Germany, India, Japan, Mexico, United Kingdom, Kingdom of Saudi Arabia, and United Arab Emirates.) Each respondent works at a company with at least 1,000 employees that is currently using AI to automate processes and tasks. All respondents are influencers or decision makers related to the use of AI within their departments or across their organizations.

THE FUTURE IS WHAT WE MAKE IT | **Honeywell**