

# PROCESS REIMAGINED

**Together, people and AI are reinventing  
business processes from the ground up.**

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# SMART MACHINES ARE REINVENTING HOW WORK IS DONE

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**And they're helping companies achieve amazing results. But there is significant untapped potential in reimagining business processes from the ground up as self-improving procedures that can sense, comprehend, act and learn—all in real time.**

This is an historic moment. With artificial intelligence (AI), we're seeing the most significant changes in how work gets done since the introduction of personal computing in the 1980s and, before that, the Industrial Revolution of the 1800s.

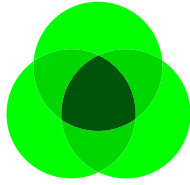
But with the great power of AI comes great responsibility to evolve roles and reskill employees for this brave new world. By implementing AI technologies simply to speed up business processes, companies risk driving away the very people needed to guide the machines and work alongside them to enable future growth.

Until now, most business leaders have taken too narrow a view of AI, using traditional automation or Robotic Process Automation (RPA) to achieve incremental performance

improvements. While automating repetitive tasks may free up employees for more valuable work, full-scale automation should not be the end goal.

To maximize the potential of AI and be truly digital leaders, companies must reimagine and reinvent their processes from scratch—and create self-adapting, self-optimizing “living processes” that use machine learning algorithms and real-time data to continuously improve. This exponential leap—the ability of machines to act as agents of process change—is what will also unlock entirely new roles and new ways for humans and machines to work together.

This third era of process change is already delivering profound results, across industries and for the economy as a whole.



# THE THREE OVERLAPPING LENSES

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**As part of the research that underlies the book *Human + Machine: Reimagining Work in the Age of AI* and to better understand the impact of AI on business processes, we surveyed more than 1,075 process professionals from large companies that use artificial intelligence technologies in at least one business process.**

Our research confirms that the benefits being achieved through the application of machine learning are substantial: some 88 percent of organizations using machine learning have seen at least a 200 percent improvement in KPIs in enterprise processes.

However, these gains were mostly achieved by using machine learning for automation. And while many companies are employing some degree of automation, only 9% are using the full force of AI.

To move from process **automation to reinvention, this small group of leaders** are doing all three of the following simultaneously:

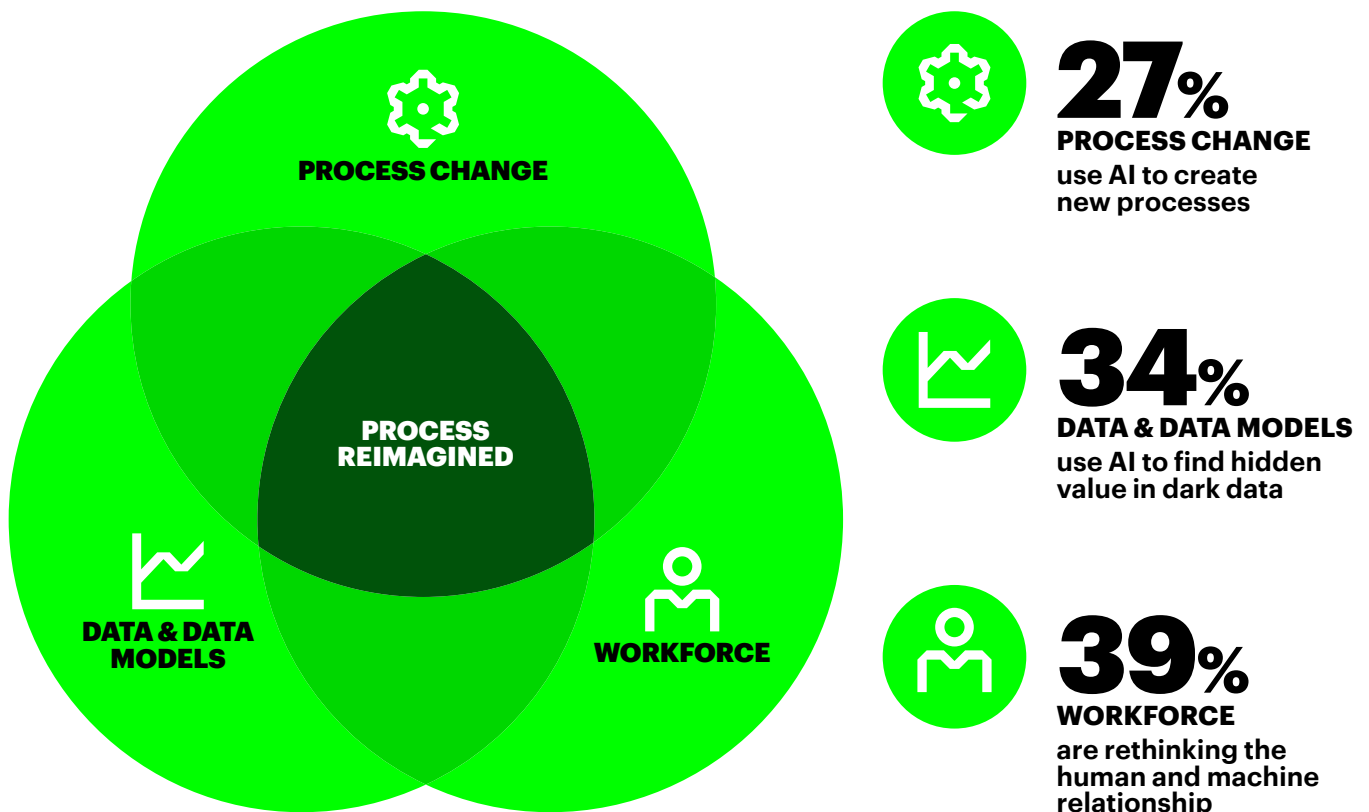
- Reimagining processes from scratch
- Unlocking the full potential for human and machine interaction
- Capturing the exponential power of dark data

As a result of this approach, 31 percent of their reimagined processes are generating 10x KPI improvements. For those not applying all three, only 15 percent of the processes are generating such KPI improvements. In other words, the probability of achieving 10x improvement doubles when you apply the elements seen through the overlapping lenses.

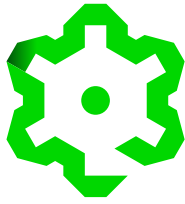
# 9% USING THE FULL FORCE OF AI

While only 9% are looking at all three 'sectors' simultaneously, AI is progressively being used to shore up specific parts of the business.

Figure 1. Overlapping Lenses



Source: Daugherty, Paul R. and Wilson, H.J. *Human + Machine: Reimagining Work in the Age of AI*. Boston: Harvard Business Review Press, 2018.



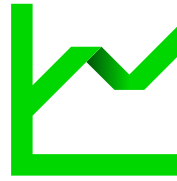
## PROCESS CHANGE

### Reimagining processes from scratch

For the first time in history, business processes like after-sales product servicing or quality management are being reengineered in real time by smart machines. Indeed, with AI, these processes can be less deterministic and more responsive in once unimaginable ways. This approach is becoming more prevalent at leading organizations, with AI applied to multiple processes across the entire enterprise.

Almost 40 percent of the companies we surveyed use AI to make processes self-repairing, self-optimizing and self-adapting. Some 34 percent are focused on automating process change, while 27 percent say smart machines can now replace their existing processes, sequences and rules with the ability to take unanticipated actions that drive greater improvements.

What does this look like in practice? Take General Electric. For years, the company followed a step-by-step process for routine maintenance on its airplane engines. After using smart machines to reimagine its airplane-maintenance processes, GE is now making real-time predictions on which engines should be fixed and when as well as which type of aircraft technician should repair them.



## DATA AND DATA MODELS

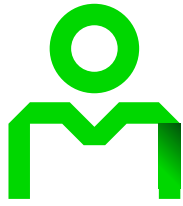
### Capturing the exponential power of data

Reinvented processes do not blindly follow a set of pre-programmed steps — they use machine learning to evolve and improve according to data.

Good data is, first and foremost, fundamental to AI. In essence, it is the essential fuel that powers AI. To provide that necessary fuel, data should be viewed as an end-to-end supply chain. Fundamentally this is a new way of thinking about data, not as a static process that's managed separately in silos across the organization but as a dynamic enterprise-wide activity for capturing, cleaning, integrating, curating, and storing information.

During the past five years, companies have made major progress in how they collect and use data, thanks to significant investments in the Internet of Things, analytics and big data.

It is important to use machine learning techniques to tap into this “dark data”— information that organizations collect during their regular business activities but do not currently use. According to our survey, 34 percent of companies strongly agree that their reinvented processes are finding hidden value in this dark data, enabling them to make better decisions or offer new products and services. And 82 percent of companies surveyed testify that machine learning enabled processes help them find solutions to unsolved problems through data they had not previously been able to tap.



## WORKFORCE

**Unlocking the full potential of processes through new jobs emphasizing human/machine interaction**

Self-changing, data-driven processes need human workers who can act rapidly on the opportunities that machines discover in real time, whether a sales lead, maintenance alert or an opportunity to cut costs. They also require people to continuously assess the need for improvements to safety, fairness and auditability.

These are just two of the many possible ways in which humans and machines will work together in an AI-enabled future. In fact, this often overlooked “missing middle”—described below—is where new categories of jobs will be created in which humans help machines and machines help humans, requiring companies to redesign both jobs and training.

# CRITICAL SUCCESS FACTORS

The leaders in AI are focusing on all three of these dimensions—process, data and human resources—simultaneously. But these companies are very much in the exclusive minority. As our research shows, only 9 percent of the AI early adopters that we surveyed are progressing on all three dimensions. The remaining 91 percent are continuing to target process efficiency through task automation, while not addressing how to make the most of their human workforce. Over time, this approach can restrict the benefits they can generate had they taken a more complete approach.

As part of this approach, it is important to leverage AI to **reimagine new processes rather than simply automating existing processes**. While automation often brings a short-term jump in productivity and speed, these benefits will level off if the focus remains on process automation rather than reinvention.

In addition, organizations **need to reskill their workforce in the right way**. Success in AI is intricately tied to investment in people. This means reskilling, retraining, reeducating, and teaching the workforce on how to maximize their creative skills and judgment. It also involves teaching employees how to train, interact and augment their work with smart machines. Organizations that fail to reskill with new types of human/machine relationships in mind will hit roadblocks on their journey to reimaged processes and could encounter a talent crunch within the next few years.

# THE MISSING MIDDLE

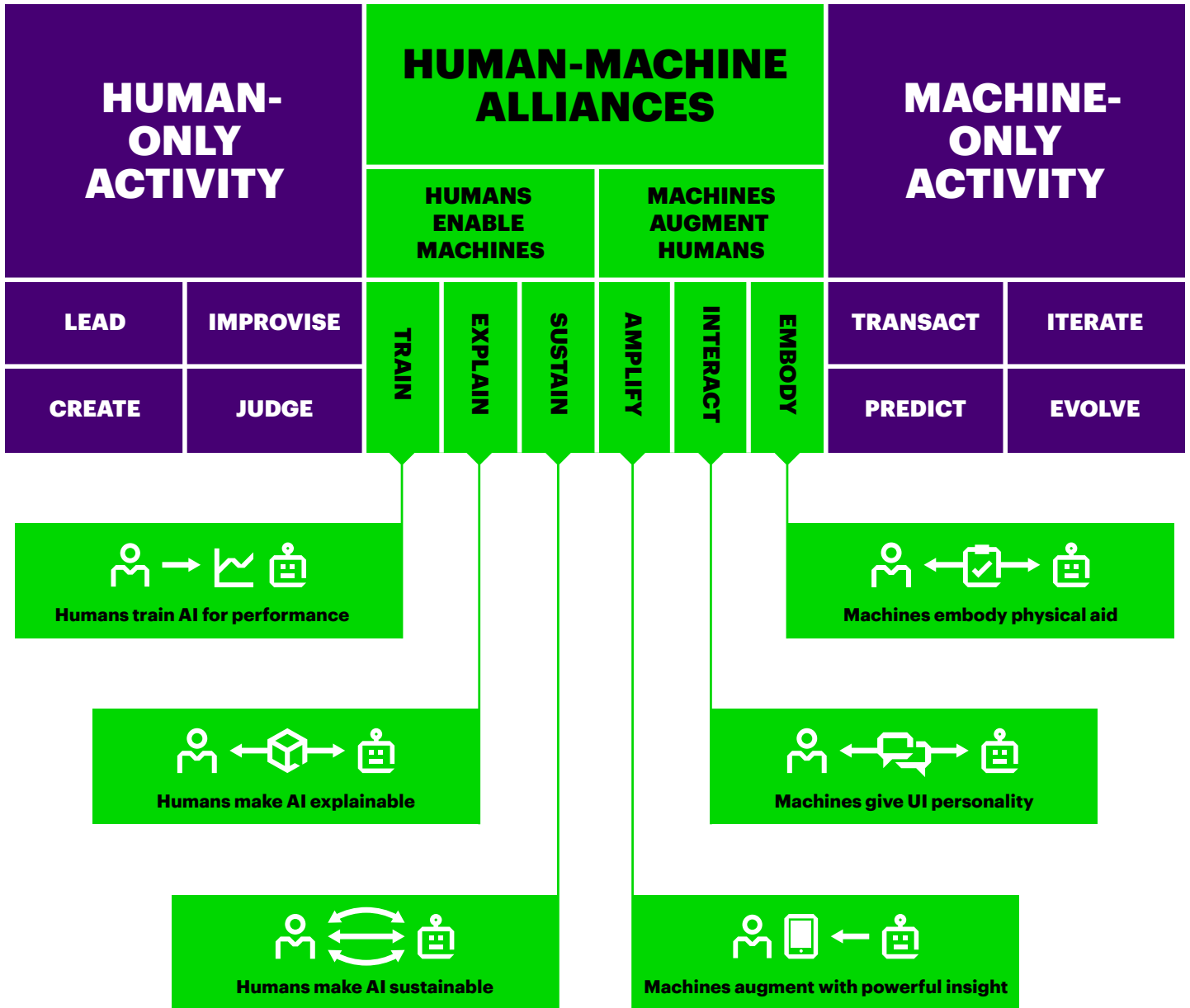
**Our research findings suggest that many organizations are already taking this view. While 90 percent of organizations believe that machine learning will personalize work to individual preferences, only 39 percent are truly embracing the full potential and forging alliances between people and machines to realize a step change in enterprise process KPIs, job satisfaction and retention.**

Some 78 percent agree—including 32 percent who agree strongly—that machine-learning-enabled processes will result in improvements in job satisfaction and retention. And 76 percent agree—including 30 percent who agree strongly—that employees feel they are doing more interesting work as a result of machine-learning-enabled processes.

The companies seeking to develop new interactions between humans and machines are forging these alliances to enable or augment the work and achieve more, as opposed to simply automating existing processes. To this end, we have identified six types of human-machine alliances that will reshape the ways in which people will work in the future. (see Figure 2).



Figure 2. Human-machine alliances



Source: Daugherty, Paul R. and Wilson, H.J. *Human + Machine: Reimagining Work in the Age of AI*. Boston: Harvard Business Review Press, 2018.

# HUMAN MACHINE ALLIANCES

**In *Human + Machine*, we identified six such human and machine alliances that will reshape the ways in which people will work in the future:**



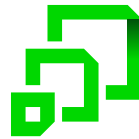
**TRAINERS**



**EXPLAINERS**



**SUSTAINERS**



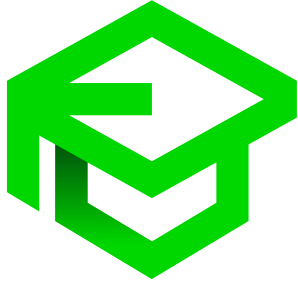
**AMPLIFIERS**



**INTERACTORS**



**EMBODIERS**



# 1. TRAINERS

## Humans train AI for performance.

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This is where most of the interaction is happening today. At the most basic, human trainers help to improve an algorithm's performance through activities like data-cleaning and data- and image-labelling. At the more sophisticated, humans teach algorithms how to mimic human behaviors to improve the AI's social, emotional (and even natural language) intelligence.

Think about how customer-service chatbots detect the complexities and subtleties of communication. Who's teaching them? Humans. It's what Accenture's partner, IPsoft, is doing with Amelia, our jointly developed digital assistant. Amelia is being trained not only to communicate naturally with customers and employees, but also to use subtle facial expressions.

To further illustrate the point, consider autonomous vehicles, which must learn to adapt in real time to changes on the road. In Nissan's self-driving car project, the company is pairing humans with machines to solve the many challenges of driving a car, from plotting the best route to keeping the passengers safe. For example, to help the vehicle handle real-world situations, trainers apply their own human intuition and past driving experience to train the data and data models.



## 2. EXPLAINERS

### Humans make AI explainable.

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The “black box” nature of machine-learning algorithms can cause concerns, especially when systems recommend or take actions that defy conventional wisdom. The world’s policymakers share these concerns in their regard for these issues and are taking action (note the European Union’s General Data Protection Regulation). As AI systems become more complex, explainers are becoming more important.

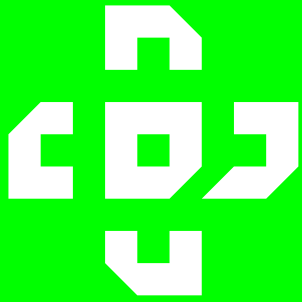
By using experimental analytical techniques on AI data models, humans can explain why algorithms make the decisions they do, such as passing over an employee for a promotion, halting a manufacturing process or targeting a subset of customers with online ads.

Large enterprises that deploy advanced AI systems should consider hiring employees who can explain the inner workings of complex algorithms to non-technical professionals. In our survey, three out of four companies are hiring not just industry and academic experts, but also recent university graduates who can be trained to participate in these types of alliances.

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**75%**  
of companies surveyed are hiring recent university graduates as well as industry and academic experts to train in advanced AI systems

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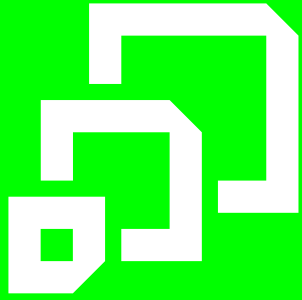
### 3. **SUSTAINERS**

#### **Humans make AI sustainable.**

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Sustainers make sure AI systems operate as they've been designed to do. If any unintended consequences occur, they ensure that the enterprise responds accordingly. However, only one-third of the companies we surveyed have a high degree of confidence in the fairness and auditability of their AI system. And less than half have the same level of confidence in the safety of these systems. Clearly there are some fundamental issues to be addressed. This is where sustainers play a crucial role.

For example, a Las Vegas resort uses AI extensively to continuously change and optimize its inventory and pricing processes in retail outlets, casinos and resorts. Humans carefully collaborate with the AI to set limits on price changes and avoid price-gouging for necessities. In this way, people act as overseers to uphold societal and organizational values. And they intervene when AI systems exhibit inappropriate behaviors.



## 4. **AMPLIFIERS**

### **Machines augment with powerful insight.**

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Smart machines amplify human capabilities with powerful data-driven insights. They do this by sifting through real-time process data to enhance workers' judgment and creativity to match, recommend and spot patterns, with interactions usually taking place through a PC or tablet screen.

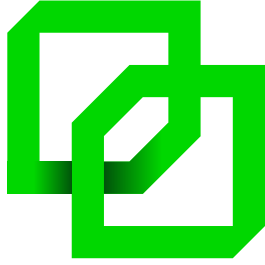
Look at Autodesk. Its AI software, "Dreamcatcher," uses genetic algorithms to iterate potential designs. Unlike traditional design processes, a lengthy procedure in which people conduct research, sketch ideas, and then move to computer modeling and physical prototyping, Dreamcatcher offloads mental calculations to the AI. This frees the human designer to work in a very different way: setting and refining parameters, allowing the machine to work through iterations at a rapid pace. In this new relationship, humans and AI steer the design process together until the human selects a design that fits the desired aesthetic and matches the requirements for the project.

As well as augmenting human capabilities, smart machines will also require people to get better at managing unanticipated outcomes. In our research study, 36 percent of respondents strongly agree—and an additional 50 percent agree—that augmenting employees through machine learning will mean not only doing more and better work, but also managing far more process variability and unpredictability.

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**78%**  
strongly agreed or  
agreed that machine  
learning will result  
in improvements  
in job satisfaction  
and retention

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## 5. INTERACTORS

### Machines give UI personality.

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The fifth type of alliance enables personality-based interactions between humans and machines through voice and natural language. This allows employees to administer, analyze and adapt to changing workloads more efficiently and naturally. In this human-machine relationship, AI often acts as an adviser, whether that involves analyzing customer feedback, inferring causalities between events (drugs and patient outcomes, for instance) or processing financial-trading operations.

In every case, the AI augments a worker's capability either by freeing them for higher-level, more engaging tasks or helping them to work faster—maybe even both. Interactive alliances are reimagining business processes in many white-collar professions, as well as blue-collar or “no-collar” areas. For example, maintenance work and field training are both being updated by AI agents incorporated into augmented-reality glasses (where visual information or workload instructions are overlaid on workers' fields of view).

One of the most advanced examples is GE's digital twin implementation. Here, the AI agent's advice and personality are driven by real-time data simulations of industrial machines. Imagine a maintenance process in a power plant. Upon entering the plant, the worker checks in with the digital twin, which reports damage to a turbine rotor. Through a conversation between human and machine, the AI can describe how the turbine has been running over the past six months, how the damage has escalated during that period, and predict the lifespan impact if no repairs are carried out. Because the worker is wearing an AI headset, the computer will also show the human exactly where the damage is, and suggest next-best actions for resolving the issue in real time.



## 6. **EMBODIERS**

### **Machines provide physical aid.**

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Collaborations between people and physically embodied robots, made from steel and plastic, are already widely deployed—for example, in fulfillment for Amazon’s warehouses or in Daimler Benz’s Mercedes plant outside Stuttgart, where assembly-line processes and inflexible industrial robots have been replaced by teams of people and highly flexible collaborative robots, or “cobots,” as they’re often called.

With more customers demanding customized vehicles, Mercedes found there was too much variety for pure automation to handle. So now its cars are made by people and machines working together. The robots give workers super-human strength and precision, while the people provide must-have flexibility. This combination literally extends the physical capabilities of the assembly process.

The human-machine alliance improves people’s ability to work. It also means they’re less likely to become fatigued or suffer injury. Suddenly, factory jobs aren’t just for workers in their physical prime, but for people of all ages and abilities. This same alliance can also extend careers and expertise within other areas of the workforce.

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**Suddenly, factory jobs aren’t just for workers in their physical prime, but for people of all ages and abilities**

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# PREPARING FOR THE THIRD ERA OF PROCESS CHANGE

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**Since Henry Ford introduced the assembly line and changed manufacturing forever, companies have been using technology to revolutionize their business processes. Continuing through the business-process-reengineering (BPR) movement of the 1990s, when managers sought to harness the power of desktop computing to create greater efficiencies, this effort has been constant and often rewarding.**

We are on the vanguard of the third era of process change, in which business leaders have an opportunity to employ AI to make a systematic shift that affects every process, piece of data and worker. However, this new approach is not simply a technology transformation. It is a new perspective encompassing strategy, technology and the future of work—one that differs dramatically from the notion of creating value through the substitution of human workers.

This new perspective requires innovation at speed and scale. And it requires unprecedented leadership vision with intentional shifts in process change, data and workforce. Executives and managers must foster organizational cultures of creativity, collaboration and data competency to capture the exponential power that is possible through AI. Perhaps most importantly, they must strengthen alliances between humans and machines to enable a future filled with growth.

## About the Authors:



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Paul Daugherty is Accenture's chief technology & innovation officer. Mr. Daugherty oversees Accenture's overall technology strategy, research and development, and ecosystem relationships, and is responsible for developing Accenture's business in emerging technologies such as Artificial Intelligence, Cloud, and Blockchain.

He also serves as chairman of the board of directors of Avanade, a global IT services provider. He is on the board of directors of GirlsWhoCode and the Computer History Museum, and on the Computer Science and Engineering advisory board for the University of Michigan.

He was recently named as Computerworld's Premier 100 Technology Leaders for 2017 for his extraordinary technology leadership. The Institute for Women's Leadership has also recognized Paul with the "Guys Who Get It Award" which recognizes business leaders who have supported diversity in the workplace and advancement of women, especially in the areas of technology and other STEM fields.

Paul is co-author of *Human + Machine: Reimagining Work in the Age of AI*, a management guide to Artificial Intelligence, published by Harvard Business Review Press.



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James is co-author of *Human + Machine: Reimagining Work in the Age of AI*, a management guide to Artificial Intelligence, published by Harvard Business Review Press.

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**To read more about *Human + Machine* and order a copy, visit [www.accenture.com/hplum](http://www.accenture.com/hplum)**

## About the Research

Accenture Research investigated where and how companies are applying Artificial Intelligence to manage and change business processes. In late 2016 and early 2017, the research team surveyed 1075 process professionals from large global companies that were using Machine Learning in at least one business process. The sample included: 156 CXOs, 420 Executives, 382 Managers, and 117 Analysts/Engineers, from 14 industries and 15 different countries. About 17% of this sample are IT professionals.

This research was key in developing the insights in *Human+Machine: Reimagining Work in the Age of AI*, published in March 2018 by Harvard Business Review Press and co-authored by Accenture's Paul Daugherty and Jim Wilson.

## About Accenture

Accenture is a leading global professional services company, providing a broad range of services and solutions in strategy, consulting, digital, technology and operations. Combining unmatched experience and specialized skills across more than 40 industries and all business functions—underpinned by the world's largest delivery network—Accenture works at the intersection of business and technology to help clients improve their performance and create sustainable value for their stakeholders. With approximately 442,000 people serving clients in more than 120 countries, Accenture drives innovation to improve the way the world works and lives. Visit us at [www.accenture.com](http://www.accenture.com).

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