Competing in the Cognitive Age

How companies will transform their businesses and drive value through advanced AI

Assessing the results of a global survey from Protiviti and ESI ThoughtLab
Executive Summary

Advanced artificial intelligence (AI) may conjure up futuristic images along with hype and fear (see our definition of advanced AI on page 4). But the reality is much different. To understand where this technology is headed and how business leaders will apply it in the immediate future, Protiviti and ESI ThoughtLab conducted a global research study delving into where advanced AI stands today and what executives worldwide are planning for and expect to happen within two years.

The survey found that when it comes to advanced AI, most companies are still at the starting gate. Moreover, many non-technology executives still have a “show me” attitude about the value that advanced AI can deliver. But very soon, that picture is expected to change dramatically. A sizable majority of companies are fast tracking AI applications and expecting to see significant gains in profitability, productivity, revenue and shareholder value in as little as two years.

How they are going to reach their ambitious AI objectives and the hurdles they likely will face are among our key findings summarised below:

Businesses are shifting from neutral into high gear

Today, only a small minority of companies (16 percent) are gaining significant value from advanced AI. But within two years that number is expected to leap more than three-fold to a majority of firms worldwide. The march of AI is a global phenomenon and businesses in the Asia-Pacific region are adopting advanced AI faster than companies in the rest of the world. In fact, the Chinese government is currently implementing a national plan to make China the global leader in AI by 2030.

Around the world, companies are putting substantial investment behind their AI efforts. In the last fiscal year, businesses spent an average of $36 million, and they plan to boost their spending by nearly 10 percent over the next two years.

Today, most AI benefits are in operations — in two years, AI will drive revenue

Currently, the benefits of advanced AI are being realised in functions that use massive amounts of data and require judgment. The biggest impact is in IT and cybersecurity, strategy and planning, and operations. In two years, most businesses will apply advanced AI to practically every function, including risk management, marketing and customer experience, sales/business development, and product development.

Advanced AI is already creating demonstrable value in core business areas, including improved planning and decision-making, accelerated time-to-market, better risk management, reduced costs, increased customer retention, and improved employee engagement. In two years, businesses will use advanced AI to drive benefits in strategic and financial performance, scaling global business and growing market share, along with improvements in productivity, profitability, revenue growth and shareholder value.

Obstacles remain

There are obstacles, however, that companies confront on the road to achieving the gains that advanced AI adoption promises. Uncertainty about the return on investment (ROI) of AI is one of the largest barriers to progress. That uncertainty stems from companies applying less rigorous standards to AI business cases than they do to other investments. Thus, CEOs, COOs and other non-technology executives remain sceptical
about advanced AI. Compelling proofs of concept and pilots are essential to gaining their support.

Although advanced AI can help protect against cyber-attacks, it also carries its own cybersecurity risks due to the greater access to sensitive and personal data. Regulatory uncertainty and securing the required AI talent are other challenges. Universities are not producing enough advanced AI specialists, which is creating a talent war.

To close the talent gap, businesses are partnering with consulting firms, developing internal talent, outsourcing, recruiting new talent and partnering with universities. Companies achieving the most success with AI are much more likely than others to develop talent in-house. In addition, when it comes to developing AI talent, the use of off-the-shelf or internally developed advanced AI tools with interfaces that most mathematically inclined managers can use may be the most effective strategy. It simplifies the training challenge and lessens the need for advanced AI specialists such as data scientists.

Culture and leadership matter

AI efforts are headed primarily by senior technology executives. But many experts believe AI should be the domain of the CEO or line-of-business head to ensure AI applications are tied closely to specific business outcomes. In addition, our research suggests organisations should adopt a model that combines a centre of excellence with AI professionals housed in business units. Only a small percentage of firms completely centralise their AI professionals.

To spur corporate culture to embrace AI, the most important lesson to bear in mind is that executives need to understand AI and what it can do. In addition, management should allay the fears of employees concerned about, among other issues, obsolescence and job displacement. Fear and a pervasive lack of AI knowledge in an organisation can retard progress and lead to a poor choice of applications.

"We are entering the cognitive age. Over the next 25 years, advanced AI will be the central element of digital transformation that fundamentally changes how businesses operate."

— Cory Gunderson, Executive Vice President, Global Solutions, Protiviti
Introduction: Artificial Intelligence Moves into the Fast Lane

AI may be the most important development of our era, poised to have a transformational impact on the world that may rival that of electricity, according to Dr. Andrew Ng, adjunct professor at Stanford and founder of the Google Brain deep learning project. For business, AI will be a major game changer. It will enable companies to take performance, decision-making and risk management to new heights across their enterprises. The AI revolution will change the course of business across all industries and turn data into the key driver of competitive advantage.

Today, businesses are trying to understand advanced AI and move their organisations to embrace it. Internal advocates more familiar with the latest technologies often pressure sceptical senior executives to pursue advanced AI (see our definitions of “advanced AI” on following page). However, advanced AI is changing industries very rapidly, as well as the perspective of these executives. “By 2022, business leaders themselves will be demanding AI solutions to keep up with and/or beat their competitors,” says Cory Gunderson, executive vice president in charge of global solutions at Protiviti. “We are entering the cognitive age. Over the next 25 years, advanced AI will be the central element of digital transformation that fundamentally changes how businesses operate.”

To understand how companies will transform their businesses through AI and the benefits they will gain, Protiviti and ESI ThoughtLab conducted a global survey of 300 senior executives across functions, industries and company sizes (see page 12). According to our research, most companies are still in the early planning and implementation stages of AI development, with only a small minority today gaining significant value from advanced AI. But that number will swell to over half of all companies over the next two years as enterprises across industries and regions put advanced AI on the fast track.

In the process, however, organisations will need to address a tangle of challenges, from uncertain ROI and limited AI talent, to concerns about cybersecurity and regulatory compliance. Among the most daunting hurdles is the fear among rank-and-file staff that advanced AI will eliminate jobs instead of making them potentially more rewarding.

But a minority of companies have overcome these obstacles. These AI leaders populate all industries — from financial services to healthcare — and are by no means limited to the ranks of the digitally born. They are far ahead of their competitors in the use of AI and are far more likely to see the rewards in terms of productivity and profitability.

“Advances in AI are helping companies improve their business operations and drive business success,” says Madhumita Bhattacharyya, managing director, artificial intelligence and machine learning at Protiviti. “Just as the Industrial Age transformed American society, AI will transform the way we do business and the way work gets done.”

Peter Henstock, machine learning and AI technical lead at Pfizer, agrees and points out that harnessing AI will be crucial for staying competitive in the healthcare industry. “Change in the healthcare industry moves slowly,” he says. “It takes 12- plus years from start to end to bring a new drug to market. Many pharma companies are apprehensive because we do not yet have the AI talent, integrated data infrastructure or capability to effectively utilise AI well. The first company that figures out how to do it will have a huge advantage in everything, including making better, faster decisions that will completely change the field.”

The stakes are too high for companies to sit on the sidelines. In our full report, available at www.protiviti.com/AI, we provide actionable insights for organisations to secure their place in the coming cognitive age.
For the purposes of this study, we use the term “advanced artificial intelligence (AI)” as an umbrella term for several different technologies that allow computer systems to perform tasks that normally require human intelligence, such as visual perception, speech recognition and decision-making.

**Areas of Advanced Artificial Intelligence Covered in Our Research**

**Machine Learning (ML):** The use of statistical techniques to give computers the ability to “learn” with data without being explicitly programmed. ML can detect patterns or apply known rules to predict outcomes, detect anomalies and yield insights.

**Deep Learning (DL):** A higher form of machine learning that applies successive layers of representations to teach computers to learn by example and make decisions by themselves.

**Natural Language Processing (NLP):** The use of computational linguistics and artificial intelligence to enable computers to understand and to interpret human language, including speech and the written word.
# Highlights and Key Findings

## AI now and in two years

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<tr>
<td><strong>01</strong></td>
<td>Currently, only 16 percent of businesses are gaining significant value from advanced AI. But within two years that number is expected to more than triple.</td>
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<td><strong>02</strong></td>
<td>Companies of all sizes and across industries are investing heavily in advanced AI — an average of $36 million was spent in the last fiscal year — and plan to increase their budgets by nearly 10 percent over the next two years.</td>
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<td><strong>03</strong></td>
<td>Healthcare and technology companies are moving the fastest. Financial services and consumer products organisations are picking up the pace but are moving ahead a bit more slowly.</td>
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<td><strong>04</strong></td>
<td>The Asia-Pacific region is poised to become the global innovation centre of AI. Businesses in the region are adopting advanced AI faster than those in Europe and North America. The Chinese government is implementing a national plan to make China the global leader in AI by 2030.</td>
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## The value from AI will soar

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<td><strong>01</strong></td>
<td>Advanced AI is already creating measurable value in essential areas of business, including improved planning and decision-making, accelerated time-to-market, better risk management, reduced costs, increased customer retention and improved employee engagement.</td>
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<td><strong>02</strong></td>
<td>Within two years, businesses expect to derive major gains from advanced AI in strategic and financial performance, ability to scale global business and greater market share, along with improvements in productivity, profitability, revenue growth and shareholder value.</td>
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<td><strong>03</strong></td>
<td>The benefits of advanced AI are coming from several business functions, especially those that use massive amounts of data and require judgment. Businesses are seeing the greatest impact today in IT and cybersecurity, strategy and planning, and operations.</td>
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<td><strong>04</strong></td>
<td>In the coming years, most businesses will be applying advanced AI to practically every function, including risk management, marketing and customer experience, product development, and sales/business development.</td>
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Businesses leapfrog to deep learning

Businesses are leapfrogging from more traditional machine learning (ML) applications to complex solutions using deep learning (DL).

- DL can be highly valuable for organisations with significant amounts of data in both structured and unstructured formats.
- Computer vision — the ability of machines to recognise an image such as a customer’s picture — is also driving growth of DL applications.
- DL can be used with robotics when processes are complex and require a substantial amount of exceptions management.

DL applications are highly complex, and many managers do not completely understand how they work. This can lead to error and bias. Regulators, especially in the financial services industry, are reluctant to approve any DL application if management cannot thoroughly explain how and why it reaches decisions.

Overcoming the barriers to AI adoption

Although improved cybersecurity is a major advantage of AI, it also brings its own cybersecurity risks due to the greater access to sensitive and personal data.

Regulatory constraints are another major roadblock. Organisations must be able to audit their advanced AI applications to ensure that data is secure and company leaders understand how the application works.

Many organisations apply less rigorous standards to AI business cases than to other investments. This leads to concerns about the actual ROI of AI — one of the top barriers to moving more quickly with advanced AI.

Universities are not producing enough advanced AI specialists, which is spawning a talent war and pushing up salaries.

CEOs, COOs and non-technology senior executives remain sceptical about advanced AI. Compelling proofs of concept and pilots are essential to gaining their support. Pilots should address low-hanging fruit that is not easily solved by other analytics approaches.
### People, structure and culture

| 01 | AI efforts are led by senior technology executives in most companies. However, many experts believe it should be the domain of the CEO or line-of-business head to ensure AI applications are tied closely to specific business outcomes. |
| 02 | Advanced AI encompasses both technology adoption and business change. Thus, only a small percentage of organisations completely centralise AI professionals. Nearly all combine a centre of excellence with additional AI staff housed within individual functions and business units. |
| 03 | To fill talent gaps, businesses are partnering with consulting firms, developing internal talent, outsourcing, recruiting new talent and partnering with universities. The most successful AI companies are much more likely to develop talent in-house. |
| 04 | The use of off-the-shelf or internally developed advanced AI tools with interfaces that most mathematically inclined managers can use simplifies the training challenge and lessens the need for advanced AI specialists. |

### Data dilemmas

| 01 | Many companies are amassing multiple sources of data. However, only one in three are confident that their existing data support their advanced AI programs. |
| 02 | While businesses are trying to make fast progress with their AI platforms and data, they should start by focusing on data for pilots, which will provide insights into data and platform needs going forward. |
| 03 | Few companies perceive data as a valuable asset, and thus they do not devote sufficient attention to how it is collected. Companies should begin by looking at the source of their data and make sure there are clear rules and policies in place that ensure it is clean and usable. |
AI leaders point the way

01 Sixteen percent of companies are already gaining significant value from AI. They are developing it differently and seeing a greater bottom-line impact than other companies.

02 AI leaders employ nearly three times as many AI professionals than do businesses overall.*

03 AI leaders are much more likely to make advanced AI part of their digital transformation and use technology to fundamentally change how they conduct business.

04 AI leaders stress that companies’ IT infrastructure must support AI programs, and that business and functional units should work closely together to ensure there is a clear ROI.

* We define “AI leaders” as those organisations reporting that they currently gain “high” or “very high” value from the use of advanced AI.

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— Madhumita Bhattacharyya, Managing Director, Artificial Intelligence and Machine Learning, Protiviti
A Call to Action: Advice on Becoming a Cognitive Leader

Although some companies have yet to embark on a path toward advanced AI, many of their leaders understand the pressing mandate. These organisations are planning to move quickly and expect to see gains in productivity, profitability, revenue and shareholder value — in just two years. Realising these achievements is no small order, however. Organisations need to heed the experience of others in order to avoid the pitfalls along the way.

The following calls to action represent advice from advanced AI adopters.

**Don’t wait until the dust settles.**
AI is essentially the next wave of the digital revolution and most businesses want to move fast. Although companies have been able to play wait and see in the use of some technologies, AI cannot be one of them. Businesses fall behind at their own peril. “The most damaging approach, still extremely common, is simply doing nothing,” says David Judge, vice president of SAP Leonardo. “We see a lot of companies waiting for the benefits to become crystal clear. But by then it might be too late to play catch-up.”

**Develop an AI roadmap.**
Companies need to have a plan to maximise the use of AI. It should start with an assessment that delineates where the company stands and what gaps need to be closed. The roadmap should identify the proofs of concept needed as well as all the functions, processes and businesses where advanced AI can make a significant difference. The plan should also include selection of leaders and project managers for each initiative, along with a budget.

**Don’t shoot for the moon.**
Companies often make significant investments in platforms and infrastructure before they truly understand how their organisation will use AI and the value it will bring. Instead, organisations should develop prototypes and proofs of concept that tackle low-hanging fruit that other analytics approaches cannot address as effectively. This may be an opportunity to use DL applications, given that they handle complexity well along with multiple types of data. But be sure to understand how the application’s algorithms work and do not settle for a black box. In addition, with prototypes, businesses only have to work with the data needed for the proof of concept. As more pilots are developed, an organisation’s data needs will become clearer, which will bring greater clarity to infrastructure requirements and related investments.

**View the business through an AI lens.**
AI is more than a technology. It can have a significant impact on costs and productivity. But AI can also play a major role in revenue-generating activities. AI leaders, for example, are already focusing their AI efforts on sales and business development as well as marketing and customer experience to a much greater degree than the overall market.

An AI lens will reveal different opportunities in various industries. Consumer products companies, for example, may focus on identifying market changes. Pharmaceutical companies may emphasise R&D to

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accelerate the time-to-market for new treatments. Any HR function can use these technologies to identify potential candidates who are likely to stay in the organisation for several years, thus reducing recruiting and onboarding costs.

**Secure funding.**

One of the main lessons learned by AI leaders is that companies need to budget enough resources for their AI initiatives. Gunderson says that businesses put resources into three major buckets: things that must be done (e.g., problems that must be fixed), things that would be good to do (which are often customer facing) and initiatives that make the organisation more competitive. Advanced AI currently falls mostly in the third bucket.

**Calculate ROI by experimenting.**

Half of all companies are uncertain about the ROI of AI. A similar number have lax standards for AI business cases. To understand the ROI, company leaders should apply AI to specific business outcomes that need to be addressed. These outcomes can be measured, which will clarify the value that AI brings to the table.

To bolster certainty, companies should conduct A/B tests — where the results of a process without the advanced AI application are measured concurrently with the use of AI — as they are developing the application. Each idea can be tested as an agile sprint to lead to the most powerful outcomes. The result is that companies do not have to make huge investments up-front and can see and learn the value of AI to the enterprise on an ongoing basis.

**Validate AI programs.**

AI algorithms should be validated to ensure they are accurate, free from bias, conceptually sound, and meet the organisation’s model validation criteria and standards. Models should also be tested against the manual processes they are replacing or augmenting.

**Deepen understanding across the enterprise and root out fear.**

Leaders, managers and employees need to understand what AI can do for their businesses, functions and jobs. Employees often fear that AI is simply a means to reduce headcount. To confront that issue from the start, organisations should conduct enterprise-wide training programs that demonstrate clearly how advanced AI can make jobs more engaging and employees more productive.

**Build a structure that brings IT and businesses together.**

To be successful with AI, companies need multiple skill sets that often are not found in a single individual. For example, AI and IT professionals do not often understand the business outcomes enough to create powerful applications. Conversely, line-of-business managers do not have enough AI knowledge to know what it can do. To bring these individuals closer together, companies tend to house AI professionals in business units, sometimes supported by a corporate AI centre of excellence. Whatever the structure, Sumedh Mehta, CTO of Putnam Investments, believes organisations need to have three elements in place for the business to embrace AI:

- A culture that values change and allows for experimentation;
- Skilled AI professionals who can operate in a business context and understand the key drivers of results from the models; and
- Identification of the right problems to tackle — those that can have a meaningful impact on the business when solved.
Develop talent in-house.

Universities are not delivering enough AI talent to meet demand, and that is not likely to change in the near future. AI leaders recognise this — more than 90 percent have their own in-house AI development programs. Equally important, off-the-shelf tools designed for non-IT managers or data scientists are increasingly available, and such managers can be trained to use them. Moreover, when companies develop AI tools, they should create user interfaces that are relatively easy to use by any manager with a mathematical bent. They should not be just for data scientists.

Follow the leaders.

Nearly 20 percent of companies are already on the fast track. They are developing their own talent, focusing on revenue-generating processes such as business development and fortifying industry-specific processes far more than their competitors. These leading adopters will be good models for companies that are lower on the learning curve. Also, be mindful of the fact that an AI leader can emerge from any part of the world, especially China and the Asia-Pacific region.

Ensure that senior executives understand how AI works and what it can do.

“We’re at this point right now where companies hire really smart, brilliant people to help develop AI capabilities,” says Gunderson. “But the number of people who can credibly push back, challenge or just govern those individuals is very limited in most organisations. The referees know less about the game than the players on the field.” Lack of senior management knowledge can slow progress and end up greenlighting projects that miss the mark.

In Closing

The digital transformation of business and society has been underway for some time, and advanced AI is entering the mix. Despite fear of its capabilities, advanced AI is poised to fundamentally change how businesses work — and to a far greater degree than virtually any other new technology since the advent of electricity.

Many companies are still at the starting gate or at early stages of AI development. Moreover, many senior executives worry about the payoffs of AI investments. But they see what is coming. In just two years, more than half of companies around the world expect to be garnering significant value from advanced AI.

As our study found, however, a great deal of work must be done in those two years and multiple obstacles stand in the way, including but not limited to lack of talent and challenging decisions about where to invest. However, AI leaders have figured out how to surmount these obstacles. They are already benefiting and are leading the way in everything from using AI to bolster employee engagement to boosting productivity and business performance. As Ron Lefferts, managing director and leader of Protiviti’s global Technology Consulting practice, observes, “The reality is that AI can and will be deployed almost anywhere.”

Our full report on the results of this global study (available at www.protiviti.com/AI) contains extensive analysis and key insights gathered from survey participants across a number of dimensions, including expectations for gaining value, current benefits, anticipated investment in AI, executive buy-in, industry and global adoption, and comparison of AI leaders versus non-leaders.
ABOUT THE RESEARCH

ESI ThoughtLab conducted interviews by phone with 300 executives worldwide. The survey was fielded between August 20 and September 7, 2018. The study also included in-depth follow-up interviews with 13 executives and other experts in advanced AI.

- **Seniority**
  - 50% C-Level
  - 50% Direct reports

- **Industry sector**
  - 25% Consumer
  - 25% Financial services
  - 25% Healthcare
  - 25% Technology

- **Function**
  - Technology/Innovation: 25%
  - Marketing/Sales: 12%
  - Operations/Manufacturing: 11%
  - Executive/General Management: 11%
  - Strategy: 10%
  - Finance: 9%
  - Risk: 9%
  - Human Resources: 5%
  - Legal/Administration: 4%
  - Analytics: 4%

- **Region**
  - North America: 50%
  - Europe-Middle East-Africa: 30%
  - Asia-Pacific: 20%

- **Size**
  - Midsize ($500 mil - $999 mil): 17%
  - Large ($1 bil - $9.9 bil): 33%
  - Very large ($10 bil - $49 bil): 28%
  - Largest ($50 bil or more): 22%
Protiviti is a global consulting firm that delivers deep expertise, objective insights, a tailored approach and unparalleled collaboration to help leaders confidently face the future. Protiviti and our independently owned Member Firms provide consulting solutions in finance, technology, operations, data, analytics, governance, risk and internal audit to our clients through our network of more than 75 offices in over 20 countries.

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