

Mind the (AI) Gap

Leadership Makes the Difference

MIND THE GAP

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December 2018

AT A GLANCE

Around the world, companies across industries are beginning to adopt the use of artificial intelligence (AI) and machine learning to massive advantage. Successful implementation of AI techniques holds the promise of revolutionary advances in how businesses operate—and of significant competitive advantages for early movers. But rates of AI adoption and success have not been equally distributed. One country, China, is currently well ahead of the rest of the industrialized world in AI implementation, with up to 85% of companies identifiable as “active players” in AI. Traditional powerhouses like Germany, while strong on AI research and infrastructure, are increasingly falling behind in actually leveraging the technology in practice.

A DISRUPTIVE APPROACH TO INNOVATION DRIVES AI SUCCESS

This gap is not a coincidence. Responses to a global BCG survey among over 2,700 managers in seven countries on the drivers of success in AI implementation make it clear that there is a connection between bold, disruption-friendly management styles—actively putting AI high on the agenda, encouraging rapid development and piloting, and fostering cross-functional, agile R&D—and being an active player in AI. As one example, our survey responses show that 72% of companies with short innovation cycles are active and successful AI implementers—compared with only 30% of companies with cycles of two years or longer. This is true not only in China, but across all countries (and indeed all industries). These aspects of management style and company culture make the difference on AI adoption and are just as important as the often cited prerequisites around infrastructure, skill levels, and business-friendly environments.

EXECUTIVE LEADERSHIP IS A KEY FACTOR

To enable their organizations to succeed, executives in Germany, France, and other countries must grasp the inevitability of AI and adapt their own innovation behavior and culture so that AI has a chance to take hold. This is best done not by slowly planning “big plays” or launching lengthy change programs, but rather—like China—by simply getting started: launching smart, agile AI pilot projects that begin to chip away at legacy innovation patterns and serve as catalysts for the broad, fundamental change that AI can bring to an organization.

THE RACE TO AI ADVANTAGE

When people think of artificial intelligence (AI), many picture some far-off future portrayed by popular science fiction: intelligent, humanoid robots by our sides to do all the things we prefer not to do ourselves. But in reality, the AI revolution is already here today. AI-enabled products are becoming commonplace in many household applications, and in the business and manufacturing world, the power of AI is already showing itself in industries around the globe.¹ Artificial intelligence, and in particular the use of machine learning to enhance and fundamentally reconceive business processes, stands poised to transform the very core of how business is done. As the April 2018 BCG study “AI in the Factory of the Future” illustrates for industrial production, the cost-reduction potential of AI is massive—even for long-established businesses.

AI innovation is moving at a rapid pace, and governments are currently scrambling to define strategies to ensure that their economies are not left behind. Many companies themselves are vocal in calling for national investments and for incentive schemes, in the expectation that this will “spark AI” in their businesses. Indeed, structural improvements at the national level do play an important role in laying the foundations for AI growth—investments in data infrastructure, in research hubs and networks, and in higher education for IT and data-related fields. Not surprisingly, much discussion today is focused on which countries are leading in these dimensions.

In the end, however, leadership on AI will not be driven simply by who is getting the enablers right. These environmental conditions can help to pave the way, but by themselves, they will not make an individual company active in exploring and exploiting AI. Rather, leadership will be determined by which companies (and countries) are most successful at actually implementing AI across their businesses, extracting value from it, and monetizing its potential.

A new BCG survey among managers from seven countries sheds light on AI leadership from this implementation perspective. We examine which countries are winning the race to implement AI in practice, which countries are losing, and—most importantly—what factors appear to be making the difference. A Chinese business owner may well read the results of our survey and raise a glass of champagne in a toast to a bright future indeed. Executives from most other countries, on the other hand, might want to pour themselves a double shot of whiskey.

Nowhere is this truer than in a country like Germany, which is often reported as leading on many of the critical enablers (such as AI research). Unfortunately for

AI innovation
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Germany, the very practices that have made its companies leaders in perfecting technical innovations during the last industrial revolution are, as our study shows, now preventing them from actually unlocking the potential of new innovations like AI for the industrial revolution in progress. The reason is simple: Changes that AI can unlock tend to be disruptive, changing the way entire processes work and the roles humans play in them, and so the approach to corporate innovation must be disruptive, too. Many recipes for success learned over the past 100 years—focusing on meticulous R&D in functional silos, followed by cautious incremental change, all while minimizing exposure to risk—now hinder rather than help, even when the right infrastructure, data, and skills are in place.

The AI leaders of tomorrow push for innovation and disruptive change

Triggering this necessary change of mindset and approach to innovation will not come down to infrastructural investments or national incentives. The AI leaders of tomorrow will be determined in part by the willingness of executives to **turn capability into action** by reexamining how (and how strenuously) they push for innovation and disruptive change in their companies. A fresh management mindset and company culture will be critical to unlocking change—and, as the results of our study demonstrate below, failure to treat AI innovation differently in these dimensions will leave countries like Germany lagging behind permanently in the race to leverage the value of this technology.

To begin, we briefly explore how companies that are successfully turning capability into action—the companies we call active players—are distributed across countries and industries. More importantly, we then seek to understand from our survey results what it is that is making the difference.

ABOUT THE STUDY

In September and October 2018, BCG conducted an online survey of companies to gain a general understanding of the role artificial intelligence² (AI) and machine learning play across countries and industries and, in particular, how companies in different industries and countries differ in their approaches to engaging with technical innovations like AI. The survey sought to evaluate which companies are active leaders in adopting or piloting AI, and to understand which organizational, procedural, and cultural drivers are underlying success factors that differentiate leaders from laggards.

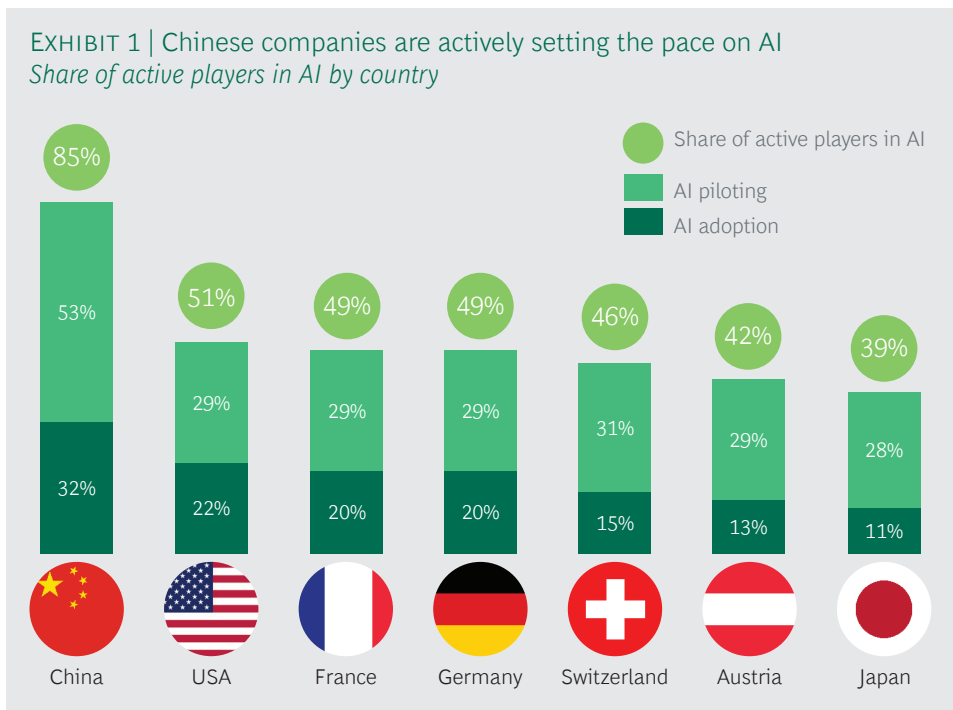
BCG surveyed more than 2,700 managers from Austria, China, Germany, France,

Japan, Switzerland, and the United States. Participants spanned all levels within these organizations, from board members and senior executives to middle- and first-level managers. BCG selected the companies from a broad and representative spectrum of industries including consumer, energy, financial services, health care, industrial, technology, media and telecom, as well as professional services and the public sector. The participating companies ranged from small SMEs (under 250 employees) to large corporates of 50,000 or more employees. BCG accepted responses only from managers with at least a basic understanding of AI and its potential.

WHO ARE THE ACTIVE PLAYERS IN AI?

In 2017, the Chinese government published its New Generation Artificial Intelligence Development Plan, challenging its business leaders to achieve preeminence in the field of artificial intelligence within the next decade—and it appears the country’s business leaders have been listening. According to our survey, a remarkable 85% of Chinese companies are active players in the field of AI. For the purposes of this study, we define active players as those companies making tangible progress in unlocking the value of AI in two dimensions: They are already moving to **adopt** AI into some existing processes or currently running **pilot** initiatives, and their efforts thus far have generally been **successful**. In the race to exploit AI’s benefits, they are, in effect, the companies actively taking part, and China is at the front of the pack.

Meanwhile, across most of the other countries surveyed, only approximately 40 to 50% of companies qualify as active players. The remaining “observer” companies are not yet significantly active in AI or, if they are, have generally remained unsuccessful in their efforts. Observers still account for the majority of respondents in most countries (exhibit 1).



China packs a double punch. China’s very high share of active players is driven by two mutually reinforcing factors: China is leading by far in terms of AI activity, with 32% of its companies having already adopted AI into processes (compared with 20% or less in most other countries) and the majority of remaining companies piloting initiatives. What’s more, a mere 10% of companies report unsuccessful past AI initiatives. In short, Chinese companies are proactively launching AI projects—and when they try, they tend to succeed.

The United States is strong but complicated. The United States is in second place in terms of its share of active players, due in no small part to high levels of AI activity in Silicon Valley and “digital start-up” industries. In this niche sector of the economy, 76% of US companies are active players and report a past implementation success rate of over 90%. Outside of this pocket of leadership, though—in traditional industries—the overall picture is mixed.

Germany and France are falling behind. According to our survey results, these two countries field as many observers as active players. Of the companies with previous AI initiatives, fully 31% of German companies and 36% of French companies report generally unsuccessful outcomes. Both of these nations were powerhouses of the last industrial revolution. As things stand today, neither of them is in a strong position to lead the AI implementation revolution.

Japan brings up the rear. A country that many perceive as a leader in cutting-edge AI robotics trails significantly in the race to AI adoption. Of the 39% of Japanese active players, only 11% are already AI adopters, with the remainder still piloting. Encouragingly, for those companies that are active, their success rate with past initiatives (66%) places them solidly in the middle of the pack—and ahead of countries like Austria and Switzerland. A success rate of two out of three, however, is nothing to brag about—especially when most have not even tried.

Chinese leadership in implementing AI is a cross-industry phenomenon. Across all industries spanned by the 500 Chinese companies we surveyed, AI activity is vigorous and actively promoted. Unlike in the United States, China’s overall lead in the race to extract value from AI is not driven by the strong dominance of one or two particular industries—it is a nation- and industry-wide phenomenon that is rooted, we would contend, in the way Chinese managers approach AI innovation. We explore these drivers in the following sections (exhibit 2).

EXHIBIT 2 | Across countries, technology companies are leaders in leveraging AI
Share of active players in AI by country/industry cluster

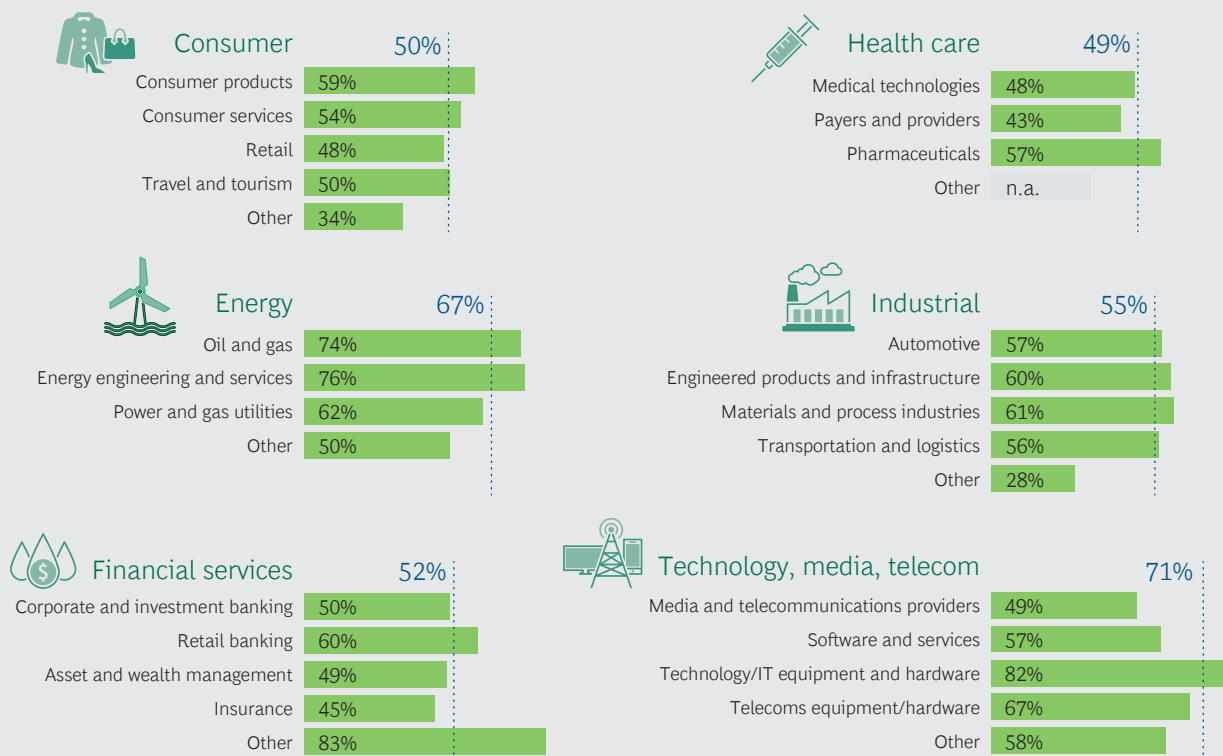
	China	USA	France	Germany	Switzerland	Austria	Japan	Total
Consumer	84%	41%	57%	39%	65%	32%	35%	50%
Energy	86%	73%	48%	50%	n.a.	67%	38%	67%
Financial services	86%	61%	45%	34%	67%	22%	42%	52%
Health care	83%	49%	51%	43%	38%	33%	23%	49%
Industrial	83%	49%	43%	60%	35%	44%	32%	55%
Technology, media, telecom	89%	65%	63%	64%	43%	67%	60%	71%
Total	85%	51%	49%	49%	46%	42%	39%	55%

Note: Values denote the percentage share of active players in each country and/or industry. Colors highlight their relative positioning. “n.a.” denotes clusters with insufficient survey statistics.³

Globally, tech firms are leading the charge on AI in most countries. It is perhaps not surprising that technology, media, and telecommunication companies have the highest share of active players (with 71% across this set of countries), led by technology and IT firms as well as telecommunication equipment and hardware producers. Energy as an industry is in second place, with energy engineering and services as well as oil and gas strong across many countries, especially in China and the United States, while utilities lag within the industry.

Other industries paint a heterogeneous picture. Across other industries around the globe, AI activity and success appears to be driven less by inherent industry characteristics than by the idiosyncrasies of individual companies and markets. Industrial engineered product companies are strong active players in Germany (with an 84% share) but weak in France. Conversely, data-rich consumer retail companies are much stronger active players in France than in Germany. Switzerland shows a high share of active players in banking and insurance, while Austrian banks lag far behind. Active players among automotive companies, seen as an early adopter industry for AI technology, range from 27% in Japan to approximately 65% in Germany and France. Clearly, simply being a consumer company or a financial services company does not predestine you to be an active player (exhibit 3).

EXHIBIT 3 | Leadership on AI adoption is scattered within industries
Share of active players by industry



WHAT IS HOLDING COMPANIES AND/OR COUNTRIES BACK?

Based on our survey results, some companies (and some countries) are clearly doing better than others at initiating AI-driven projects. But what is making the difference? Despite differences in, for instance, national investment in research and technology, the playing field across the countries surveyed is broadly level in many respects. Almost all countries covered by our survey have national strategies to promote and foster new technology. Additionally, a lack of access to AI ideas is not a material factor, given the freedom with which even privately developed AI technologies are routinely shared in the open-source AI community. From this perspective, global AI research is a rising tide that is able (and available) to lift all boats.

Finding enough local AI talent is a global problem

Finding enough local AI talent to meet the need is in fact a global problem—even in China.⁴ And simply throwing money at AI doesn't seem to work either: Many companies in our study are actively pursuing AI (some with more than 10 use cases under their belts) and yet have failed to establish successful track records. Simply “winning by investing” is not the answer.

Based on our survey results, we would argue that a large part of what drives the differences in international AI adoption and success lies not outside the realm of a business's control, but rather within it.

Management matters. Traditionally strong innovators are falling behind China not because of external conditions. They are lagging because their senior managers, like their counterparts around the world, have not evolved their thinking to match the needs of the age of AI. Again, take the example of Germany.

The irony for many German companies is that they have worked hard for decades to establish a reputation for intelligently refining new innovations. The World Economic Forum's 2018 Global Competitiveness Report recently placed Germany at the top of the list in “innovation capability,” ahead of the United States, China, and many others, based on its extensive academic research network and large volume of patents. Led in no small measure by tech-friendly sectors such as the automobile industry, German companies have historically learned to prosper by following a traditional approach to R&D—one that is deliberately incremental, thoroughly planned and research-driven, and frowns on trial and error. It is almost in these companies' DNA to take the long view and work diligently behind the scenes to perfect solutions to hard problems before launching them. But when it comes to technologies like AI, past innovation performance is no guarantee of future results. In fact, quite the opposite is true.

SUCCESSFUL AI INNOVATION IS A DIFFERENT ANIMAL

As a case in point, German automobile companies are famous for car doors that close with a solid, reassuring thud. The doors close so well because German engineers have spent decades perfecting the door, the door frame, and the hinge that connects them. Years of painstaking research and steady, incremental improvement is a perfectly reasonable, rational way to advance such design and manufacturing.

In fact, in the past half century of industrial innovation, this measured approach was a key factor that separated winners from losers.

With the rise of AI, such established processes are no longer the structural advantage they once were. AI makes it easy for an emerging car company to leverage the power of digital sensors and iterative machine learning in order to achieve similar levels of build quality (and the reassuring “thud”) in months rather than decades. In fact, such traditional engineering challenges may not even be the key differentiator going forward. There is a whole new set of digital challenges that will separate the automotive winners from the losers over the coming years, such as leveraging autonomous navigation using AI (within the factory or on the road) or the ability to intelligently predict demand for car models and specific car features in real time. AI has already begun to revolutionize how manufacturers are steering their production and distribution, driving down costs and gaining advantage. They are doing so by leveraging big data analytics and machine-based learning algorithms.

AI is fundamentally disruptive. Such new challenges require new thinking: a bold vision to change established ways of working, and a management impetus to get the change started quickly. It requires companies to foster an organizational culture that allows their development teams to dare to be disruptive: to pilot early, to test, to learn—and to fail along the way. It requires governance processes that allow this type of innovation to proceed at high speed. And it requires interdisciplinary teams that can rapidly navigate the complex intersection of data, analytics, processes, and business know-how that often marks digital innovation. Above all, it requires senior leaders who, rather than waiting for innovation in this area to slowly percolate up from below, actively demand it and prioritize pilot projects accordingly.

WHAT DOES AI NEED TO FLOURISH?

The results of our survey reveal three behaviors that are fundamental drivers of AI success—of being an active player in AI—across industries and countries: innovation cycles measured in months instead of years, a management culture that actively demands AI innovation and is willing to green-light small-scale AI projects, and a cross-functional approach to rapid prototyping. If a company is ahead of the curve on these metrics, its odds of being active and successful in implementing AI increase significantly, regardless of which country it happens to reside in. These behaviors, it appears, are the underlying triggers that turn capability into action.

Three
fundamental drivers
of AI success

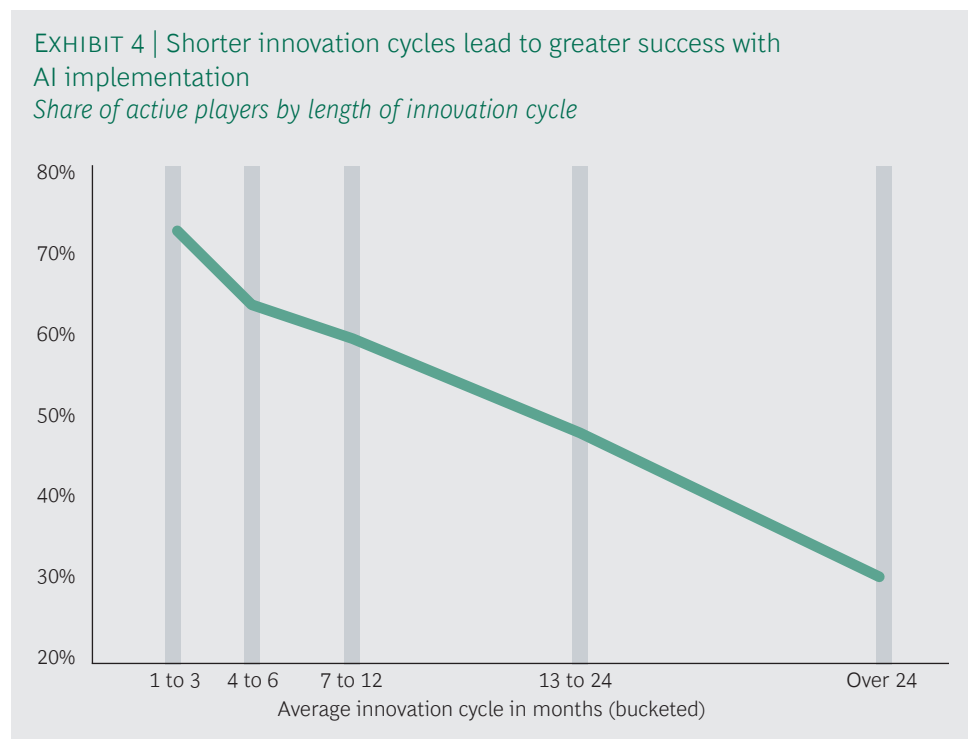
Unfortunately, our survey data shows that German, Austrian, Swiss, French, and Japanese companies are lagging far behind China, and to a lesser degree the United States, in almost every one of these dimensions. The good news: Our survey suggests that, by focusing on these three drivers, countries can still advance from observers to active players.

ACCELERATE THE INNOVATION CYCLE

One of the great advantages of AI is its ability to rapidly absorb and digest feedback. Because it is based on machine learning, the systems to which AI is connected can become better at what they do much more quickly than those based on traditional human-based feedback systems. As a result, successful AI projects move

rapidly through cycles of launching, testing, learning, and improving. The faster they move, in fact, the faster they can establish their value and embed themselves in entrenched processes.

Our survey data bears this out, showing that companies with shorter average innovation cycles have significantly better AI implementation track records than those with longer cycles. Of the 16% of companies surveyed that are the highest-velocity innovators—with an average time of three months or less between idea and working prototype—72% are classified as successful active players (with an implementation success rate of 83%). As the length of innovation cycles increases, however, the AI activity and success rates decrease proportionately. Of companies with innovation cycles of two years or more, less than 30% are active in AI, and their success rates drop to an average of just over 50% (exhibit 4).

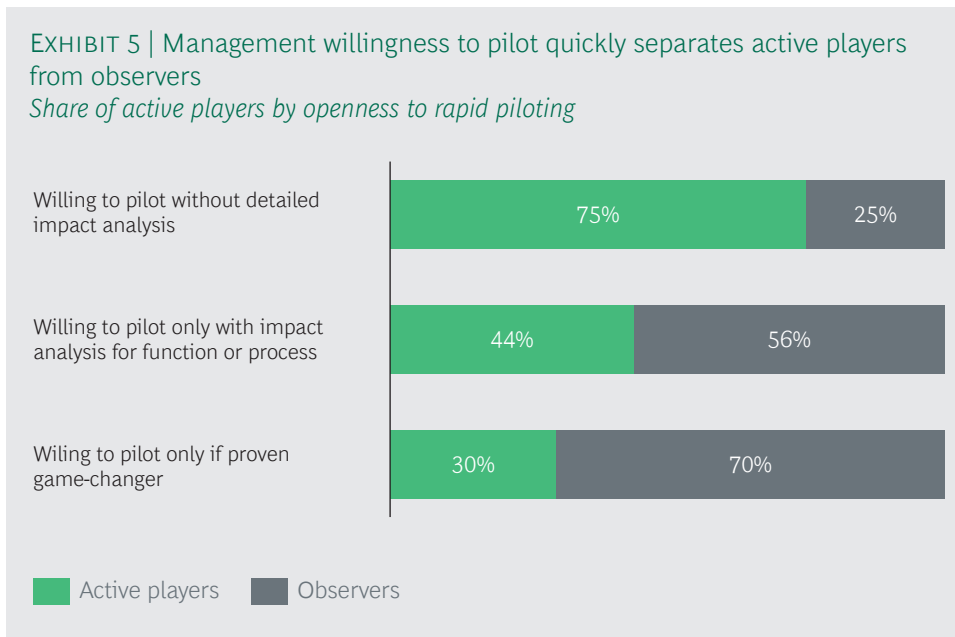


Short innovation cycles are not an exclusively Chinese phenomenon: The rate of innovation is widely distributed in our sample, with just as many high-velocity innovators coming from Japan as China. And the value of short cycles holds true in every country (and indeed in every industry as well): Companies with short average innovation cycles account for a much higher percentage of active players than companies with longer cycles—even in Germany, France, and Japan. But on average, companies from these countries have average innovation cycles of between 10 and 14 months, while China leads with an average of only 7.3 months. The longer the cycle, the higher the odds of being an AI observer—and this gives China an edge in the race.

DRIVE AI ENGAGEMENT TOP-DOWN AND PILOT EARLY

As noted above, one of the strongest drivers of AI success is the degree to which company executives adopt a mentality of being willing to pilot these kinds of typically disruptive technologies. Active players consistently score the proactivity of their senior management in “pushing AI” in the organization significantly higher (by over a third) than observers do. This, too, is a universal truth across countries and industries: The surveyed gap in active management demand for AI innovation between active players and observers ranges from a weak 15% in Austria to 33% in Germany and a strong 47% in the United States. The trend is clear: When senior management visibly pushes AI, organizations become more active in AI innovation—and more successful.

As noted in the recent joint BCG and MIT report “Artificial Intelligence in Business Gets Real,” there are many success stories of how such management “push” allows AI-enabled change to thrive. From Chevron to Allianz to ING, executives in active player companies are actively putting AI on their employees’ agenda. And like the executives of these companies, China’s managers as a whole perform well at setting a positive AI tone. Nearly 90% of Chinese managers treat AI with greater attention than other innovation topics, while only 53% of German and 52% of French companies do so. In some countries, many executives even seem to actively disincentivize AI innovation: Managers in 20% of Japanese companies, for example, report that they actually give AI less attention and share of mind than other innovation topics (exhibit 5).



Senior management’s openness to quickly piloting AI projects—their willingness to try fast and sometimes to fail—further differentiates the active players from the observers. Companies whose managers are willing to invest in AI initiatives at an

early stage, without a detailed business-impact analysis already in hand, represent a 75% share of those who become active players. In companies where such ideas do not move ahead without complete impact analyses for the affected function or process, the share drops to 44%. Managers who believe that AI initiatives must be demonstrable game changers for the entire business in order to be considered have only a 30% chance of being an active player in our survey.

Perhaps not surprisingly, we see that 30% of Chinese companies are willing to pilot AI quickly, while only 13% of German and 12% of Japanese managers are willing to do the same. This is not to say that developing business cases is unimportant. Establishing clear use case scenarios is a critical safeguard for a positive return on investment for any implementation at scale, but insisting on highly detailed business cases before even beginning to pursue innovative ideas is, as the survey data reveals, a recipe for stagnation.

BUILD CROSS-FUNCTIONAL TEAMS FOR AI

Countries that do well on AI implementation are also those that take a decidedly cross-functional approach to innovation. Because implementing AI essentially means teaching machines to do human tasks, it necessarily requires a multidisciplinary mix of technology, data, and business acumen to get it right. And since successful AI implementers want to innovate quickly, it takes an integrated cross-functional team to keep pace and stay agile. In the past, an IT department might have been tasked with innovating a new functionality on its own, without close cooperation with client managers, marketing departments, or production experts, or as part of an unwieldy project organization. Neither organizational structure will suffice for successful AI innovation—they simply cannot move fast enough.

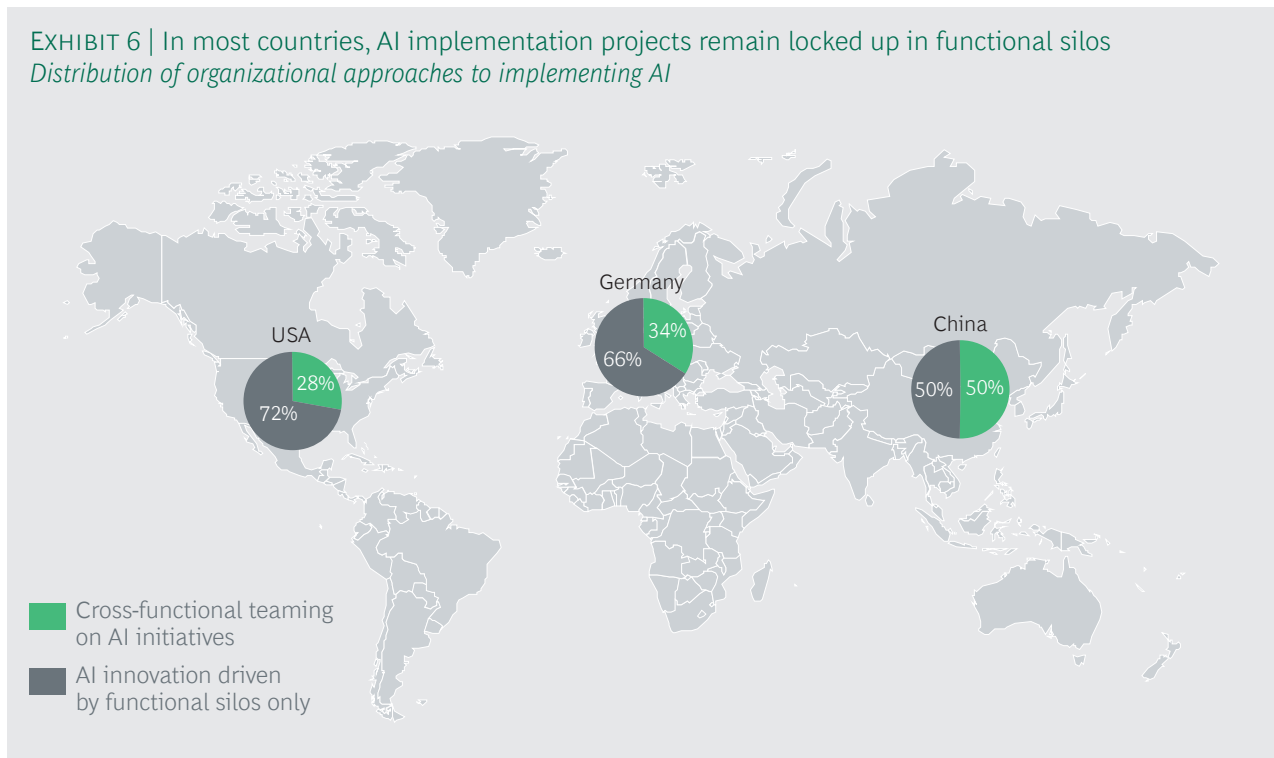
Companies
have to create
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On average across countries, working in silos still appears to be the norm. But according to the survey, breaking through functional silos on AI significantly increases the chances of becoming an active player: 41% of active players drive AI innovation through cross-functional teams, compared to only 22% of observers. But survey participants from 72% of US companies and 66% of German companies say their organizations do not create multidisciplinary teams to tackle AI projects. In these companies, AI know-how is largely buried in silos, and the chances of driving AI innovation forward—of becoming an active player—decrease correspondingly. In comparison, their Chinese counterparts already put the cross-functional teaming figure on AI topics at 50% (exhibit 6).

CHANGE IS POSSIBLE

China is currently leading on extracting value from AI, but it is well within the grasp of company executives in all of the countries we surveyed (as well as others) to create the organizational and cultural AI prerequisites that will pave the way for successful AI implementation. These companies need not toss out everything they have learned in the past and begin again from scratch. Instead, they need to make room for another, more agile and management-driven approach to innovation when pursuing initiatives (such as AI) that require it. Although artificial intelligence will represent a revolutionary change in how businesses operate, companies can adopt it evolutionarily. They can “eat the elephant in small bites” and still succeed—but they do have to start eating before they starve to death while planning the dinner.

EXHIBIT 6 | In most countries, AI implementation projects remain locked up in functional silos
Distribution of organizational approaches to implementing AI



HOW CAN COMPANIES CATCH UP?

The first step to gaining ground in the AI race is to simply begin. Business leaders who have thus far been observers need not think of this in terms of large, multi-year AI projects. Companies don't need to prepare to spend hundreds of millions of euros or draft thousand-page master plans. In fact, the very fear of such high barriers to entry could easily prevent many countries and companies from taking any meaningful steps toward AI at all.

What appears to be a far more successful strategy for senior managers is to carefully choose a small number of initial use cases, build a modest, agile interdisciplinary team to run them, and just get started.⁵ Small victories, with their attendant small failures, serve to clarify the kinds of organizational and process changes needed to implement AI successfully and sustainably, allowing the organization to eventually move towards a more complex end vision of AI at scale in manageable steps. Small pilot projects can catalyze and calibrate such changes far more efficiently than long-term, resource-consuming initiatives that hold out the promise of some distant, game-changing transformation.

Successful pilot use cases can act as lighthouses, helping to build a cultural acceptance of AI that is fundamental to broader AI implementation. Leveraging AI at scale brings with it big changes (and challenges) in the way humans work and the type of work they will do. Such changes are best introduced by clear, convincing examples of the value AI can bring to the overall success of an organization.

AI's place
is not in the future
but in the present

In addition, our experience shows that a thoughtful selection of those first few AI pilot projects can invariably help to fund the journey itself. Within the cost base of almost any corporation or large SME, there is ample low-hanging fruit waiting to be harvested using an AI-enabled approach. As such, the barriers to initial entry into AI can be remarkably low.

TO SUCCEED AT AI, EXECUTIVES MUST ACT

Companies do not become active and successful at AI through spontaneous combustion. Executives must embrace the decisive role that artificial intelligence and machine learning will play in shaping the next generation of industry leaders and laggards. Managers must recognize that AI's place is not in the future but in the present—and they must act accordingly. In thinking about AI, they must in particular set aside established innovation practices that may well have benefitted them in the past, but which will only hold them back in the future. Future success will require a head-on, fail-fast-and-move-on attitude toward AI projects. It requires executives to actively demand that their organizations start making AI innovation a priority—at speed and across silos. Above all, if executives in countries like Germany want their companies to rise with the tide, they must start initiating AI pilot projects—not in a year or two, but now.

¹See also S. Ransbotham, P. Gerbert, M. Reeves, D. Kiron, and M. Spira, “Artificial Intelligence in Business Gets Real,” *MIT Sloan Management Review* and BCG, September 2018.

²For the purposes of this survey, we defined AI as machine-based systems that process information from the environment, pursue goals, adapt to changes, and provide information or take action. This describes the broader concept of machines being able to carry out tasks in a way that humans would consider “smart.”

³Averages per country reflect the relative contribution of value-added output per industry (2017).

⁴See the BCG and *MIT Sloan Management Review* in “Global Competition with AI in Business: How China Differs” for further discussion.

⁵For a more thorough discussion on how to prioritize AI use cases and how to scale AI to a company-wide program, see the BCG report “The Big Leap Toward AI at Scale.”

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Acknowledgments

The authors thank Jürgen Eckel, Philipp Gerbert, Carsten Kratz and Rainer Strack for their invaluable comments and contributions, as well as Laurent Acharian, Birgit Dengel, Philipp Keirath, Sophie Rüdinger, and Janina Wildgruber for their contribution and ongoing support in shaping and positioning this report.

The authors also thank Hobart Swan for his writing assistance and Mokihana Arnest, Ellen Felder, and Christina Pregler for their contributions to its editing, design, and production.

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