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AMPLIFYING HUMAN POTENTIAL

Towards Purposeful Artificial Intelligence

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FOREWORD

Artificial Intelligence (AI) is reshaping the human journey. It is becoming increasingly part of every aspect of our lives, from simple things such as the way we shop and drive, to more fundamental things like how our homes, automobiles and offices amplify us. These elicit a mixture of emotions, from fascination to fear, from wonder to worry. For us, as business leaders, the potential to leverage AI to transform our businesses, bringing radical cost reductions and efficiencies while opening up entirely new kinds of opportunities, is truly exciting. As managers and employers, as citizens in our communities, we bear the great responsibility that comes with transformation, to ensure we are driving a purposeful approach to AI.

And yet, we are only just beginning to see the massive potential of AI. Since humanity's earliest days, technology has been a great enabling force that amplifies and empowers people, improving our quality of life, unlocking new opportunities, enhancing our creativity and equalizing the playing field for all. AI and automation technologies are taking this to a whole new level, enabling us to do more than we could have ever imagined. As intelligent systems take over more of the known, well-defined work, we will be called to exercise our human creativity and ingenuity to find new problems and opportunities and create new kinds of products, experiences, and value that do not yet exist.

The story of technological disruption and human transcendence continues to play out today, though the pace of change is only accelerating. Therefore, we need to rethink that which makes us fundamentally human —

our ability to learn. We, as humans, have always been able to adapt to dramatic changes in our world because we have evolved the way we learn alongside our increasingly powerful technologies. We must now think beyond how we've been approaching our education, to recast it as a holistic, continuous and lifelong process of learning — one in which problem-finding is as important as problem-solving, and digital literacy is taken as seriously as language literacy.

Moreover, we must not lose sight of the values and ethics involved in this journey, particularly as it pertains to business. Standards must be developed and governed, and engineers must realize that what they build is not without consequence. Leaders have a great responsibility today, to steer their businesses and extended organizations purposefully through these extraordinary times.

Infosys, for its part, set out to understand more about current levels of AI adoption in enterprise; decision-maker perspectives on AI technologies; and future market disruption. In particular, we looked at job skills and ethics, market maturity and growth rate expectations. We believe that with greater understanding, we can further explore the opportunities and challenges that businesses face as they look to implement AI and do more to realize its potential. We can do this in a purposeful way — one that amplifies all that is possible, even beyond what we can imagine today, in our individual and collective human potential.

Dr. Vishal Sikka, CEO, Infosys

INTRODUCTION

The way we interact, the way we make decisions and the way we learn are all being shaped and influenced by the rapidly developing and increasingly accessible computing technology around us. Nowhere is this more prevalent than in the use and adoption of AI.

The ever-expanding presence of AI in our daily lives evokes a complex emotional response, from fascination and curiosity to fear and anxiety. But are these concerns justified, given the vast array of positive use cases of AI that will define the future? For employees and customers, what are the benefits that can be harnessed from AI for their advantage and, quite possibly, for the wider world? For organizations, especially those in the midst of considering their own adoption of AI, the challenge lies in balancing risk and reward across both the workforce and the operations of the business.

In the face of such questions, Infosys commissioned independent market research company Vanson Bourne to investigate the approach and attitudes that senior decision-makers in large organizations have towards AI technology and how they see the future application and development of AI in their industries. The study also sought to measure and score organizational maturity, to create an index and set of profiles for the countries and industries examined.

There is no precise definition for Artificial Intelligence (AI) as experts throughout the field disagree on the exact wording. Marvin Minsky, the renowned MIT professor, defined AI as "the science of making machines do those things that would be considered intelligent if they were done by people." This is a pragmatic definition, still valid today. In laymen's terms, AI is any activity that used to only be done via human intelligence that now can be executed by a computer. Some of the most powerful AI examples today include visual perception, speech recognition, machine learning, decision-making and natural language processing. These functions used to require an immense number of man-hours but can now be done in a fraction of the time and with a much higher degree of accuracy than before. As time moves forward and computers develop more processing power and pervasiveness, AI will develop a larger set of capabilities for addressing an expanding array of use cases — a phenomenon known as the "AI effect".

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For the purposes of this research, AI was defined as an area of computer science that emphasizes the creation of intelligent machines that work and react like humans. Some of the activities that computers with AI are designed for include image and speech recognition, learning, planning and problem-solving. Examples of applied AI technologies include (but are not limited to): machine learning, deep learning, predictive/prescriptive analytics, virtual agent and natural language understanding (avatar) technologies (Siri, Alexa, Google Home, Amelia etc.)

The research results reinforce the notion that AI will have a profound, disruptive effect on global business and society, and underscore the importance of developing and implementing a holistic AI strategy.

In undertaking this study, we sought to better understand both immediate and longer-term perceptions of AI and its role in individual businesses and in wider society. Respondents were asked to provide guidance on the expected contribution that AI would make to revenues, productivity and business rationalization, as well as to business expansion. Respondents were also questioned on the ethical issues related to AI. This was to build understanding of whether ethical considerations were already part of their corporate AI roadmaps. From this, we sought to evaluate the extent to which human disruption associated with AI adoption was being considered by enterprise decision-makers.

The study looked at three key themes in relation to AI adoption and use:

- **How could organizations assess their use of AI technologies to develop a strategic plan?**

- **How could organizations address the ethical issues behind the use of AI?**

- **What is expected of future generations of the workforce, in terms of skills and flexibility, to succeed in a world of AI?**

This document and the results aim to define what constitutes a successful, AI-mature organization and demonstrate what others can learn in order to continue their own AI adoption journey.

SUMMARY OF KEY FINDINGS

76% Three-quarters of senior decision-makers agree that AI is fundamental to the success of their organization's strategy

39% By 2020, those currently or planning to use AI technology anticipate a 39% boost to their organization's revenue, on average

80% Eight in 10 organizations that have replaced, or plan to replace, roles with technology will retrain or redeploy those who are displaced

Organizations have been using AI for two years on average, but they don't expect to hit "mature" adoption for at least another three years. Meanwhile, only 25% state that they have AI technologies fully deployed and working as expected. Of those that use it, only 10% believe they are fully maximizing the current available benefits of AI.

However, over six in 10 (64%) believe the future growth of their organization is dependent upon large-scale AI adoption. Over half (53%) believe ethical concerns stop AI from being as effective as it can be. The vast majority believe employees (90%) and customers (88%) face concerns about the adoption of AI.

Nonetheless, the majority (71%) of respondents believe that AI is "inevitable" and will be disruptive. Given this perceived inevitability, it is concerning that just over a third (36%) believe that their organizations have fully considered the ethical issues relating to the use of AI.
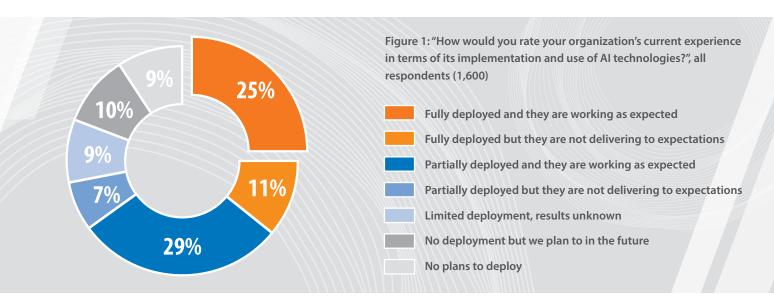
THE JOURNEY TO AI MATURITY

In an ever-changing, increasingly digital world, whether respondents' organizations are focused on strategies to improve the customer experience (46%) or to develop new products and services (43%), the vast majority (76%) believe that AI is fundamental to the success of their organization's strategy.

Only a quarter (25%) have fully deployed AI technology that is delivering up to expectations. Around four in 10 respondents believe that the time to implement, ease of use and the interoperability with other systems and platforms are areas of AI that require the most improvement before it can be effective in their organizations. For many, there is a long journey ahead, with most being somewhere en route. The bad news
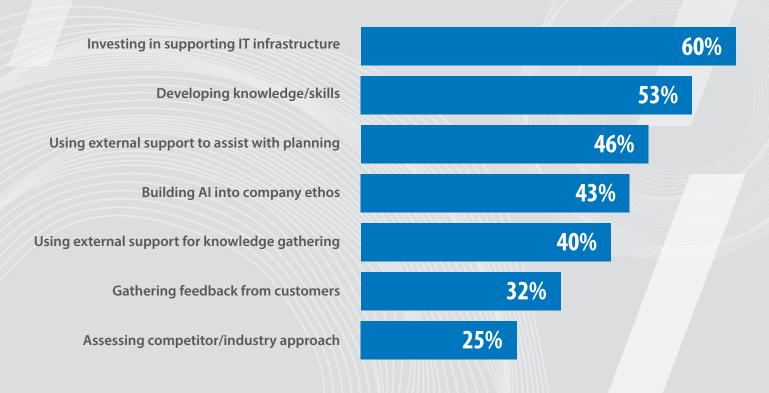
for the minority (9%) with no intention to deploy AI is that they are at risk of being left behind.

What are the main AI technologies set for deployment in respondents' organizations, either now or in the future? Around two-thirds (65%) say big data automation, and over half are looking at predictive analytics (54%) or machine learning (51%). Significant numbers have already, or are planning to, deploy expert systems (44%) or neural networks (31%).

Multiple forces are encouraging deployment. Of those whose organizations have deployed AI, they are commonly driven by a desire to harness competitive advantage (28%) or are being led from an executive level (25%).

Figure 1: "How would you rate your organization's current experience in terms of its implementation and use of AI technologies?", all respondents (1,600)

- Fully deployed and they are working as expected
- Fully deployed but they are not delivering to expectations
- Partially deployed and they are working as expected
- Partially deployed but they are not delivering to expectations
- Limited deployment, results unknown
- No deployment but we plan to in the future
- No plans to deploy

Figure 2: "How is your organization preparing for AI deployment and use?", all respondents (1,600)

Investing in supporting IT infrastructure	**60%**
Developing knowledge/skills	**53%**
Using external support to assist with planning	**46%**
Building AI into company ethos	**43%**
Using external support for knowledge gathering	**40%**
Gathering feedback from customers	**32%**
Assessing competitor/industry approach	**25%**

Preparing for AI

Respondents' organizations are preparing for AI deployment in several ways. Most commonly, this involves getting the foundations in place first by investing in supporting IT infrastructure (60%) and developing knowledge/skills (53%). Alongside this, many organizations recognize the value of outside specialist help — whether it is to assist with planning (46%) or for knowledge gathering (40%).

Application within the business

Reflecting the high value that most respondents' organizations place upon AI, an array of departments are already actively using it. The majority (69%) report that IT is using AI. While this was broadly expected, adoption does not stop there. For around three in 10, operations (34%), business development (33%) and marketing (29%) are all open to the use of AI. IT systems and security (54%), data analytics (43%) and customer service (43%) are just a few of the many areas where AI is being considered for future deployment. On average, respondents' organizations that have fully, or partially, deployed AI-based technologies have invested $6.7 million in them in the last year.

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The AI maturity index methodology

In order to add greater context to the investigation of the opportunities and challenges faced by organizations in adopting AI, a maturity index was created. This index defines five key maturity groups, highlighting the stages in the journey towards more effective uses of AI technologies.

At the very beginning of designing the research from which this report is based, a series of questions were developed to measure and score organizational maturity. The answers for these questions were assigned scores, and each respondent was given a total score across all areas.

Based on the score that they achieved, respondents were placed into one of five groups reflecting their organizations' AI maturity:

Skeptics **(Maturity score: 0–19 percent)** represent a small but significant group within the study. These organizations are least mature when it comes to AI, with no current deployment of such technologies and no plans to do so in the near future. These organizations tend to lack AI-related skills and do not see a strong link between AI's adoption and the success of their strategy.

Watchers **(Maturity score: 20–39 percent)** made up of around a fifth of respondents' organizations. Here, partial deployment of AI has begun, but things remain in the very early learning stages of its use. AI skills are lower, and as such, many preparatory or supporting activities for AI are planned for the longer term. Nevertheless, the link between AI and strategy success is being recognized.
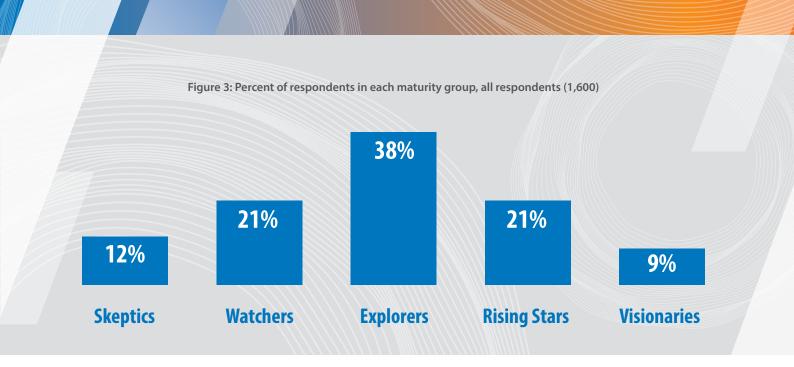
Explorers **(Maturity score: 40–59 percent)** are the most common group. Their partial deployments of AI are proving their value, and there is a desire to expand further. AI related skill levels are on the increase and more initiatives to support AI are on the horizon for the coming 12 months.

Rising Stars **(Maturity score: 60–79 percent)** are organizations that are taking the leap to a more widespread deployment of AI throughout the business. There is more work to do in order to maximize the benefits but initial successes are aided by a wider presence of AI-related skills and an increasing number of supporting activities. AI is seen as key to the organization's strategic success.

Visionaries **(Maturity score: 80–100 percent)** are the true AI leaders. This small group of organizations have already successfully deployed AI throughout their businesses and are reaping the benefits. AI-related skill levels are high and opening doors to a greater number of AI technologies and opportunities. AI is central to the success of their future strategies.

Figure 3: Percent of respondents in each maturity group, all respondents (1,600)

Skeptics	Watchers	Explorers	Rising Stars	Visionaries
12%	21%	38%	21%	9%

AI maturity groups

The index shows us that at this point in the AI journey, the profile of the largest group is that of the explorer — those actively participating in probing, trying and learning about AI in real-world scenarios including deployments.

A deeper look at AI maturity levels by country

China and India head the maturity scoring by country, a trend replicated elsewhere in the research when respondents were answering questions about the level of progress and adoption of AI. This is potentially due to both countries having fewer legacy systems and business processes to contend with, making AI adoption and integration easier to accomplish.

Figure 4: Average survey score by country, all respondents (1,600)

CHINA 56%

US 46%

UK 44%

AUSTRALIA 40%

INDIA 55%

GERMANY 53%

FRANCE 44%

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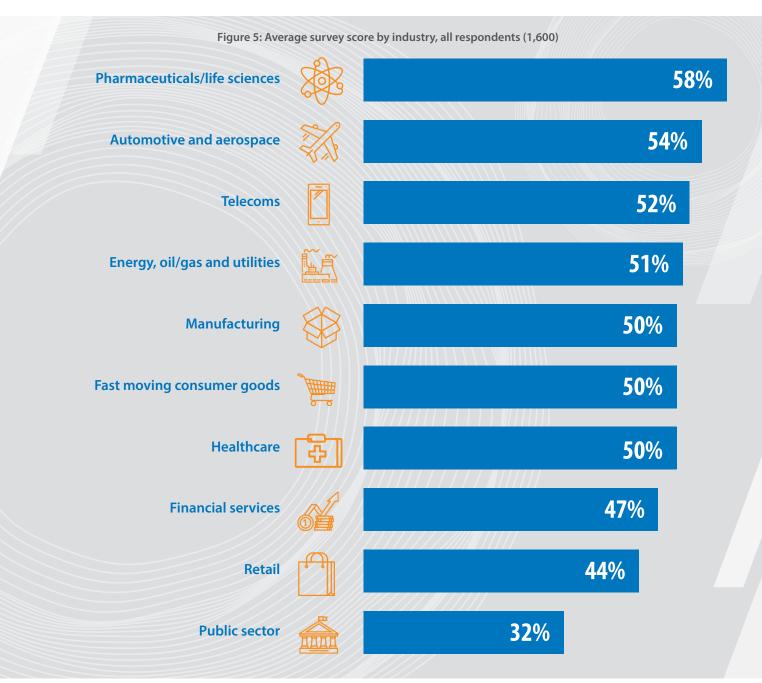
A deeper look at AI maturity levels by sector

The maturity index shows us that across all organizations, the evaluation and partial deployment stages dominate the AI journey. Organizations across all verticals continue to evaluate AI, as well as look inwardly at their own workflows and employee processes to better understand how and where AI could fit. Current spending will be, in part, on evaluation, proof of concept, prototypes, external support and expertise to help companies on their way. However, we also see that a fifth of organizations are being aggressive in their investment in and adoption of AI technologies. These "rising stars" represent the trailblazers at the infancy of modern AI technology, potentially setting themselves up for greater success as AI becomes more widely adopted and more developed.

Figure 5: Average survey score by industry, all respondents (1,600)

Industry	Score
Pharmaceuticals/life sciences	58%
Automotive and aerospace	54%
Telecoms	52%
Energy, oil/gas and utilities	51%
Manufacturing	50%
Fast moving consumer goods	50%
Healthcare	50%
Financial services	47%
Retail	44%
Public sector	32%

THE AI ETHICS DEBATE

Delivering on the promise of AI

With the vast majority somewhere along the journey of AI adoption, respondents from organizations that have or are planning to deploy AI technologies, report multiple drivers behind their decision. These include a desire to increase efficiency through automating IT (59%) or business processes (55%) or boosting employee productivity (56%). Financial goals are also key factors, with a similar number looking to save costs (55%) or increase revenues (53%).

A highly positive picture emerges when comparing initial adoption drivers against actual benefits that many organizations have experienced. The message is that AI can deliver on what it promises. Significant numbers of decision-makers report that their organizations have benefited from the automation of processes (46%), cost savings (44%), increased productivity (44%) and an increase in revenue (39%).
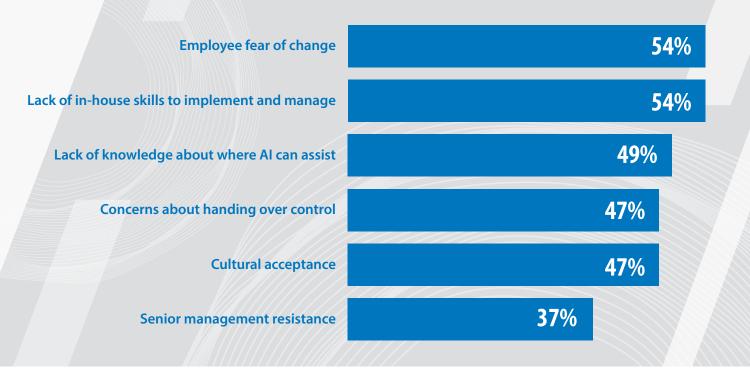
AI can demonstrate its value to the business internally, but it does not end there, and that means good news for the customer as well. Almost all (97%) decision-makers feel that there are customer benefits to be had. They hope that AI can assist customers in many ways, particularly in the creation of new products, services and business models (55%). Also in giving faster access to existing ones (55%). In a world where customer demands become ever more instant and specific, many feel AI can help with the quicker resolution of problems (50%) and greater personalization (42%).

Furthermore, by 2020 almost all respondents believe AI can generate a significant ROI impact through both an expected 39% boost to revenues on average and an anticipated 37% reduction in costs.

Breaking down the barriers

The use of AI presents an extraordinary set of hurdles. Organizations using it to some extent find themselves struggling to get the most out of it — only 10% of respondents' organizations are fully maximizing the current available benefits of AI.

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Figure 6: "Which of these barriers does your organization face in adopting AI technologies?", all respondents (1,600)

Barrier	Percentage
Employee fear of change	54%
Lack of in-house skills to implement and manage	54%
Lack of knowledge about where AI can assist	49%
Concerns about handing over control	47%
Cultural acceptance	47%
Senior management resistance	37%

As one might expect, given AI's broad potential use, there are a wide range of barriers. Among the most commonly highlighted center around the employee fear of change (54%) and cultural acceptance (47%). Many also feel that a lack of in-house skills to manage AI (54%) is a concern. Perhaps a symptom of this is that many report a lack of knowledge in their organizations about exactly where AI can assist (49%).

These issues can be addressed by increasing awareness of AI in organizations, and it is encouraging that only the minority report senior management resistance (37%) as a barrier — for the AI dream to become a reality, organizations require effective leadership from above. As AI adoption spreads, the industries in which organizations operate are likely to be impacted. Around four in 10 (39%) decision-makers report that their industry has already faced disruption by AI, and over seven in 10 (71%) either have been or expect to be at some point.

The call to action is clear — organizations must start to consider the use of AI not just as a means to differentiate, but simply to keep up.

The inevitable impact of AI

Ethics and successful AI adoption are a tricky balancing act — while the majority of respondents believe that their organization's future growth is dependent on large-scale AI adoption (64%), over half (53%) feel that ethical concerns significantly stop AI being as effective as it can be. Almost two-thirds (62%) believe that stringent ethical standards are needed to ensure the success of AI deployments.

However, with the majority (71%) of respondents believing that AI is "inevitable", it is concerning that just over a third (36%) believe that their organizations have completely considered the ethical issues relating to the use of AI.

Employees – reduce, redeploy, upskill?

It is expected that the benefits of AI will eventually spread beyond the organization — the majority feel it can deliver positive societal (70%) and economic (76%) change. In anticipation of such benefits, it is interesting to note that a significant minority of respondents' organizations are even willing to endure short-term pain in the form of sacrificing employee (39%) or customer (35%) satisfaction in order to achieve the longer-term gain that AI promises. However, the concerns of these key stakeholder groups cannot be swept under the carpet, particularly when 90% of respondents believe that employees have concerns about AI and 88% believe the same for customers.

When it comes to employee concerns, a third or more decision-makers consider issues around data safety (43%) and an increased impact on privacy (34%) to be among the chief areas. Almost three in 10 (28%) believe that AI's impact will go beyond day-to-day concerns and will affect their employees' human dignity. With employees tasked with the management and use of AI, these are fears that cannot be ignored.

A range of concerns are also highlighted in relation to respondents' organization's customers — the most likely being a lack of understanding about AI's use (41%). Similar numbers also see a mistrust of the technology by consumers (38%).

With employee concerns faced by many, this should be a primary consideration for organizations when developing their AI plans.

With that in mind, it is highly encouraging to see respondents' organizations either currently or planning to undertake activities to boost awareness. Over eight in 10 report that their organization is giving, or planning to give, teams freedom to experiment with new technologies (83%) or training employees about the benefits of AI (85%). Most positively of all perhaps, is that although three-quarters (75%) are currently or planning to replace workforce resources with AI technology, the vast majority (80%) of respondents' organizations will retrain or redeploy displaced employees. This is an optimistic sign that fears may be misplaced and that AI deployment and worker redundancy do not necessarily go hand in hand.

> "The vast majority (80%) of respondents' organizations that plan to replace roles with AI technology will redeploy or retrain displaced employees"

Mapping out the future of AI

Looking to the future, with all the benefits and challenges of AI adoption, there are a variety of improvement areas that are highlighted. Among the most common are improving AI's time to implement (44%) and ease of use (43%). For organizations to harness the benefits, they need to act as quickly as possible to set progress in motion. As we have already seen, many will look to third-party specialists or focus on training internal users to boost knowledge and awareness. With many already behind their competitors when it comes to AI and with industry disruption rising, the case becomes more and more pressing.

The skills of employees entrusted to lead the AI journey are critical to success. However, over four in 10 do not feel that they have the necessary development (42%), security (42%) or implementation (43%) skills required for AI use. In addition, despite the concerns of employees and customers, only a minority of decision-makers believe that their organizations have AI-related training (47%) or AI-related customer facing (37%) skills. Such gaps threaten to derail many organizations before they have even begun to use AI, putting success at risk. In light of this, the study offers encouragement in that many organizations plan to invest in AI training for employees in the future.

In a world of AI, what are the key skills that organizations will demand of future generations in the workforce? What is clear is that the level and sophistication of skills will rise, with decision-makers believing active learning (58%), complex problem-solving (53%) and critical thinking (46%) to be key. Creativity (46%) and logical reasoning (43%) also come into play, highlighting a growing need for employees who can learn quickly, think on their feet and overcome problems efficiently to succeed in an AI-driven environment. In order to reach this level, the most important academic subjects that decision-makers see as focus areas for future generations are computer sciences (72%), business and management (47%) and mathematics (45%).

Figure 7: "Which of the below skills do you believe your organization's employees have when it comes to implementing and using AI?", all respondents (1,600)

Skill	Percentage
Development skills	58%
Security skills	58%
Implementation skills	57%
Training skills	47%
Customer facing skills	37%
We do not have any...	10%

CONCLUSION

As the vast majority of decision-makers believe, AI is inevitable. Some organizations already find themselves actively exploring how the technology can work for them, while many remain focused on planning their approach. What is clear, however, is that the successful use of AI requires balance: greater automation versus employee engagement and customer satisfaction versus changing business models. The goal is to harness the vast array of possible rewards while also minimizing the many potential risks.

Driven by the significance of the potential benefits, AI adoption continues to spread more widely throughout organizations and begins to touch and impact more employees and customers.

However, ethics are a significant factor. The key responsibilities and challenges here for organizations are to properly address ethical concerns as they try to maximize potential. Not only for AI technology, but also as they seek to amplify the potential of the human workforce. This is not an easy task, but remains one that offers significant benefits for the organization, with AI and the workforce working side-by-side, as AI supports the people in the organization to do more, be more creative and to deliver greater value for the business. Many could

improve their consideration of ethical issues. Those that fail to do so are at risk of being left behind by more AI-mature organizations that can balance the often opposing competing forces of doing well and doing right.

So, with many organizations still a number of years away from reaching AI maturity, what can they learn from those AI visionaries who are leading the way?

The key factor in organizations that are more mature in their use of AI is that employee resources are being effectively used to the benefit of AI implementation and not simply sidelined by technology. Organizations that can retrain or redeploy employee resources instead of simply making redundancies stand to benefit from increased skills and greater motivation to help further explore what AI can bring. Organizations have high expectations of the future generation and the skills it should offer — once these employees are on-board, it is down to their organizations to help further nurture and foster talent in an increasingly AI-filled world.

A holistic view to AI adoption is also fundamental — those that look to apply an array of technologies across multiple areas will position themselves to benefit the most from the potential synergies that AI can offer — not

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least the anticipated significant ROI benefits in the form of revenue and cost. Strong established links between AI adoption and overall business strategy are key features of organizations that are true AI visionaries. Such an approach helps to consider and align the needs of employees and customers, ensuring that their trust and buy-in is achieved.

Overall, the adoption and use of AI technologies offer an exciting leap forward for many organizations, but careful consideration must be placed on the impact of doing so to ensure that employees and customers are actively engaged along the journey.

Scope of research/methodology

Infosys commissioned independent technology market research specialist Vanson Bourne to undertake the research upon which this report is based. 1,600 IT and business decision-makers were interviewed in November 2016. All came from organizations of more than 1,000 employees, with $500M or more annual revenue and from a range of sectors.

The research was carried out across seven countries with interviews split accordingly:

Country	Number of interviews
US	400
UK	200
France	200
Germany	200
Australia	200
China	200
India	200

The majority of interviews were conducted using online interviewing with a small number of telephone interviews. All were undertaken using a rigorous multi-level screening process to ensure that only suitable candidates were given the opportunity to participate. Unless otherwise indicated, the results discussed are based on the total sample.

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