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# ***Artificial intelligence in India – hype or reality***

## Impact of artificial intelligence across industries and user groups

February 2018



# Foreword

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Simulation of the activities of the brain has always been a subject of interest to scientists, philosophers and artists. Theories and mathematics behind artificial intelligence (AI) have existed for quite some time. However, recent advances in computing power have made this subject very real for us.

They have also opened up a few questions such as 'Will human beings get overrun by machines?' Or, 'Will AI be a benefactor to humans, helping them free themselves for higher levels of thinking?' While either proposition cannot be completely ignored, we can rest assured knowing that a vast majority of us (nearly 60% of our survey respondents) see AI helping humans live more rich and fulfilling lives.

Indian businesses, the government and individuals have, in recent years, also seen multiple use cases of AI in various facets of life. Digital assistants, cab aggregators, biometric recognition, targeted advertisements and online recommendation engines are among the more common AI applications used today. Organisations have started realising the efficiencies and growth opportunities that come with the automation of back-end processes, chatbots for customer services, machine learning for predictive maintenance in manufacturing, etc. Government bodies have employed AI-powered applications such as machine learning, image and speech recognition, robotics and more to bolster defence equipment and techniques.

Through this report, we have tried to understand where AI stands vis-à-vis the various activities industries undertake. We have also tried to portray a holistic picture by understanding what business decision makers would want from AI. For example, 68% of the respondents of the survey conducted by PwC feel that AI will help businesses in various ways by boosting productivity and generating growth, thus outweighing employment concerns.

Moreover, we have reached out to the general populace (i.e. employees in industries) to see how they perceive AI (60% of the respondents feel that they can reduce the time it takes to get answers), their fears, if any (~45% respondents feel there could be job losses), and what they expect from it (50% of the respondents already prefer AI recommendations for news, music, entertainment to humans).

The report tries to synergise the perceptions of business decision makers and the general populace in order to help organisations achieve their maximum potential by utilising AI.



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AI—a distinct branch of science and technology—has been practiced for over 60 years. The field has seen many periods of heightened expectations (often called AI spring), only to be followed by disappointing results (often called AI winter) and the drying up of investments. ‘Hype’ and the eventual necessity to face ‘reality’ have been a part and parcel of AI’s progress. Many of those who have been involved in AI for decades believe or hope that ‘this time it is different’.

The survey results highlighted in this report show that consumers and businesses have high expectations from AI and that it has the potential to transform our individual lives, work and society. However, these expectations must be carefully examined by putting the latest AI techniques and technologies to the test, both at the consumer and enterprise level.

The success of AI in enterprises has the potential to usher in a new era of abundant, highly personalised products and services, unbiased and rational decisions, and lower costs of delivery and development. At the same time, if not implemented in the right way, AI could also result in the widening of income disparity between skilled and unskilled workers. Consumers, businesses, governments and international bodies (like the UN or

the World Economic Forum)—all have to consciously make policy decisions to help with the success of AI and passing on its benefits to all.

Further, the success of AI cannot be taken for granted. This report and similar global ones show that there are a number of challenges to the success of AI. Talent, data availability, privacy and confidentiality, cost of implementation, developing trust amongst users, AI governance and further progress in technology are all key challenges.

We hope that this report will help India—its consumers, businesses and the government—embrace AI and stay ahead of the competition at all levels. Furthermore, the central tenet of AI and its role in society—that is, ‘humans + machines are better than either one on their own’—is critical for a country like India to recognise and act on. We need to produce not only the brightest and smartest ‘humans’, but also the smartest ‘machines’ that can work with us.

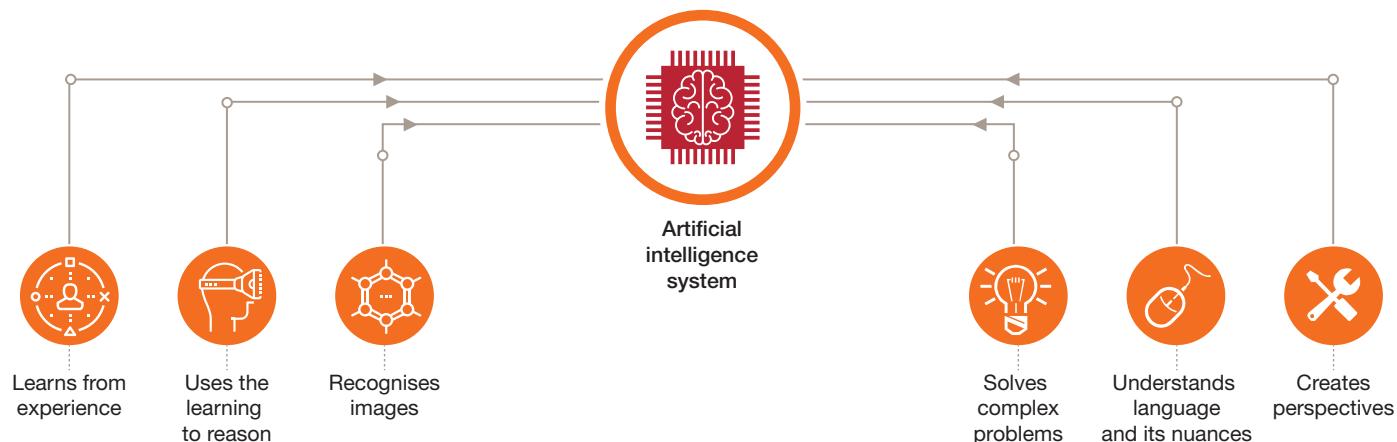
# Artificial intelligence – an overview

## 1.

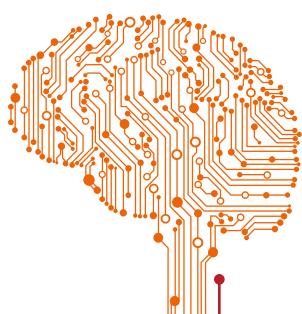
### 1.1. What is artificial intelligence?

Artificial intelligence (AI) refers to the ability of a computer or a computer-enabled robotic system to process information and produce outcomes in a manner similar to the thought process of humans in learning, decision making and solving problems.

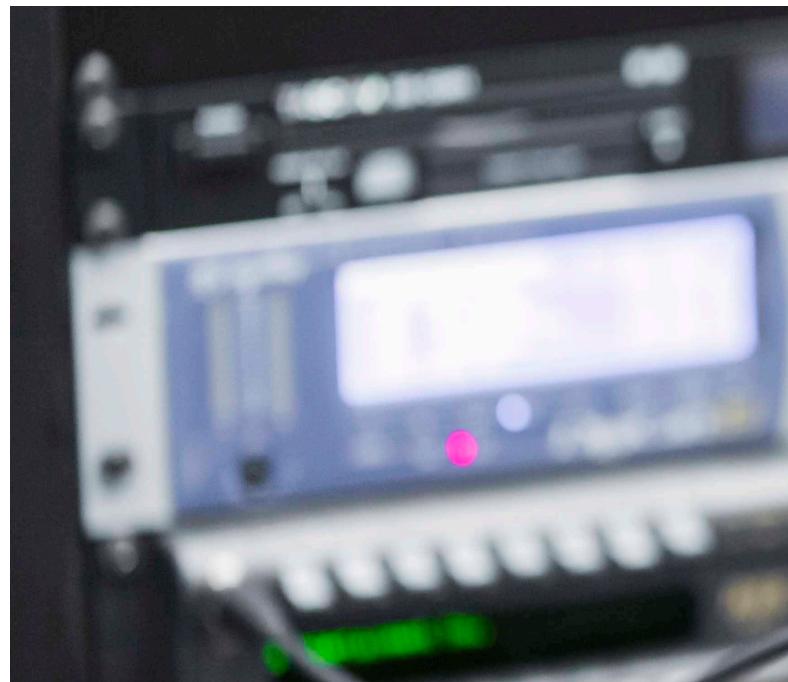
By extension, the goal of AI systems is to tackle complex problems in ways similar to human logic and reasoning.



Source: PwC analysis



*'Artificial intelligence is the science and engineering of making intelligent machines, especially intelligent computer programs.' – John McCarthy, father of AI*

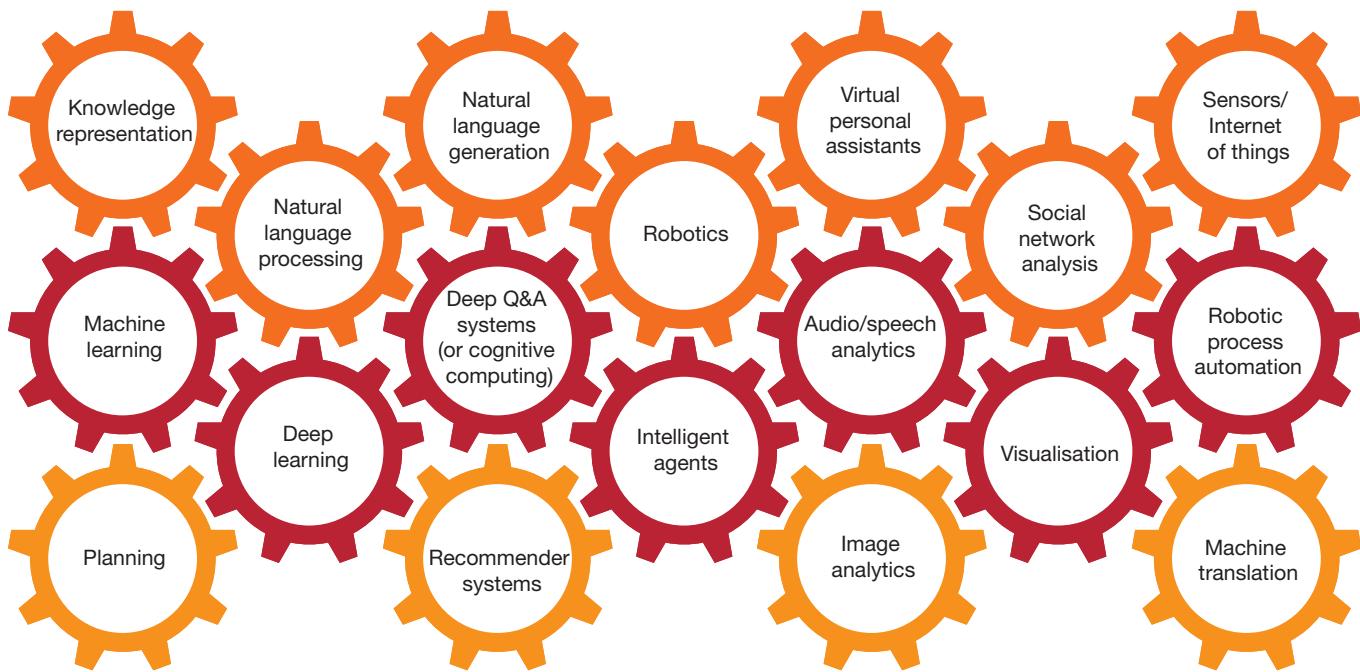


## 1.2. What does it encompass?

AI is an over-arching concept that encompasses multiple (often overlapping) disciplines.

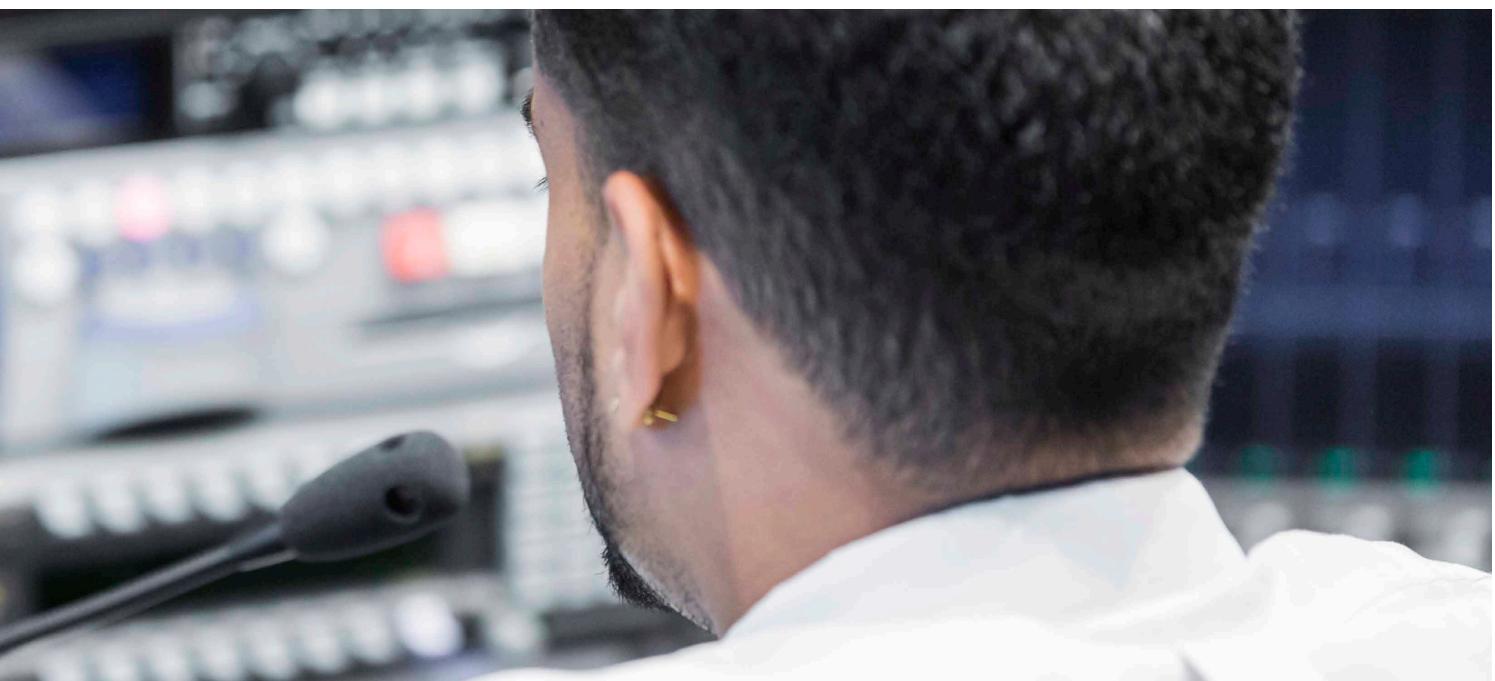
These draw upon knowledge and techniques from mathematics, statistics, computer science and domain-specific expertise to create models, software programs and tools.

### Topic areas within AI (non-exhaustive)



Source: PwC analysis

These software programs and tools can undertake complex tasks with outcomes that are comparable, if not better, to traditional manual approaches.

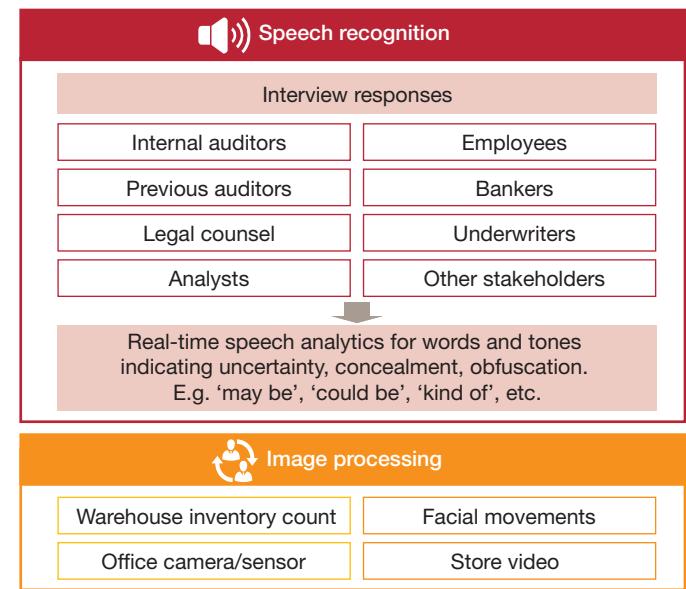
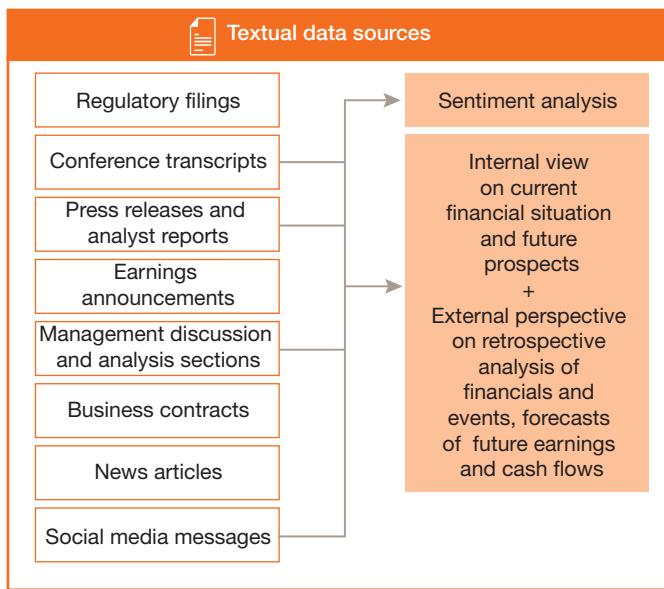


### 1.3. What does technology advancement driven by AI imply for businesses?

AI is probably one of, if not, the most significant general purpose technologies of our era. With machine learning, we can now build systems that are capable of improving their own performance by learning from data over time.

A continual challenge humans have been facing is identifying ways to perform certain tasks such as recognising images and audio so that we can replicate similar functionalities using software applications. Machine learning systems try to mimic the learning processes of humans—that is, learning at scale from data and achieving levels of performance comparable to humans in processing it and arriving at certain outcomes.

#### Insight generation from unconventional sources and artefacts



Therefore, financial institutions and hospitals have started utilising AI systems for fraud detection and diagnosis of diseases to effectively harness the potential of their information and tackle more complex problems.

PwC helped a manufacturing client deploy and use predictive maintenance solutions using machine learning. This allowed the client to reduce machine downtime and improve equipment efficiency. In another instance, unsupervised machine learning algorithms had been applied to a logistics and transportation business to classify entities such as vehicles, routes and transportation service providers based on the propensity of drivers to resort to improper driving behaviour that causes significant losses in consignments for the client. The output from the algorithms enabled the client teams to identify and selectively re-assign vehicles to different routes so as to reduce the overall value at risk of consignments.

Other PwC case studies have involved the use of machine learning, computer vision, speech analysis, process automation, predictive and risk modelling for addressing client problems.

A few examples of the above relate to the identification of fraudulent claims and invoices, optical character recognition (OCR) for vehicle tracking and real-time safety monitoring within factories.

Advanced use cases of deep learning techniques such as convolutional neural networks (CNNs) for video analytics have helped clients operating in sectors such as energy, maritime, real estate and mining get real-time alerts for detecting intrusions, identifying abandoned objects, evaluating traffic flow density and enabling facial and character recognition so as to improve overall safety and security levels at different locations.

In addition to the opportunities that AI can create for businesses and society, this report aims to bring to light a few perceived challenges. For example, cost implications for implementing AI-based solutions, the lack of talent and quality data to effectively set up and operationalise such programmes with a reasonable turnaround time are usually some challenges that are holding back businesses from capitalising on AI.

# Methodology and objectives

## 2.

We sampled business decision makers and regular employees engaged in Indian firms via a nation-wide online survey to explore attitudes towards AI and its current and future implications on society.

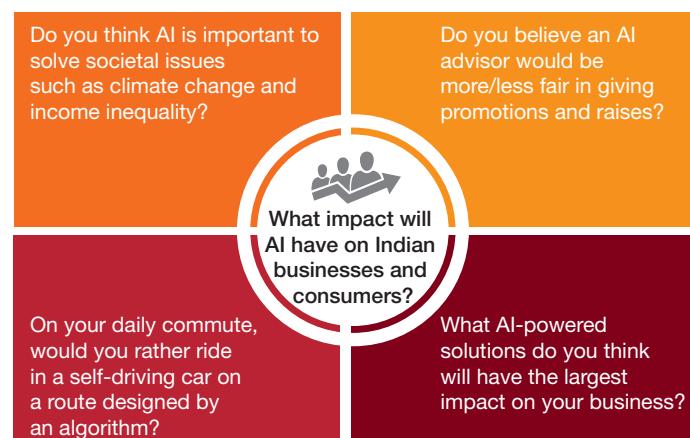


As part of PwC's global initiative to understand the impact of AI, a survey was conducted to understand consumer and business perceptions on the importance and anticipated impact of AI across sectors and our daily lives. We also reached out to Indian businesses—decision makers and regular employees—across a wide range of sectors such as financial services, technology and manufacturing via an online survey to explore attitudes toward AI and its current and future implications on society. The survey was conducted among adults employed in full-time/part-time or self-service roles in organisations.

Organisational leaders and managers who influenced key choices on technology, service development and other critical aspects of the business were identified as business decision makers and influencers. A wide range of sectors such as financial services, technology and manufacturing were considered for the survey.

Our decision to base the survey on responses from the above group of respondents was taken on the assumption that employees working in mainstream sectors have a basic level of understanding of AI. Secondly, we assumed that a significant portion of India's relatively younger workforce, employed in white collar jobs across metro cities are likely to have a preliminary awareness, access and a level of affordability towards mass applications of AI such as digital assistants and chatbots.

The objective of the survey was to understand which areas within businesses and our lives are most likely to be affected by these transitions—that is, how willing and comfortable individuals are with AI technologies making in-roads into their workplaces and homes.



# Impact of AI

## 3.

### *3.1. Will artificial intelligence benefit humans and, if so, how?*

AI is expected to transform the way we humans live and work. This could be by helping with automating repetitive tasks and personalising or customising products and services for consumers with the ability to learn from specific preferences and interests.

AI can be deployed in hostile environments. For example, intelligent robots can be fed with information and sent for defusing bombs, thereby reducing risks to human life.

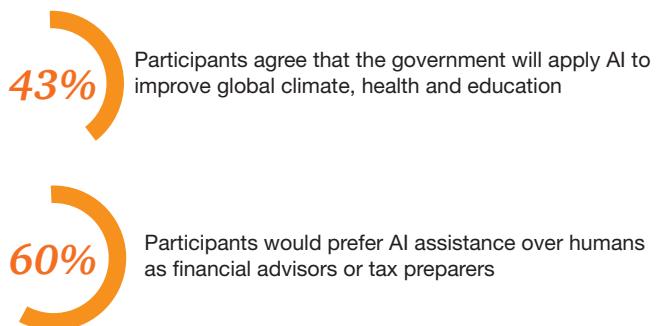
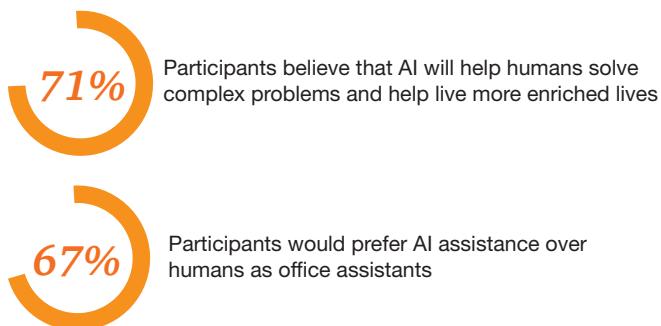
AI systems can minimise occurrences of 'human error', assuming that they are programmed correctly and can help in making faster decisions using cognitive technologies. This also begs

the question as to who would be liable when an AI system malfunctions. Some of these themes have been discussed in detail in our previous joint publication with ASSOCHAM titled 'Artificial Intelligence and Robotics – 2017; leveraging artificial intelligence and robotics with sustainable growth'.

Survey participants were presented the above thoughts in order to understand their perception towards AI.

#### *Can AI applications help address social, economic and environmental causes?*

Survey participants are optimistic about the potential of AI to address key socioeconomic causes and are confident that the government and businesses will undertake necessary developments to meaningfully use AI solutions for the same.

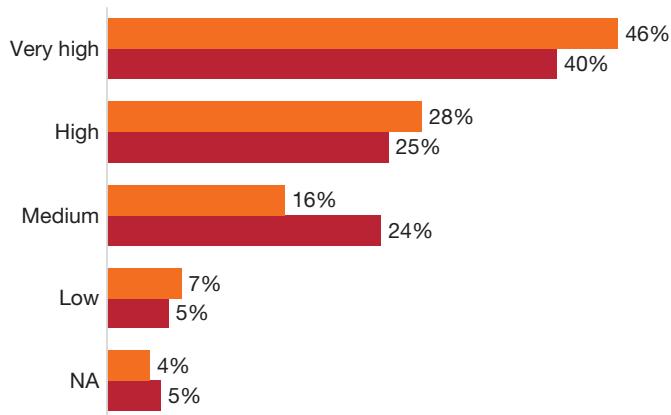


Close to **58–74%** or more of the participants indicated that the likelihood of AI aiding socioeconomic causes (economic growth, cyber security/privacy, global health and well-being and global education) and the government taking steps towards their application is high.

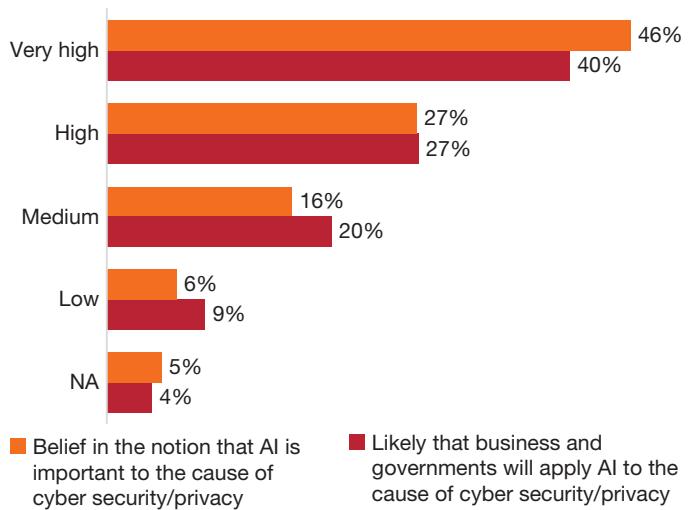


1. PwC and ASSOCHAM. (2017). Artificial Intelligence and Robotics – 2017. Leveraging artificial intelligence and robotics for sustainable growth. Retrieved from <http://www.pwc.in/assets/pdfs/publications/2017/artificial-intelligence-and-robotics-2017.pdf> (last accessed on 29 September 2017)

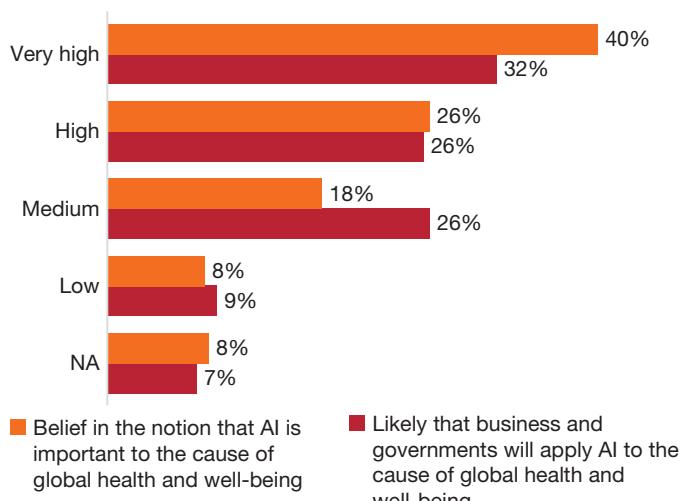
### Economic growth – percentage of participants by perception



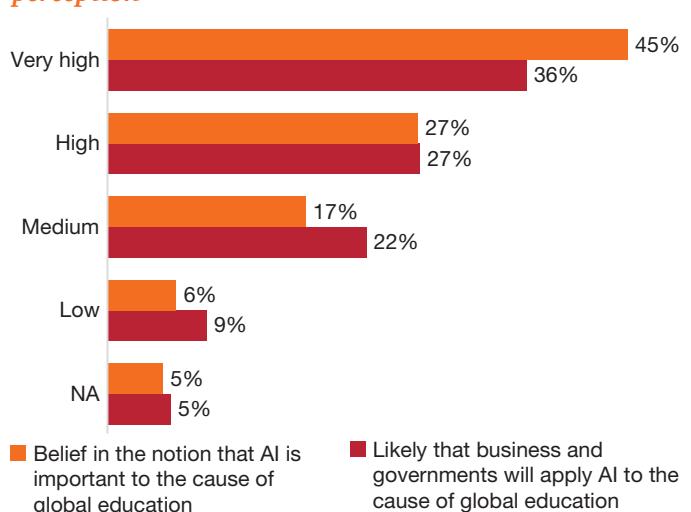
### Cyber security/privacy – percentage of participants by perception



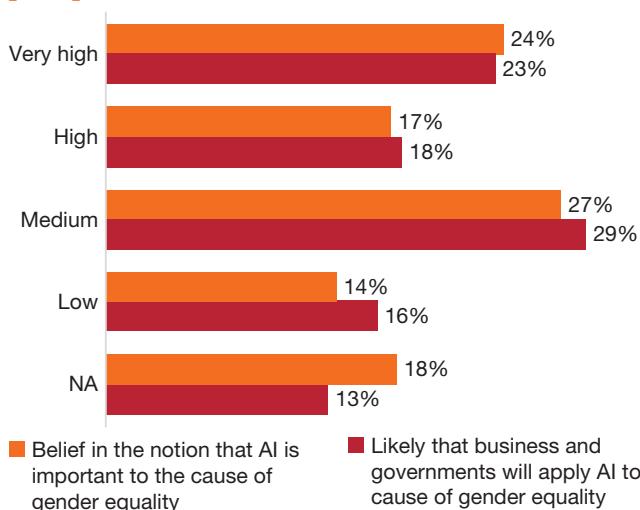
### Global health and well-being – percentage of participants by perception



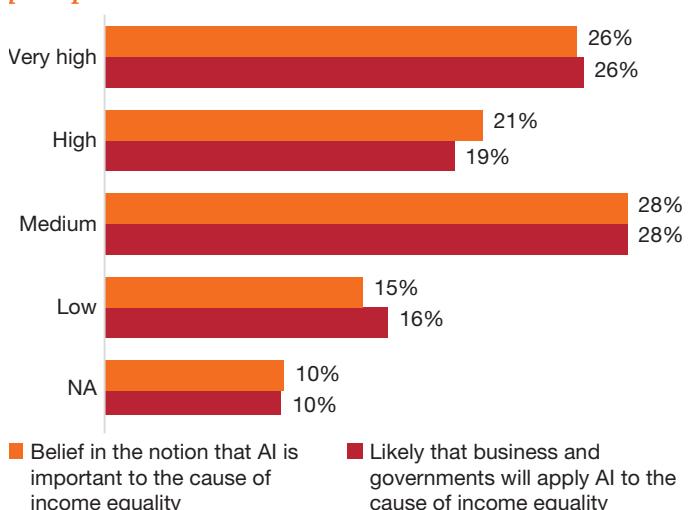
### Global education – percentage of participants by perception



### Gender equality – percentage of participants by perception



### Income equality – percentage of participants by perception

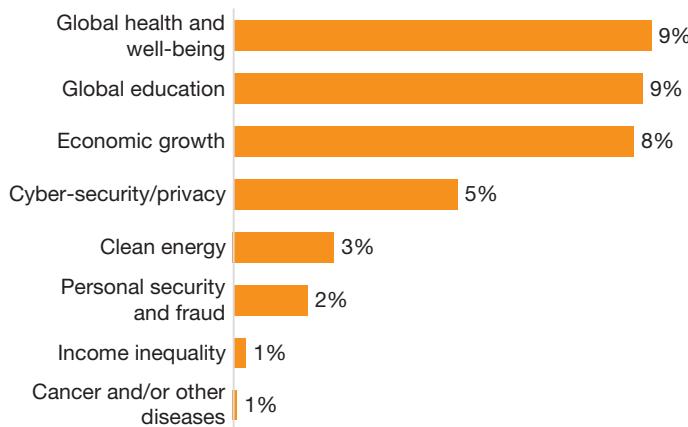


Only **40%** of the participants favourably indicated their perception about AI helping in improving gender equality and income quality. This hints towards a more balanced outlook in terms of the extent to which AI innovation can address these causes and how far private and public bodies would be willing to prioritise research and development in AI with these goals in mind.

Most of the participants who believe AI is important in addressing the causes also felt that governments and businesses will apply AI for the same.

In certain cases, such as for economic growth, global health and well-being, and global education, there is an **8–9%** difference between the participants who indicated either a ‘high’ or a ‘very high’ importance of AI in aiding the respective causes and the participants who have indicated the likeliness of businesses and governments to actually apply AI to these areas. These could represent opportunities where the government and businesses could bring social and economic gains by scaling up AI adoption.

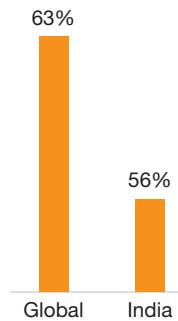
#### *Gap between the percentage of participants who think AI is important for a cause and that businesses and the government will apply AI for the same*



#### *A comparison of the perception of AI in solving problems (India vs global)*

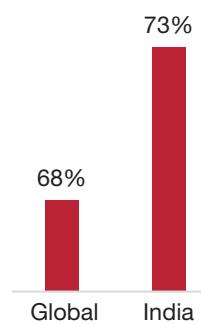
**Fifty-six percent** of the participants from our survey agree that AI will help solve complex problems that plague modern societies compared to **63%** globally.<sup>2</sup>

#### *Percentage of participants who agree that AI could help solve complex problems that plague modern societies*

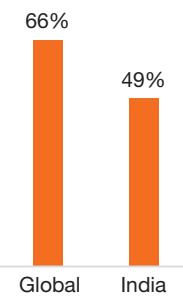


**Further, 73%** of the participants from the survey agree on the importance of AI in cyber security and privacy as compared to **68%** globally; however, only **49%** of the participants agree that AI is important for solving cancer and other diseases compared to the global **66%**. This could be indicative of a lower penetration of AI into mainstream medical diagnosis in India.

#### *Percentage of participants who agree with AI's importance in cyber security and privacy*



#### *Percentage of participants who agree with the importance of AI in solving cancer and other diseases*

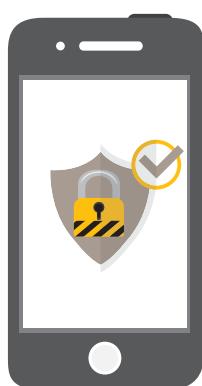


2. PwC. (2017). Bot.Me: A revolutionary partnership. Retrieved from <https://www.pwc.com/us/en/press-releases/assets/img/bot-me.pdf> (last accessed on 29 September 2017)

### **What about data privacy concerns?**

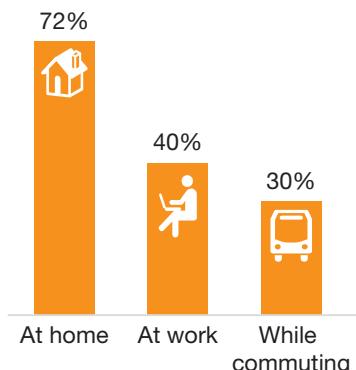
Even with all the potential benefits of AI, which are envisaged to aid humans, people still have concerns regarding data privacy and are apprehensive to share data for a better experience.

A vast majority of participants agree that they have major concerns regarding data privacy to the point that it is near unanimous (**93%**) and that they are hesitant to even share medical results knowing that it could help provide some personalised knowledge about their health. However, the participants were more open (**57%**) to sharing less intrusive data such as their transportation patterns with AI applications if it gets them out of traffic.



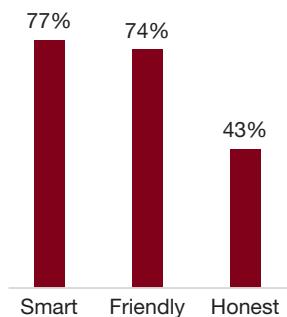
**93%**  
of the participants  
have concerns  
regarding privacy

### **Places where people use digital assistants**



People want their digital assistants to possess a smart and friendly demeanor with the ability to pull off handy shortcuts that allow them to save time, manage their calendars, set reminders and generally become better at getting things done.

### **Personalities of AI assistants**



### **3.2. Is artificial intelligence revolutionising human and computer interaction?**

#### **AI at our fingertips – to what extent are people reliant on digital assistants to get things done?**

Users are likely to take the help of digital assistants (Apple's Siri, Google Now, Amazon's Alexa, etc.) in context-specific requirements. Digital assistants are majorly used at home and not at work. This shows that there are significant opportunities for organisations to adopt smart digital solutions which will trigger the usage of digital assistants.



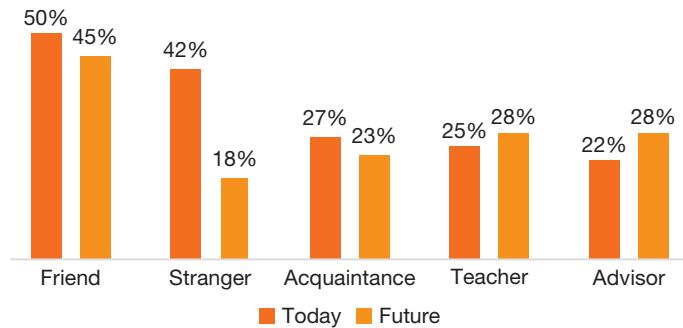
**61%**  
of the participants  
use digital  
assistants

### **Benefits of AI assistants**



The survey data also indicated that, presently, the ‘relationship’ that people feel they share with their digital assistants is that of a friend or acquaintance. However, AI assistants are expected to gradually encompass more advanced forms of interaction in the future, acting as teachers and advisors to people in various walks of life.

#### *Perceived relationship with AI assistants – today and in the future*

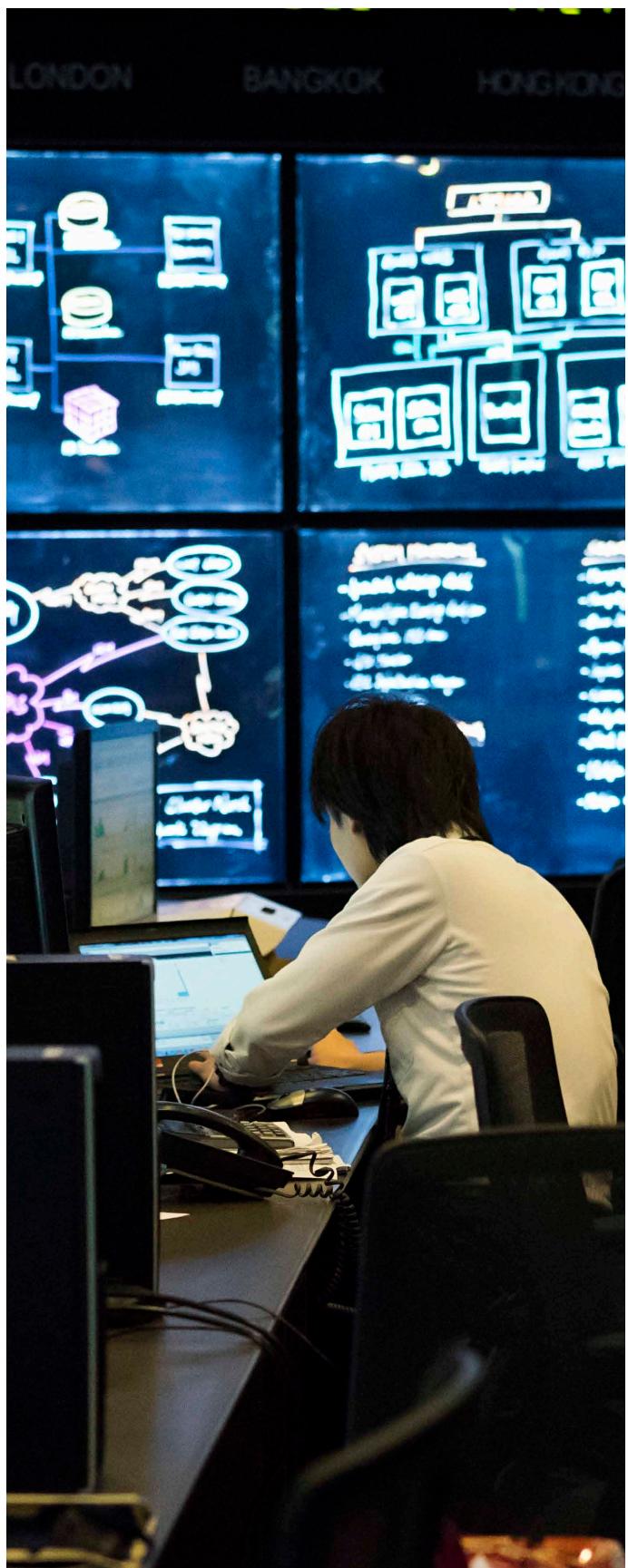
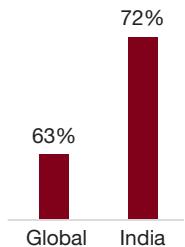


#### *A comparison of the perception of AI as a customised service (India vs global)*

**Seventy-two percent** of the business decision makers from our survey believe that AI can provide a better experience of one-to-one personalisation compared to **63%** globally.<sup>3</sup>

People are gradually moving towards the idea of AI recommender applications/websites so much so that they are willing to trust different software to suggest and surprise them with new and novel options of media (**~46%**).

#### *Percentage of business executives who believe AI can provide better 1-1 personalisation*



3. PwC. (2017). Bot.Me: A revolutionary partnership. Retrieved from <https://www.pwc.com/us/en/press-releases/assets/img/bot-me.pdf> (last accessed on 29 September 2017)

### **Are people ready to pay a premium for AI-driven customer service?**

With the increase in businesses providing personalised service to customers for a premium, people are willing to pay the extra price for customised and superior service by AI. However,

they still need 'human touch' whenever required and cannot completely rely on having a fully functional artificially intelligent customer service system.

### **Customer service scenario for which participants would be willing to pay a premium**

None, I would prefer current customer service models

**13%**

'Higher touch customer service' with direct access to speak and deal with humans

**19%**

I have no preference

**20%**

'Smarter higher touch customer service' run by AI that guarantees quick resolution of your problems over text messaging and offers direct access to humans

**26%**

'Smarter customer service' run by AI and guaranteed to quickly solve your problems over text messaging

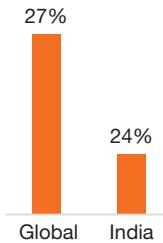
**23%**

**49% of all the participants are ready to pay or are already paying extra for either a 'smarter higher touch customer service' run by AI that guarantees to solve your problems quickly over text messaging, or, preferably, one that also offers direct access to humans.**

### **A comparison of the perception of customer service interaction (India vs global)**

**Twenty-four percent** of the participants indicated that they weren't sure whether their last customer service interaction was with a human or a chatbot compared to **27%** globally.<sup>4</sup> This goes to show that AI solutions are slowly becoming less conspicuous as they get more advanced.

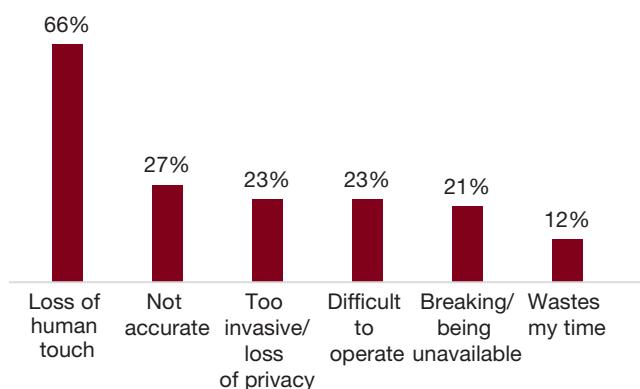
**Percentage of participants who were unsure if their last customer service interaction was with a human or a chatbot**



### **What are the key concerns of AI-run customer service?**

When it comes to AI-run customer services, some of the key concerns indicated by the participants include loss of 'human touch' (**66%** of the participants), among others.

### **Key concerns associated with AI-run customer service**



4. PwC. (2017). Bot.Me: A revolutionary partnership. Retrieved from <https://www.pwc.com/us/en/press-releases/assets/img/bot-me.pdf> (last accessed on 29 September 2017)

In addition to the key concerns, the below-mentioned worries had been voiced by some of the participants surveyed, which echo an underlying broad theme of the inability to establish exact context with AI bots. This continues to strengthen the inference

that human touch may not be completely replaced by AI. At best, AI-powered customer service coupled with humans will become acceptable.

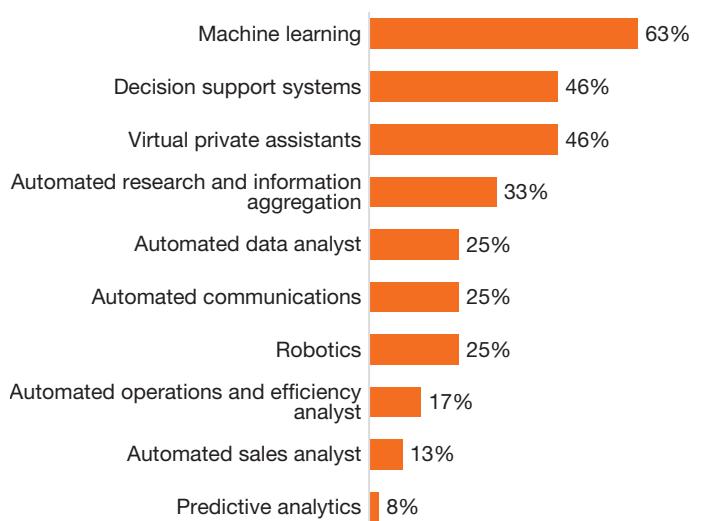


### 3.3. Impact of artificial intelligence on business

We identified the following categories of usage of AI-powered solutions<sup>5</sup> in organisations:

1. Machine learning
2. Decision support systems
3. Virtual private assistants
4. Predictive analytics
5. Robotics
6. Automated research and information aggregation
7. Automated data analyst
8. Automated sales analyst
9. Automated communications
10. Automated operations and efficiency analyst

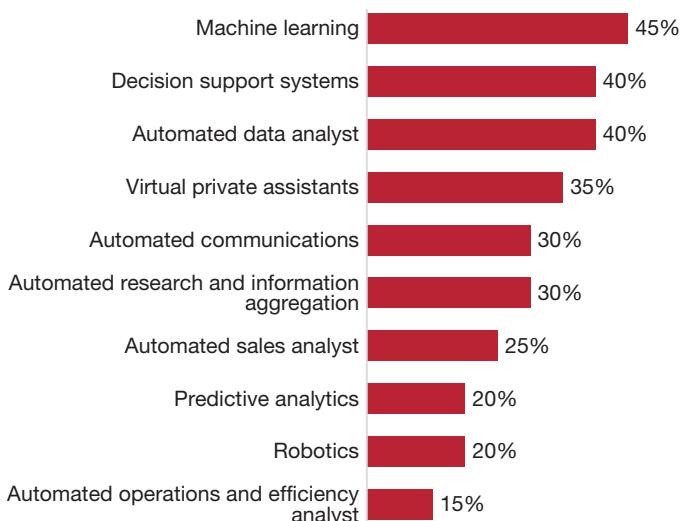
*IT/ITES – percentage of decision makers indicating that AI-powered solutions are highly impactful*



This section shows the relative degree of importance of the above-mentioned categories in different industries and functions.

5. Definitions for each of the AI-powered solutions referred to in this section can be found under the 'glossary of terms' at the end of this report.

**Technology – percentage of decision makers indicating that AI-powered solutions are highly impactful**

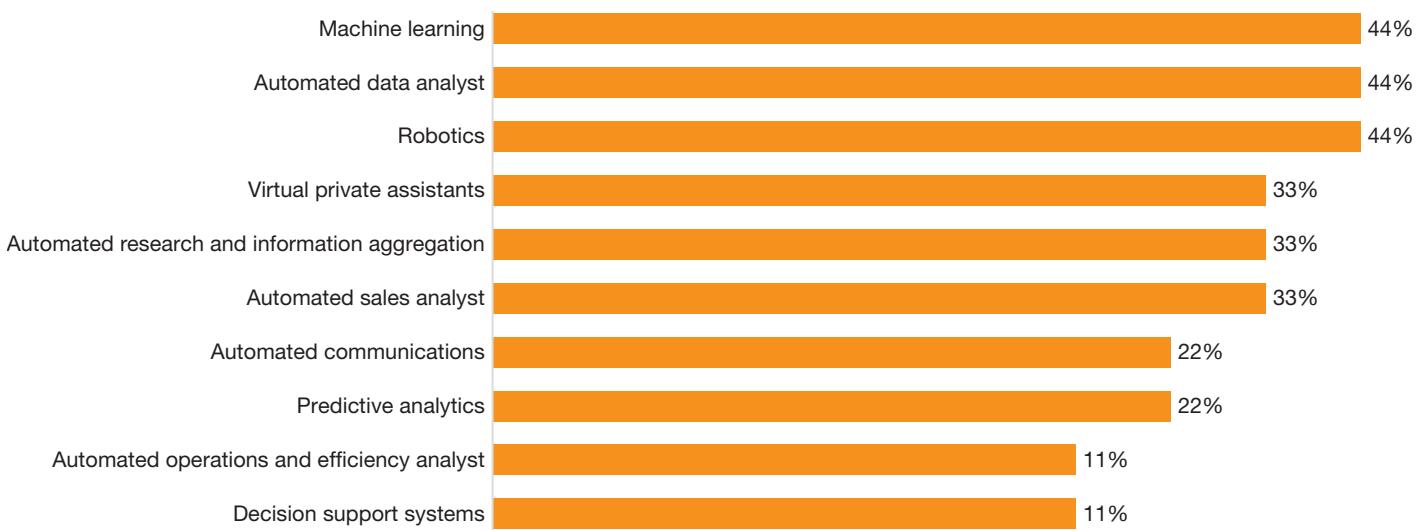


Not surprisingly, in the **IT/ITES** industry, machine learning is the most popular AI-powered solution (**63%** of the participants). This also reinforces the understanding that IT/ITES may potentially be the most disrupted sector by machine learning solutions, indicating that the sector may replace repetitive manual jobs.

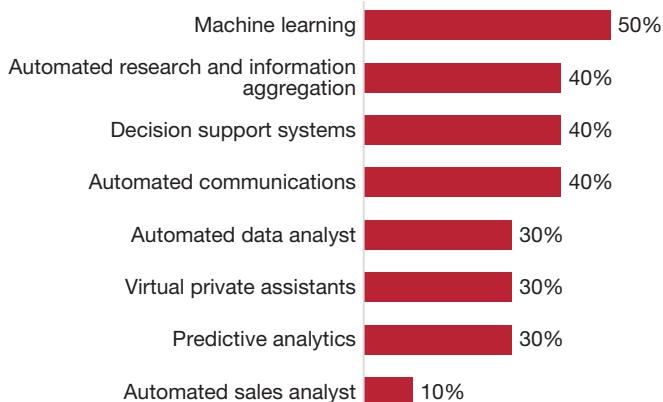
Also, the other prominent observation from the survey response data was the relatively balanced focus on multiple AI-powered solutions in the **technology** sector. As this sector is at the forefront of AI research and commercial deployments, it is likely to cater to multiple client industries with a range of AI-powered solutions.

**The banking, financial services and insurance** (BFSI) industry considers robotics, along with machine learning and automated data analysts (**44%** of the participants for each), to have the highest impact on their business, which could, in theory, be owing to a number of solutions aimed at automation of processes, customer support, regulatory processes and other back office operations.

**BFSI – percentage of decision makers indicating AI-powered solution to be highly impactful**



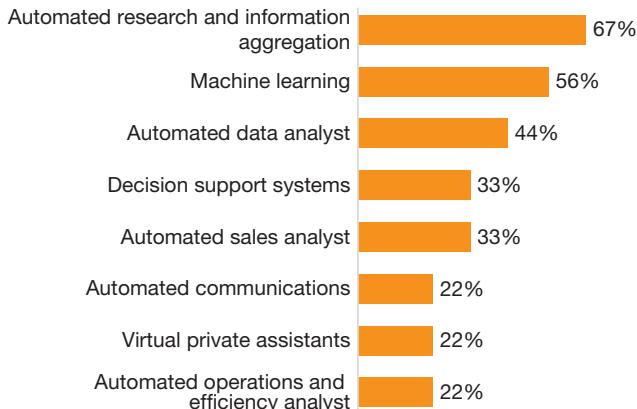
**Manufacturing – percentage of decision makers indicating that AI-powered solutions are highly impactful**



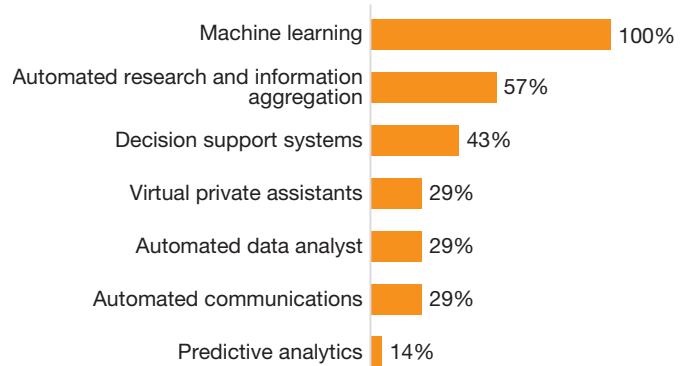
In the **manufacturing** sector, decision makers/influencers seem to lean towards a mix of machine learning solutions (**50%** of the participants), decision support systems, and automated communications and automated research and information aggregation solutions (**40%** of the participants each) in terms of how they perceive the above solutions to impact their business over the next few years. AI solutions, combined with other enabling fields such as industrial Internet of things (IIoT) devices and platforms, are expected to play a significant role in paving the way for smart manufacturing and Industry 4.0.

**Which AI-powered solutions are gaining popularity across business functions?**

**Finance function – percentage of decision makers indicating that AI-powered solutions are highly impactful**

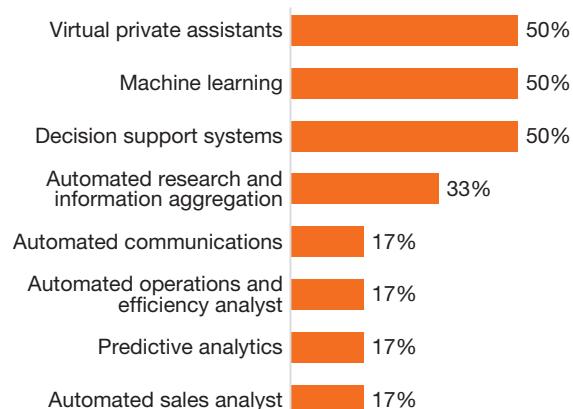


**Education and teaching – percentage of decision makers indicating that AI-powered solutions are highly impactful**



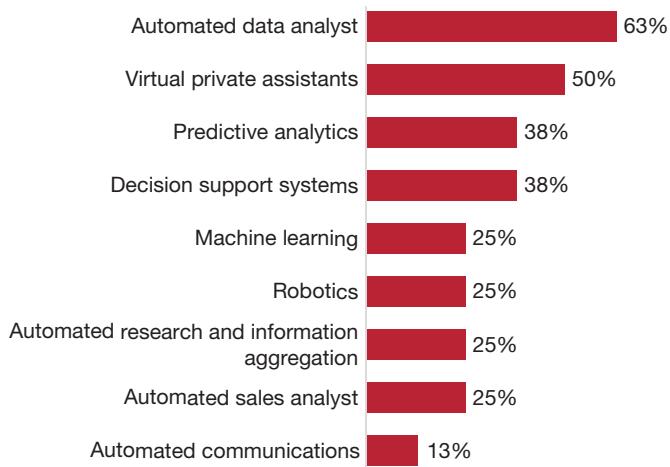
In the field of **education and teaching**, machine learning solutions (**100%** of the participants) and automated research and information aggregation solutions (**57%** of the participants) seem to be the perceived high-impact applications of AI-powered solutions. This seems to be a potential opportunity for identifying use cases where machine learning and other AI-powered solutions can deliver the appropriate training and education to a vast majority of the populace.

**Accounting – percentage of decision makers indicating that AI-powered solutions are highly impactful**



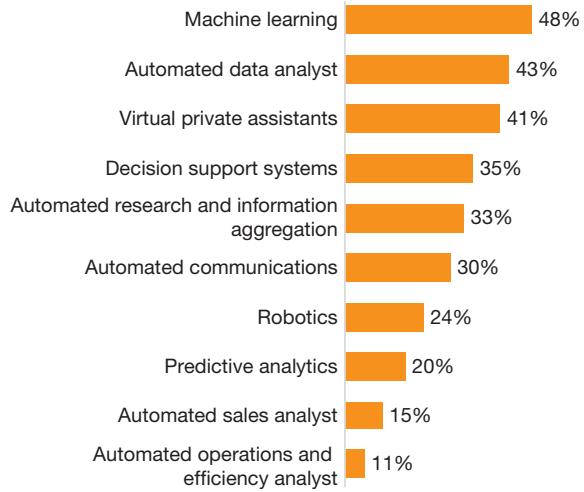
The outcome from the survey analysis shows that business decision makers/influencers who are employed in the finance function perceive automated research and information aggregation solutions (**67%** of the participants), machine learning solutions (**56%** of the participants) and automated data analysts (**44%** of the participants) to bring about the

***General management – percentage of decision makers indicating that AI-powered solutions are highly impactful***



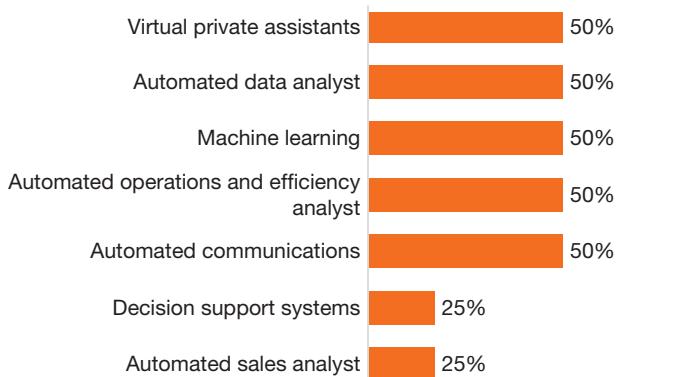
greatest impact for businesses, while those in **accounting** rate virtual private assistants, machine learning solutions and decision support systems (**50%** of the participants each) highly in terms of their expected impact. AI-powered external and internal research and information aggregation solutions along with automated analysis is expected to ease the job of finance professionals and aid in financial decisions.

***IT function – percentage of decision makers indicating that AI-powered solutions are highly impactful***



However, **general management** executives perceive automated data analysts (**63%** of the participants), virtual private assistants (**50%** of the participants), predictive analytics and decision support systems (**38%** of the participants each) to bring about the biggest gains for businesses by supporting precise growth forecasts, competitive intelligence and providing crucial insights on the fingertips of leaders and senior management of organisations.

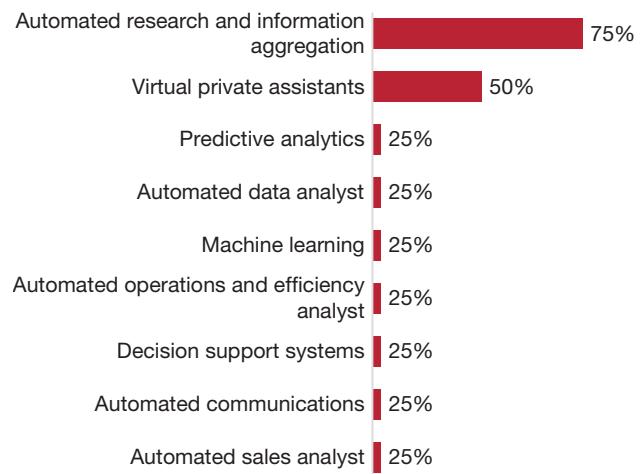
#### *Operations/production – percentage of decision makers indicating that AI-powered solutions are highly impactful*



Within **operations and production**, the perception swayed towards a few solutions, including automated operations and efficiency analysts and automated communications and machine learning solutions (**50%** of the participants for each), while for **administrative** professionals, the perceived

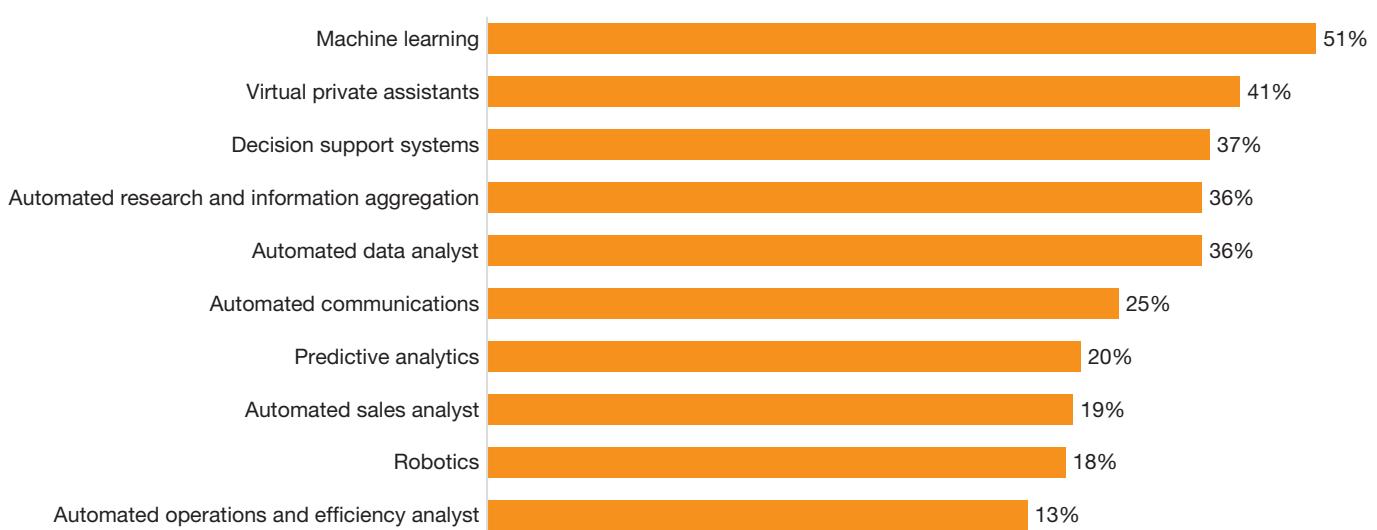
Business decision makers/influencers who are part of the IT function seemed to possess a more balanced view on the possible impact of AI-powered solutions, with the greatest optimism held for machine learning solutions (**48%** of the participants), automated data analysts (**43%** of the participants) and virtual private assistants (**41%** of the participants).

#### *Administration – percentage of decision makers indicating that AI-powered solutions are highly impactful*



impact of AI is expected to be manifested through automated research and information aggregation solutions (**75%** of the participants) and virtual private assistants (**50%** of the participants).

#### *Overall perceived impact of AI-powered solutions on businesses – percentage of decision makers/influencers indicating that AI-powered solutions are highly impactful*



Overall, the survey results have indicated that business decision makers/influencers perceive machine learning solutions, virtual private assistants followed by decision support systems, automated research and information aggregation solutions and automated data analysts to be the most impactful for businesses in the near future, with **approximately 36–51%** of the participants vouching for each of their expected impact potential.

#### **How do people perceive the effect of AI on the employment scenario?**

With the initiation of automation and the implementation of AI in organisations, there have been concerns regarding displaced jobs; however, the long-term benefits of leveraging AI in businesses to boost productivity, stimulate growth and, in turn, create higher value involvement opportunities for the workforce might outweigh the potential short-term employment concerns.

# 65%

*of the participants agreed that AI is likely to have a severe impact on employment in India*



While employment-related concerns cannot be dismissed altogether, there is likely to be a shift from traditional jobs to more evolved, high-involvement roles for humans in the future as efficiency, safety and standardised quality is expected to take precedence in certain services over the natural course of development.



# 55%

*of the participants believe that the benefits of AI in business to inform strategy, generate growth and boost productivity will outweigh the potential downsides of employment concerns*

Participants from the survey indicated a general preference towards affordable transportation, legal services and convenient customer services in lieu of traditional service providers keeping their jobs.

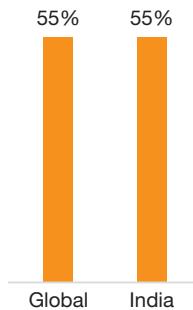
#### **Percentage of participants who would prefer improved quality of service and affordability over traditional models**



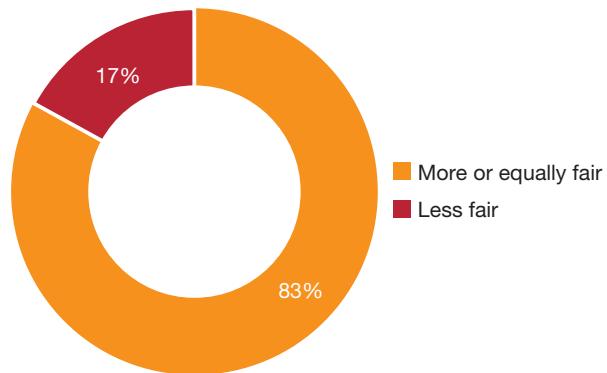
### **A comparison of the perception of AI on the employment scenario (India vs global)**

The global perception<sup>6</sup> regarding AI's potential to boost productivity and inform strategy outweighing short-term downsides such as employment concerns resonates with the findings from our survey—that is, **55%** of the business decision makers believe the same.

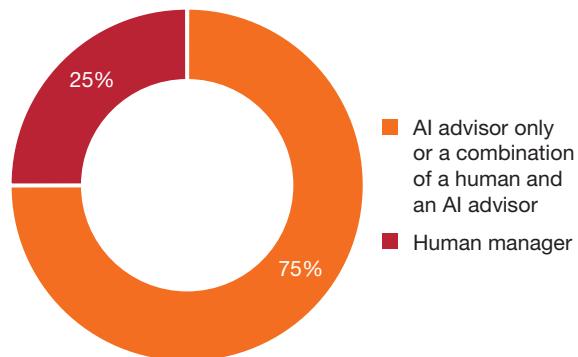
### **Percentage of participants who believe AI's potential to boost productivity and inform strategy outweighs employment concerns**



### **How AI advisors are perceived in terms of fairness in giving promotions and raises**



### **If you were up for a promotion against another employee, who would you want to make the decision?**



### **3.4. Artificial intelligence transforming the workplace**

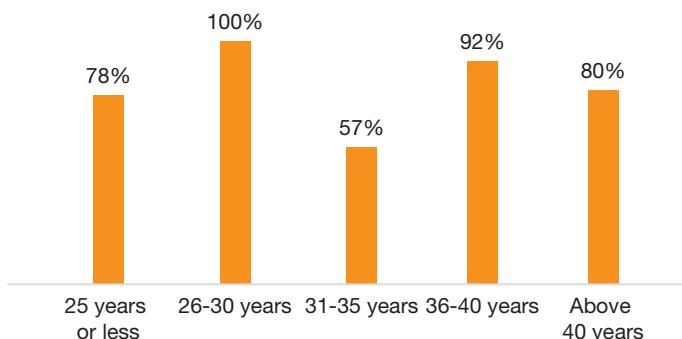
#### **AI advisors and AI managers at the workplace**

New technology and AI are promising to transform the workplace, with the participants of the survey resonating the same view. Further, **83%** of the decision makers/influencers believe that having an 'AI advisor' at work to monitor performance would be more or less equally rational and impartial in giving promotions and raises compared to a human advisor.

While the perception of fairness is certainly in favour of AI advisors when it comes to the ultimate decision regarding promotions, decision makers/influencers would rather trust an AI advisor or both a human and an AI advisor (**75%**) than purely a human manager to make an unbiased decision of promoting employees. The above findings indicate a latent need for impartiality and transparency in evaluating performance of employees—an opportunity that organisations can employ AI solutions to address.

However, even though the decision makers/influencers choose to rely on an AI advisor to make better decisions, they would still prefer to meet a human advisor for a follow-up or feedback post review or recommendation for a promotion (**85%** of the participants).

### **Percentage of participants who feel that AI advisors would be either more or equally fair compared to humans – age-wise comparison**



6. PwC. (2017) Bot.Me: A revolutionary partnership. Retrieved from <https://www.pwc.com/us/en/press-releases/assets/img/bot-me.pdf> (last accessed on 29 September 2017)

Upon observing how perceptions of fairness vary when it comes to AI advisors at the workplace, we noticed that **90–100%** of the business decision makers/influencers within the age group of 26–30 years and 36–40 years perceive AI advisors to be either more or equally fair compared to their human counterparts.

The perception in favour of the above notion is relatively lower within the 31–35 year age category (**57%** of the participants), while the vast majority—that is, approximately **80%** of the participants under 25 years of age or above 40 years of age tend to also consider AI advisors to be either more or equally fair compared to humans. This shows that organisations will have to devise a different strategy particularly for millennials in order to be seen as impartial in the performance appraisal process. This is where AI can help human capital leaders to differentiate themselves in order to attract and retain the best talent.

According to PwC's 20th CEO Survey,<sup>7</sup> **56%** of CEOs in India are exploring the benefits of humans and machines working together. However, the availability of key skills (innovation, problem-solving methodologies, creativity, leadership and adaptability) in the country is a concern for the growth prospects of organisations. Hence, companies should invest in building distinctive capabilities that give them a competitive edge. However, there is a gap between aspiration and execution in India. This year, **64%** of CEOs stated that it is difficult for their organisations to recruit people with problem-solving skills. Similarly, **74%** find it challenging to recruit talent that is innovative and creative, and **66%** said that it is difficult to recruit talent that is adaptable. These data points reinstate the fact that the availability of a skilled workforce—not just in the area of technical skills required to do the job but also in terms of necessary behavioural and leadership traits—continues to be a pressing issue in India.

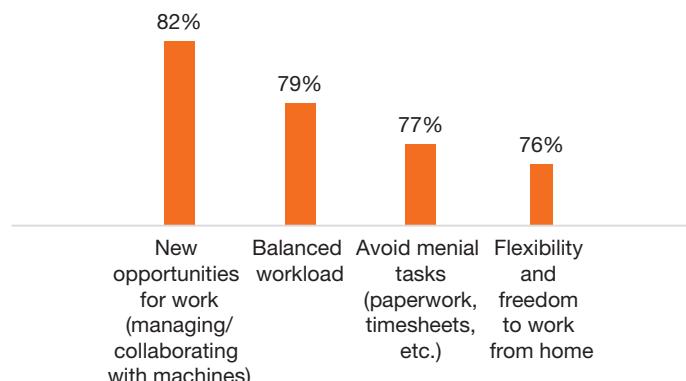
Given the fact that AI is widely accepted and there is lack of skilled talent, there are opportunities where AI-based solutions can fill this gap and transform the workplace.



### What drives decision makers' desire to work with AI advisors<sup>8</sup> at the workplace?

Decision makers/influencers are keen on working with AI advisors provided they have more flexibility, a balanced workload and the freedom to work from home. They feel that AI solutions will create new opportunities for work and will free them from mundane tasks.

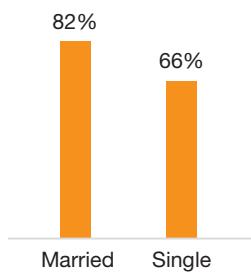
### Reasons why executives would prefer working with AI managers



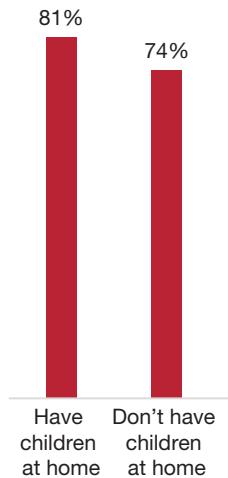
7. PwC. (2017). 20th CEO Survey. Being fit for growth. Retrieved from <http://www.pwc.in/assets/pdfs/publications/ceo-survey/20th-ceo-survey-being-fit-for-growth.pdf> (last accessed on 31 October 2017)

On taking a deeper look, it was further found that decision makers/influencers who are married and have children find the reasons of 'balanced workload' and 'flexibility and freedom to work from home' to be more valuable (~**5–15%** more) when wanting to work with AI advisors.

#### **AI managers would lead to flexibility and freedom to work from home**



#### **AI managers would lead to a balanced workload**

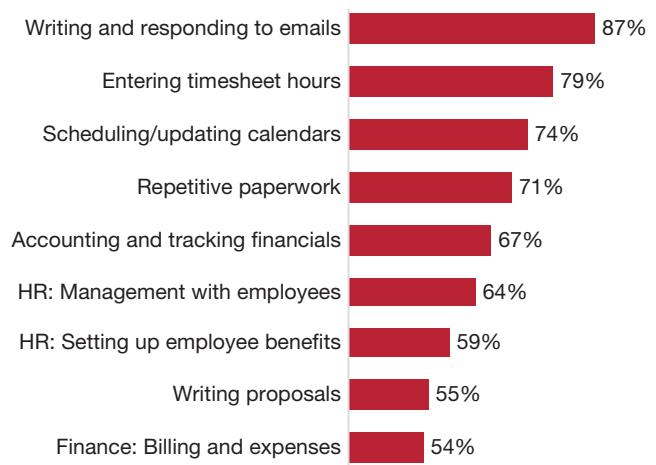


#### **Which aspects of jobs can be outsourced to AI assistants?**<sup>9</sup>

Employees would prefer to have systems or digital assistants for email management, entering hours into timesheets, scheduling tasks or updating calendars and accounting for tracking financials, as well as other routine paperwork. The proportion of employees who would prefer digital assistants for their routine tasks dips slightly when it comes to activities such as proposal writing and expenses/reimbursements that are still somewhat dependent on human cognition and contextual awareness. Nevertheless, a majority of employees indicated their preference for automation in their daily work routines.

Respondents want to outsource jobs which are repetitive and time consuming in their respective sectors and functions. For example, nearly **88%** of the respondents engaged specifically in IT/ITES feel that entering timesheet hours can be outsourced to digital assistants as opposed to the overall **79%**. Similarly, **87%** of accountants and finance professionals feel that accounting and tracking financials can be carried out with the help of AI compared to **67%** within the overall business decision-making population.

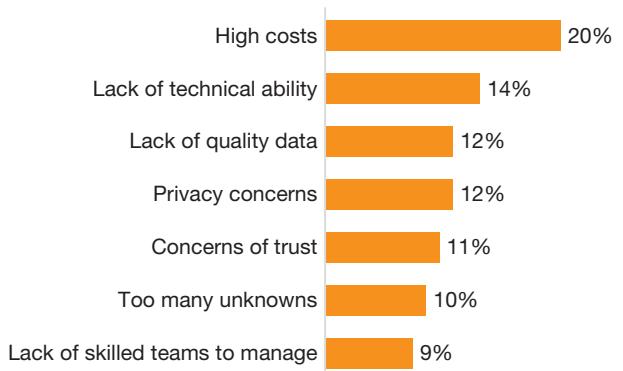
#### **Job elements that can be outsourced to digital assistants**



#### **What are the factors which are holding back business leaders from successfully integrating AI systems in their organisations?**

High costs seem to be the key barrier for AI integration in organisations. Given that AI costs (devices, integration and analytics) are rapidly reducing, this barrier is expected to be eliminated in the future.

#### **Key barriers to AI integration for businesses**



8. The definition of AI advisor referred to in this section can be found under the 'glossary of terms' at the end of the report.

9. The definition of AI assistants referred to in this section can be found under the 'glossary of terms' at the end of the report.

### 3.5. Impact of artificial intelligence on society

People want businesses and governments to invest in research and development to provide reasonable transportation and legal and medical services to low-income groups, along with free or affordable education and teaching aids to disadvantaged children.

There seem to be diverse opinions in society when it comes to the adoption of AI. While people are eager to use self-driving cars or be picked up by self-driving mass transit vehicles on routes designed by an algorithm, they are averse to the idea of availing annual health check-ups at home with a robotic smart kit (**77%**) or having chatbot assistant teachers in universities/colleges that lower the cost of overall tuition (**61%**).

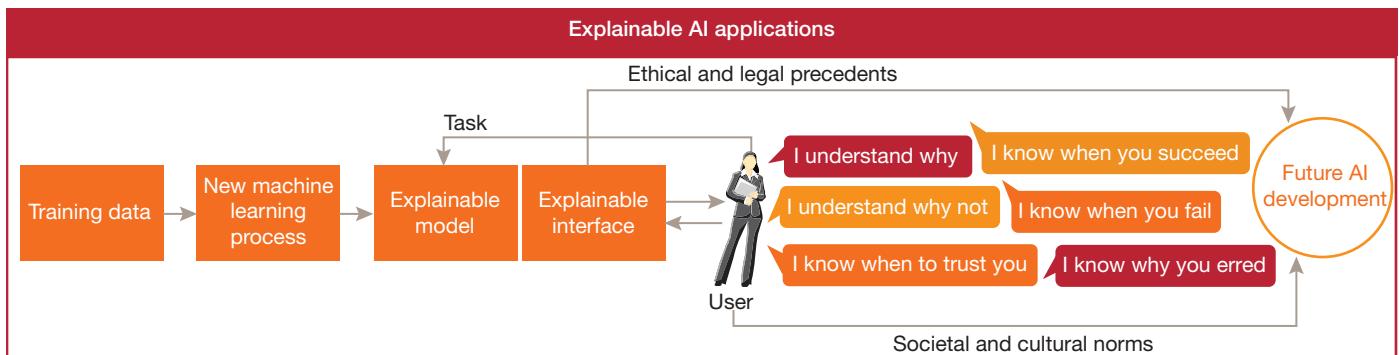
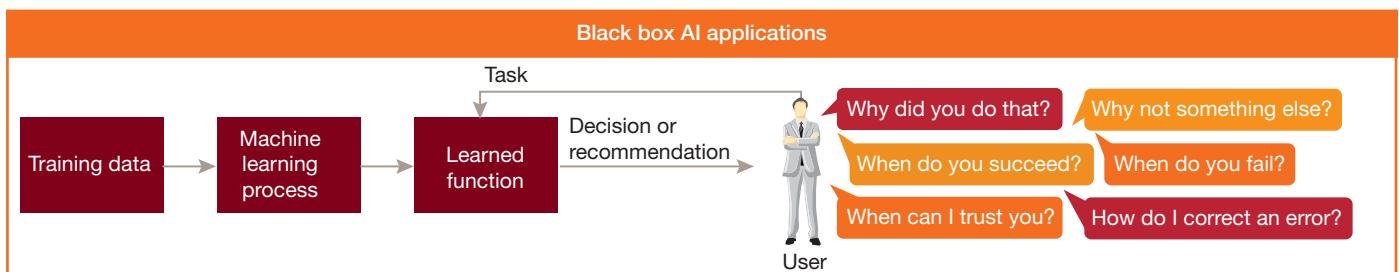
Overall, people believe that humans are more prone to errors than AI systems and that the designers and managers of these systems are at fault when they malfunction or fail. This is of

significance in fully autonomous applications of AI, where speed and response times are critical and that AI systems can only behave as intelligently as they are designed to do so.

However, the effectiveness of these systems is limited by their current inability to explain their decisions and actions to human users. Responsible AI ensures that its workings are aligned to ethical standards and social norms pertinent within its scope of operations. Explainable AI ensures that the inner workings of the AI system are transparent to and well understood by the system owners and administrators and its outcomes can be explained beyond reasonable doubt or ambiguity. Explainable AI is responsible for building AI models with accountability and the ability to describe or depict why a certain decision was made by the algorithm.<sup>10</sup> It is essential to build such systems which would enable companies/people to understand, appropriately trust and effectively manage an emerging generation of artificially intelligent machine partners.



10. Gunning, D. (n.d.). Explainable Artificial Intelligence (XAI). DARPA. Retrieved from <https://www.darpa.mil/program/explainable-artificial-intelligence> (last accessed on 16 November 2017)



Black box AI applications vs explainable AI applications

Source: DARPA



# Looking ahead

## 4.

### **What can individuals and businesses expect from AI in the future?**

As AI is all set to bring about a revolution in the business landscape, businesses and consumers are bound to be divided on how quickly and eagerly they should adopt and integrate the new applications and workflows arising from it. During the initial phases in particular, businesses will need to identify the requisite data, direct training processes and refine outputs.

As manual jobs get automated, businesses and society will need to rethink skill areas and move away from procedural tasks to higher involvement strategic ones with a greater focus on creativity, adaptability and an outcome-oriented mindset.

Most importantly, business leaders and government authorities should prioritise areas where AI can bring about widespread visible and quick positive impact. This would require them to decide on whether they should invest in enhancing existing processes and workflows to increase efficiency and/or reduce costs or create alternative business and operating models built around new experiences and modes of interactions with humans.

#### Areas where AI can create value

AI holds the potential to address socioeconomic concerns such as stimulating economic growth, improving global health and education and helping enhance the quality of life for humans.

AI systems like chatbots, digital assistants and robots can, at least partially, carry out customer service operations such as informing about new products/services, handling feedback and concerns and responding with solutions.

AI applications hold the potential to automate a number of repetitive tasks such as entering timesheet hours and routine communication such as emails and paperwork.

AI, when integrated into businesses, is expected to bring about higher productivity, efficiency and growth.

AI managers at the workplace can improve fairness and transparency in conducting appraisals and giving promotions and raises at the workplace.

#### Caveats to realising AI's potential

- Institutional frameworks for AI development and adoption across businesses and society are paramount for ensuring that the benefits of AI are equitably dispersed. The three pillars of AI innovation—private sector, public sector and academia—would need to collaboratively create an enabling environment for the above.
- The pace of innovation for AI-powered solutions such as digital assistants, recommender systems and more are subject to individuals and businesses sharing data freely. Tighter data security, policy and legal recourse can provide a reassuring premise for facilitating data-sharing.
- In the present scenario, an AI-powered customer service set-up may also require a ‘human touch’, which will help create a differentiated, convenient and seamless experience for customers.
- AI assistants and applications are expected to evolve from their roles as mere assistants to those of advisors that can effectively process information and suggest appropriate courses of action to facilitate important decisions.
- High costs and the lack of technical expertise are among the key barriers to the effective integration of AI in businesses. While costs are expected to go down in the future, core skills in AI development and innovation may need to be addressed.
- The perception of fairness will however require AI systems to be responsible and explainable. AI systems will need to be developed in such a way that they are free from biases, robust against tinkering or manipulation attempts and easily understandable in their workings and outcomes.



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# Methodology used for survey and analysis

The facts and figures presented in this report, unless stated otherwise, are based on findings from the results of a pan-India online survey conducted by PwC India, involving participants from across industries and business functions who are employed at an organisation in either a full-time, part-time or a self-employed role and belong to either of the two groups—a business decision maker/influencer or a regular employee.

The survey questionnaire was designed by PwC India with the aim of bringing out India-focused perspectives on the perceived impact of AI on businesses and the daily lives of consumers and had been structured along the lines of similar initiatives undertaken across PwC's global network, following which the

response data was collected over a period of two weeks. For certain questions that were specific to business decision makers/influencers, it was ensured, by design, that only the relevant group of participants would be eligible to attempt the same.

Further, the data was used to conduct a set of analyses to gauge perspectives of each of the respondent groups on parameters relevant to them. The findings were broadly classified into five dominant themes, as stated in section 4 of this report. Additionally, select figures from the PwC India survey results have been called out for a side-by-side comparison with corresponding ones presented in the US Bot.Me survey report published earlier in 2017.



# Glossary of terms

Terminology	Definition
Automated communications	Also known as an interactive agent, or artificial conversational entity, these are computer programs which conduct a conversation via auditory or textual methods. For example, chatbots, mailbots.
Automated data analyst	AI solutions aimed at performing the job of data analysts and data scientists and bridging the gap between such roles and business imperatives. For example, these might include programs that are able to develop a deep understanding of customer preferences from data, identify high-risk customer groups and tailor interaction touch points in a manner personalised to such customers.
Automated operational and efficiency analyst	AI solutions targeted at increasing operational efficiency and reducing costs. These include AI programs and bots aimed at automating repetitive manual tasks such as identifying and correcting data and formatting mistakes, performing back office tasks and automating repetitive interactions with customers.
Automated research and information aggregation	Applications of AI that involve aggregating and processing large volumes of information on a topic so as to generate meaningful insights. For example, aggregating information from research papers or medical journals for diagnosis support, identifying online hoax, bad reporting and statistics, and identifying plagiarised publications.
Automated sales analyst	AI-powered digital analysts for sales and marketing decisions. These programs are able to test a range of scenarios using internal and external data to predict the impact of marketing strategies such as promotions and campaigns, simulate 'what if' scenarios against multiple hypotheses and perform root cause analyses against business results.
Business decision makers/influencers	A sub-set of participants in the survey who have identified themselves to be either in a decision making role or an influencing role in their current organisations. Some of the survey questions had been specifically targeted towards this group.
Decision support systems	Decision support systems (DSS) are a specific class of computerised information systems that support business and organisational decision-making activities.
Machine learning	Machine learning is concerned with computer programs that automatically improve their performance through experience.
Predictive analytics	Predictive analytics is an area of statistics that deals with extracting information from data and using it to predict trends and behaviour patterns—for example, sales forecasts, predicting customer churn and industrial machine failure.
Robotics	Robotics deals with the design, construction, operation and use of robots, as well as computer systems for their control, sensory feedback and information processing. Environmental information such as imagery and sound are captured using a group of sensors and the same are processed using various computerised techniques for the robot to respond.
Virtual personal assistants	Virtual assistants use natural language processing (NLP) to match user text or voice input to executable commands. Many continually learn using AI techniques, including machine learning. For example, Apple's Siri, Amazon's Alexa, Google Now.
AI advisors	AI advisors are machines or systems that monitor employees' progress and performance. They are responsible for the growth of the employee in the organisation and for the delivery of projects.
AI assistants	AI assistants are machines or systems or application programming interfaces ([APIs] a set of subroutine definitions, protocols and tools for building application software) that perform non-value adding services such as scheduling and email management.

# About the authors

This knowledge paper has been co-authored by Sudipta Ghosh, Indranil Mitra, Prasun Nandy, Udayan Bhattacharya, Debopriyo Dutta and Shruti Kakar. Sudipta Ghosh is a Partner in the firm and leads the Data and Analytics practice. Indranil Mitra and Prasun Nandy are Directors and focus on the AI field for the Data and Analytics practice. Udayan Bhattacharya is an Associate Director and works on AI, machine learning and cognitive automation, along with Debopriyo Dutta and Shruti Kakar, who are Senior Consultants in the Data and Analytics practice.



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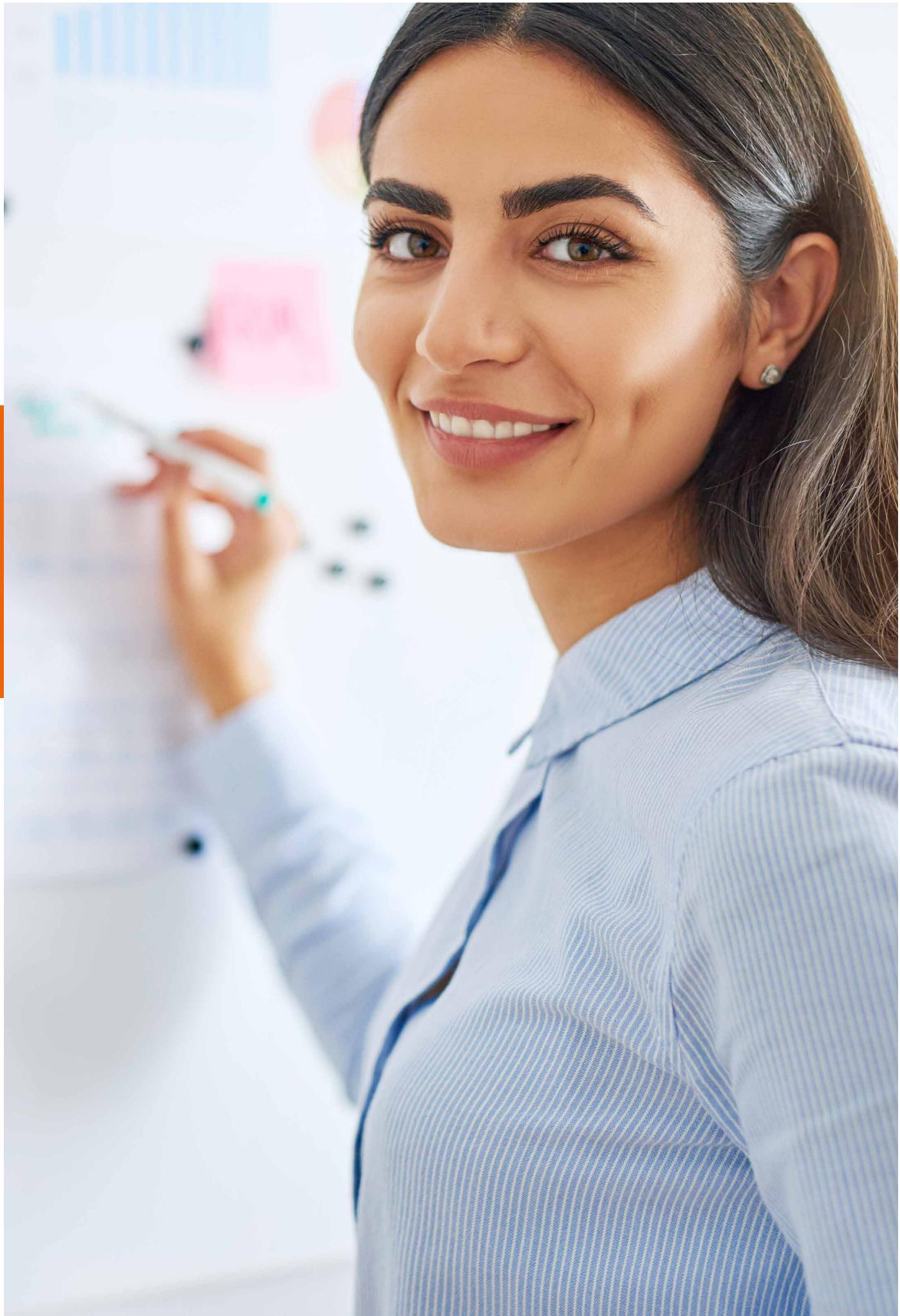
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