The Future Computed: Artificial Intelligence and its role in society

Executive Summary

It's remarkable how much technology has changed the way we live and work over the last decade or two. Digital technologies, powered by the cloud, have made us smarter and more productive, transforming how we communicate, learn, shop and play. And this is just the beginning. Advances in artificial intelligence (AI) are giving rise to computing systems that can see, hear, learn and reason, creating new opportunities to improve education and healthcare, address poverty and achieve a more sustainable future.

But these rapid technology changes also raise complex questions about the impact they will have on other aspects of society: jobs, privacy, safety, inclusiveness and fairness. When AI augments human decision-making, how can we ensure that it treats everyone fairly, and is safe and reliable? How do we respect privacy? How can we ensure people remain accountable for systems that are becoming more intelligent and powerful?

To realize the full benefits of AI, we'll need to work together to find answers to these questions and create systems that people trust. Ultimately, for AI to be trustworthy, we believe that it must be "human-centered" – designed in a way that augments human ingenuity and capabilities – and that its development and deployment must be guided by ethical principles that are deeply rooted in timeless values. At Microsoft, we believe that six principles should provide the foundation for the development and deployment of AI-powered solutions that will put humans at the center:

- **Fairness:** When AI systems make decisions about medical treatment or employment, for example, they should make the same recommendations for everyone with similar symptoms or qualifications. To ensure fairness, we must understand how bias can affect AI systems.

- **Reliability**: AI systems must be designed to operate within clear parameters and undergo rigorous testing to ensure that they respond safely to unanticipated situations and do not evolve in ways that are inconsistent with original expectations. People should play a critical role in making decisions about how and when AI systems are deployed.

- **Privacy and security:** Like other cloud technologies, AI systems must comply with privacy laws that regulate data collection, use and storage, and ensure that personal information is used in accordance with privacy standards and protected from theft.

- **Inclusiveness**: AI solutions must address a broad range of human needs and experiences through inclusive design practices that anticipate potential barriers in products or environments that can unintentionally exclude people.

- **Transparency**: As AI increasingly impacts people's lives, we must provide contextual information about how AI systems operate so that people understand how decisions are made and can more easily identify potential bias, errors and unintended outcomes.

- **Accountability**: People who design and deploy AI systems must be accountable for how their systems operate. Accountability norms for AI should draw on the experience and practices of other areas, such as healthcare and privacy, and be observed both during system design and in an ongoing manner as systems operate in the world.

A continuing collaboration between government, business, civil society and academic researchers will be essential to shape the development and deployment of human-centered AI to be trustworthy. Ongoing dialogues among these communities will help to identify and prioritize issues of societal importance, enable

further research and development of solutions and sharing of best practices as new issues emerge, and, where appropriate, shape policy that can more readily adapt to these rapidly evolving technologies.

Some of the most urgent questions surrounding AI relate to jobs and work. Today, there are clear indications that how businesses organize work, how people find employment and the skills people need to prepare for the workforce are changing dramatically. These changes are likely to accelerate in the decade ahead.

AI and cloud computing are driving much of this change. This is evident in the rise of the on-demand – or "gig" – economy and the automation of many aspects of today's jobs. As AI continues to transform the nature of work, we'll need to think in new ways about education, skills and training to ensure that people are prepared for the jobs of the future and businesses have access to the talent they need to succeed. And as traditional models of employment transform, we'll need to modernize legal frameworks to recognize new ways of working, provide adequate worker protections and maintain social safety nets.

To enable people to thrive in today's economy, and prepare for tomorrow's, we believe it's critical to focus on the following areas:

- **Preparing today's students:** Every young person should have the opportunity to study computer science. The skills they gain will open the door to higher-paying jobs in faster-growing fields. This means equitable access to rigorous and engaging computer science courses and a focus on uniquely human skills must be top priorities.

- **Supporting today's workers:** We must also help today's workers gain skills that are relevant in the changing workplace. Distance and online learning and investments in on-the-job training programs will be essential. And we'll also need to improve how we identify the skills that businesses need.

- **Creating a skills-based marketplace:** To help companies find qualified employees and enable workers to find jobs, we'll need to move from a degree-based system to one that uses credentials that are widely recognized and valued by employers.

- **Providing legal certainty for employers and workers:** The rise of the on-demand economy raises important questions that are not clearly addressed by existing laws about how we classify workers. To enable innovation and to protect workers, legal certainty must be created so that workers and businesses understand their rights and obligations.

- **Developing industry standards to protect workers:** Business leaders have an opportunity to play a significant role in reshaping employment policy in the emerging economy by setting their own standards for on-demand engagements that include fair pay and treatment for on-demand workers.

- **Ensuring benefits move with workers and modernizing social safety nets:** As the nature of work evolves with technology innovation, the traditional system of employer-provided benefits and government-supported social safety needs to be reformed to provide adequate coverage for workers and a sustainable contribution structure for businesses.

At Microsoft, we're optimistic about the opportunities that AI provides to create a better future for all. To ensure that we realize this future, it will be essential for governments, businesses, academics and civil society to work together in creating trustworthy AI systems and prepare people for a world where the skills they need to succeed will be constantly changing. This will require the development of AI in ways that are human-centered and can ensure broad and fair access to its benefits as we move forward together.

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