AI RFI Responses, October 26, 2018

Update to the 2016 National Artificial Intelligence Research and Development Strategic Plan RFI Responses

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October 26, 2018

Mr. Faisal D'Souza
National Coordination Office
National Science Foundation
Alexandria, Virginia 22314

Dear Mr. D'Souza,

Accenture is grateful for the opportunity to provide input to the National Science Foundation on the National Artificial Intelligence Research and Development Strategic Plan. We applaud the Administration in its effort to ensure the U.S. maintains global leadership in AI and the American people realizes positive benefits of these technologies.

As a leading global professional services company, Accenture provides a broad range of services and solutions in strategy, consulting, digital, technology and operations. We combine Artificial Intelligence (AI) with deep industry and analytics expertise to help our clients embrace these emerging, intelligent technologies confidently and responsibly.

Accenture Recommendations

The National Artificial Intelligence Research and Development Strategic Plan released by the National Science and Technology Council in 2016 to guide government efforts in AI R&D is an important foundational document. Many of the strategies remain as important today as they were in 2016. For the purposes of this RFI, we have decided to focus on a few specific areas where we believe the Select Committee should modify or enhance its R&D strategy. Our recommendations are:

- Define investment goals. Consider both the value areas of AI and capabilities of AI;
- Develop a plan to engage non-government stakeholders;
- Increase investments to improve the quality of data to train and monitor supervised AI algorithms;
- Promote and support new learning techniques to bolster the AI R&D workforce and beyond;
- Implement governance frameworks for government-funded R&D;
- Increase focus on the industrial supply chain; and
- Align strategies for future enabling technologies, such as quantum computing, 5G, biotech, and biocomputing.

Recommendation: Define investment goals. Consider both the value areas of AI and capabilities of AI.

We encourage the Administration to focus on defining goals for investments made in AI, and in doing so, consider both the value and capabilities of AI. These five value levers are: Intelligent Automation, Enhanced Judgement, Enhanced Interaction, Intelligent Products and Enhanced Trust. A framework of five value levers can help prioritize quantifiable results and sustainable growth for AI R&D.[1]

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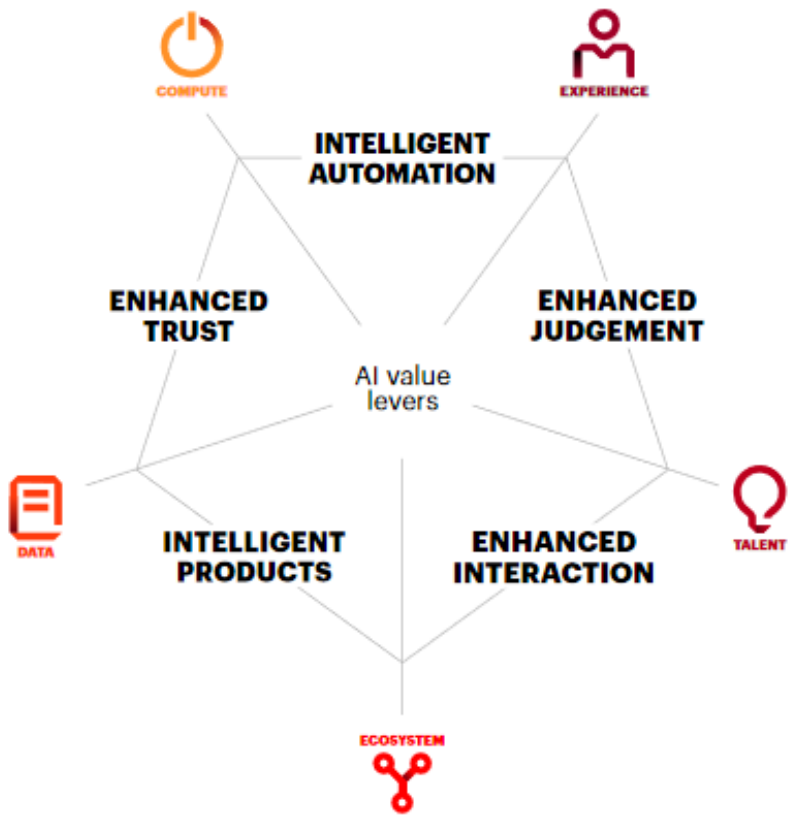
VALUE AREAS & CAPABILITIES OF AI

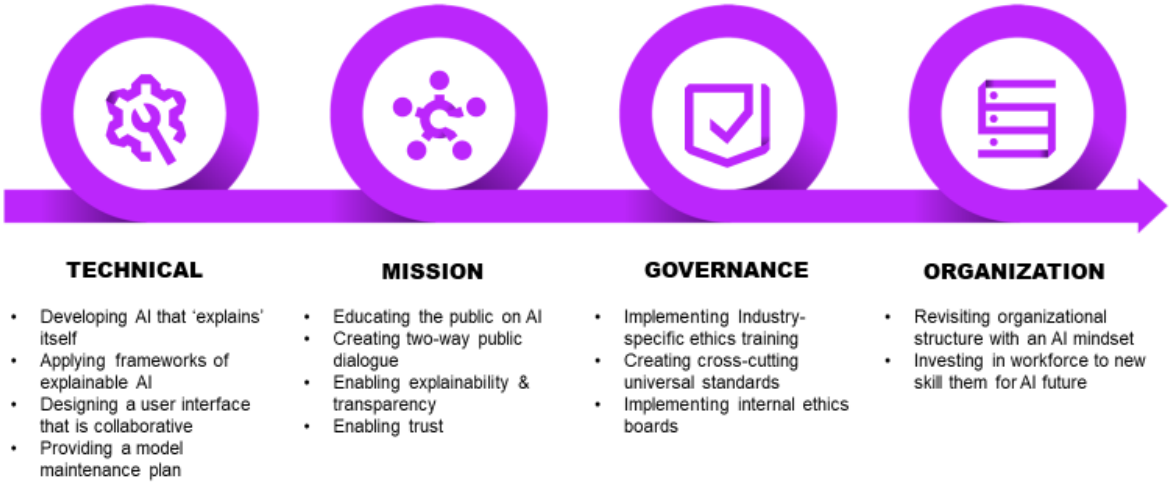


Recommendation: Develop a plan to engage non-government stakeholders.
Due to the rapidly changing environment driven by emerging technologies as well as investments being driven in the private sector, we encourage the federal government to create a formal engagement strategy between the public and stakeholders to better identify and monitor investments, as well as anticipate risks and challenges in long-term R&D. The federal government would benefit from a formal advisory committee of stakeholders outside government, which would include industry, technical experts and consumer advocates. Technology will continue to advance at a fast clip, which makes it difficult to anticipate the associated challenges and opportunities – especially in the R&D space — that the United States will face year over year, never mind many decades from now. The risk of forecasting too far into the future, without continuous evaluation and updating, is that we will either underestimate the benefits or overestimate the challenges.

Recommendation: Move beyond "understanding" ethical, legal, and societal implications. Focus on governance.
We agree with the statement in the current strategy on the need for further research into "multidisciplinary perspectives that involve experts from computer science, social and behavioral sciences, ethics, biomedical science, psychology, economics, law, and policy research." The federal government should provide social science and ethics training to all

federally-funded AI R&D researchers to ensure management of the dilemmas that technology use is apt to create. Social scientists, civil society, technologists and other non-government stakeholders should be involved in creating, continually updating, and implementing this training. The training should include a close evaluation of the technical capabilities *as well as* the limitations of AI. This is necessary to avoid ethics panels and discussions that focus solely on the technical perspective and overlook important social issues that may arise from this new technology.

In a recent survey of 300+ business leaders conducted by Accenture, SAS, Intel and Forbes Insights, 63% of the companies that have deployed successful AI projects reported that they had formed an internal AI ethics committee.[2] While we believe this to be promising, it is unclear how companies are leveraging those ethics committees to govern AI. We recommend that the federal government support ways to encourage companies to share best practices, governance guidelines, methodologies and tools that are being used to evaluate risk, monitor, and audit AI. We believe that the federal government, acting as a convener to encourage stronger governance programs, will enable human-centric, secure, transparent, explainable, trustworthy, and accountable AI systems.



Recommendation: Invest in R&D to improve the quality of data to monitor supervised AI algorithms.

To effectively monitor data and minimize the ethical, legal, and societal implications of AI, we must place a greater focus on improving the quality of data. Error rates for many AI algorithms, especially in computer vision, have fallen well below human error, however, error rates for human labeling of data needed to train algorithms remain as high as 35-40%.[3] Early work shows promising results that improved data labeling methods can provide significantly greater accuracy and precision than algorithmic advances.[4] Effective data labeling methods draw from a variety of academic disciplines.[5,6,7,8] The federal government should establish R&D programs specifically focused on improving data quality.

Recommendation: Promote and support new learning techniques to bolster the AI R&D workforce and beyond.

Employers face a global skills crisis that could hold back the economic promise of intelligent technologies. Well beyond today's talent shortages, digital innovations will continually and rapidly alter the demand for skills in the future.

According to Accenture Research, the cost of inaction is staggering. Over the next decade, the 14 G20 countries could miss out on as much as US$11.5 trillion of cumulative growth promised by intelligent technologies – if they can't meet future skills demand.[9] That equates to forgoing more than an entire percentage point from their annual average GDP growth rate every year. And U.S. employees are eager to provide new skilling opportunities – indeed, two thirds of the 3,500 workers Accenture surveyed agreed that it is important for them to develop skills to work with intelligent machines. [10]

Incremental changes to our education and corporate learning systems will not be sufficient. To some, the solution is to train more engineers, raise the number of creative designers, produce more data analysts. However, creating larger cohorts with specialized skills is not the answer to the more fundamental need to invest in programs that keep up with the pace of change.

We encourage the Administration to invest in large-scale new skill building that leverages the latest advances in learning sciences, digital applications and experiential techniques. These can help develop diverse talents in unique ways—combining creativity, analytical and digital skills. These efforts are necessary because even though almost half of the U.S. business leaders we surveyed identified skills shortages as a key challenge, only eight percent say their organization plans to increase investment in training programs significantly in the next three years. [11]

To do this, we recommend relevant entities, such as the National Science Foundation, promote and support basic research in the following:

Speed up Experiential Learning

From design thinking in the board room to simulation training tools for technical roles; from on-the-job training initiatives to apprenticeships. Apply new technologies like virtual reality and AI to make learning more immersive, engaging and personalized.

Shift focus from Institutions to Individuals

Incentivize each individual to develop a broader blend of skills, rather than only targeting the output of institutions in terms of graduates or certifications.

Empower Vulnerable Learners

Support older workers, those in lower skill roles or in smaller businesses, who can be more vulnerable to work dislocation and have less access to training. Offer more guidance to follow appropriate training and career pathways. Provide modular learning to suit their life commitments. Provide new funding models, such as grants and tax-free accounts, to encourage personal lifelong learning plans.[12]

Recommendation: Focus on the industrial supply chain (Industry X.0).
The United States would benefit from a more robust strategy with regards to AI R&D in manufacturing and supply chains. This is one of the areas of AI where the U.S. is at risk of falling behind Japan, Germany, and China.[13] In the age of digital disruption, U.S. companies need to rethink their business, products and services to compete with an increasingly global marketplace.

Germany has been executing a comprehensive strategy they are calling Industry 4.0[14]. It is a strategic initiative backed by the federal government to establish Germany as the leading market provider of advanced manufacturing solutions by 2020. Industry 4.0 has an official steering committee composed of private sector and civil society members, and one of the committee's goals is to grow Germany's technological leadership and vision in the fields of manufacturing, automation and software-based embedded systems, as well as historically strong industrial networks. Finally, this strategic initiative not only aims to consolidate technological leadership in mechanical engineering but to also play a role in guiding policy-makers to push forward Industry 4.0 at all levels of the public and private sector.

The United States government should consider how a coordinated, jointly funded AI R&D initiative focused on manufacturing can benefit players throughout the U.S. manufacturing sector and help the U.S. maintain global AI leadership.

Industry X.0 in action**:** The delivery of electricity has not changed for more than a century. However, digitization over the last 10 years has provided a unique opportunity to rethink the way the energy industry operates and how Schneider Electric can better serve their customers. Schneider Electric recently launched the Digital Services Factory, a new platform that has reduced the typical launch time for new digital services such as predictive maintenance, asset monitoring, and energy optimization by 80%. (Accenture)

Recommendation: Ensure the U.S. strategy for enabling technologies such as AI, 5G, quantum computing, biotech, and biocomputing are aligned.
The AI strategy should ensure that U.S. government R&D efforts in quantum computing, biotech, and biocomputing are aligned with the broader intelligent computing strategy.[15] We are aware of several important initiatives and investments in these areas by DARPA, NIH, and other key federal research agencies. As these critical enabling technologies continue to advance, they must be considered part of the larger technology ecosystem.

4G enabled the app economy, but we see 5G enabling the experience economy (extended realities, artificial intelligence). In the U.S. alone, deploying the next generation of high-speed 5G wireless networks could create up to three million jobs and add approximately $500 billion to U.S. gross domestic product (GDP) through direct and indirect benefits.[16]

And, much like quantum, biocomputing is an important emerging technology. It leverages systems of biologically derived molecules—such as DNA and proteins—to perform

computational calculations involving storing, retrieving, and processing data. The development of biocomputers has been made possible by the expansion of nanobiotechnology. This technology will bring about a new, complementary approach to classical processor architectures. In some cases, biocomputing could overcome the scale limits of quantum computing.

The European Union has developed a funding strategy to ensure continued innovation in biocomputing. This strategy also set forth the goal of "building a computer with greater processing speed and lower energy consumption than any of the most advanced computers existing today."

In addition to bio-computing, biotech is at the center of technology innovation where data, analytics and AI are completely changing our understanding of disease, wellness and patient outcomes, life sciences R&D must be a focus of the U.S. government. Biotech will be the lynchpin of self-sustainability as AI grows and dominates transportation, trade, and other sectors. Artificial intelligence can significantly accelerate growth, profitability and sustainability for businesses on the commercial side of the life sciences industry. It will have a significant impact on the food chain, health care, and the environment- all areas critical to security and global competitiveness. [17] While there are many important goals and priorities, it is essential that the U.S. keep its eye on next generation technologies.

On behalf of Accenture, I thank you for the opportunity to provide feedback. We look forward to remaining engaged in this process.

Very respectfully yours,

Paul Daugherty
Global Chief Technology & Innovation Officer

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[1] Accenture Strategy, "The New Normal: Exponential Growth Powered by AI."
[2] SAS, Accenture, Intel and Forbes Insights, "AI Momentum, Maturity and Models for Success", July 2018.
[3] Olga Russakovsky*, Jia Deng*, Hao Su, Jonathan Krause, Sanjeev Satheesh, Sean Ma, Zhiheng Huang, Andrej Karpathy, Aditya Khosla, Michael Bernstein, Alexander C. Berg and Li Fei-Fei. ImageNet Large Scale Visual Recognition Challenge. *IJCV,* 2015.
[4] McCulloh, Ian, James Burck, Josef Behling, Michael Burks, and Jonathon Parker. "Leadership of Data Annotation Teams." In *Social Sensing (SocialSens),* pp. 26-31. IEEE, 2018.
[5] Timnit Gebru, Jamie Morgenstern, Briana Vecchione, Jennifer Wortman Vaughan, Hanna Wallach, Hal Daumé III, Kate Crawford, "Datasheets for data sets", 9 July 2018.
[6] Margaret Mitchell, Simone Wu, Andrew Zaldivar, Parker Barnes, Lucy Vasserman, Ben Hutchinson, Elena Spitzer, Inioluwa Deborah Raji, Timnit Gebru "Model Cards for Model Reporting" 5 October 2018.
[7] Emily Bender and Batya Friedman, "Data Statements for Natural Language Processing: Toward Mitigating System Bias and Enabling Better Science."
[8] MIT, The Dataset Nutrition Label Project.
[9]Accenture, "It's Learning. Just Not As We Know It", October 2018.
[10] Accenture, "Reworking the Revolution", 2017.
[11]Accenture, "Reworking the Revolution", 2017.
[12] Alastair Fitzpayne & Ethan Pollack, Aspen Institute, "Lifelong Learning and Training Accounts: Helping Workers Adapt and Succeed in a Changing Economy," 24 May 2018.
[13]Accenture, "Turning Possibility into Productivity."
[14] "Germany Industry 4.0", January 2017.
[15] Kurzweil AI, "A living programmable biocomputing device based on RNA,"28 July 2017.
[16] Accenture Strategy, "How the U.S. wireless industry can drive future economic value," 2018.
[17]Accenture, "Raising the Life Sciences, Patient Inspired. Outcomes Driven. Commercial IQ With Applied Intelligence", 2018.