



ELEMENT^{AI}

AIX^{Exchange}

The Future of AI and Human Experience

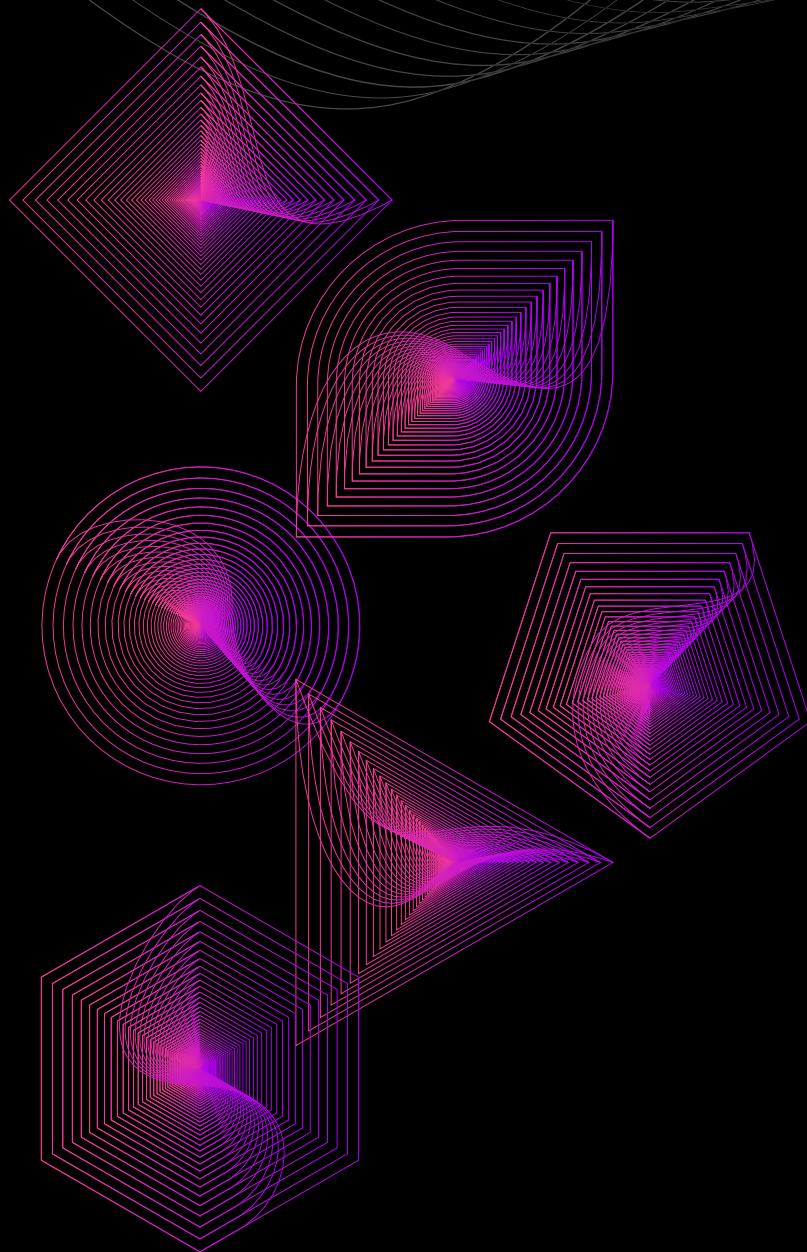


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Introduction

Welcome to the AIX Exchange

2020 felt like the longest year in recent history. With the global Covid-19 pandemic acting as a catalyzing agent, major geopolitical, social and economic changes continue to reverberate through what was supposed to be the start of a most promising decade.

For the Artificial Intelligence industry and the increasing number of companies and brands at different points of adopting the technology, 2020 did not slow AI's advancements, in fact, in many ways, it may have helped accelerate it.

Open AI's launch of GPT-3 is already being applied in ways that are **shaking up how content is written and enjoyed**.¹ And through ever-increasing amounts of personal, location and biometric data, coronavirus contact tracing has become a **great example**² of AI's power to contextualize patterns while also reminding us that without human-centric design, **ordinary people** are most likely to be negatively affected.³

And so, through the many rosy promises made by technology companies for AI's impact on humankind, it feels like the consequence of AI on humans is being glossed over. With AI, we are changing how we work, how we fight wars, how we invest our money, how we identify new drugs, how we learn about the world and **how others learn about us**.⁴ But whether we know it or not, AI is also in our most personal spaces. It informs us, entertains

us and cleans our floors. AI is very quickly being baked into appliances, cars, **toothbrushes**⁵ and **toilets**.⁶

And while industries such as the automotive industry are heavily regulated and have built a **clear roadmap**⁷ for the levels of automation in self-driving cars, until recently, there has not been clear guidance for how the AI that will permeate our personal, professional and social lives should evolve.

In January 2020 at CES, LG Electronics and Element AI launched the **Levels of Artificial Intelligence Experience (AIX) Framework**, proposing a shared definition for advancements in consumer AI while maintaining a rigorous focus on human-centric design.

The AIX Framework is a starting point but we need the expertise and forethought of multidisciplinary teams from around the world to help identify the challenges and opportunities that lie ahead for the industry and to support the adoption of this framework in a shared effort to earn the trust of consumers as they increasingly adopt AI into their lives. This report aims to begin this process.

Through interviews with developers, roboticists, anthropologists, designers, policymakers, consumer advocates, entertainment, payment and transportation brands and workers' rights leaders, we hope to bring together a wide range of expert perspectives on the future of Artificial

Intelligence as it pertains to the technology's application for human spaces, such as in the home, the car, at work and in public.

This effort isn't about answering questions but to ask them in the frame of the end-user. We hope that by raising the issues and opportunities presented by AI, we can better understand what is at stake and help shape the future through collaboration.

In this same spirit, we've developed this report primarily as a digital canvas to be explored at www.AIXExchange.com. It is designed to be enjoyed by academics, industry and the general public. Listen, watch and read about the **key themes** affecting the future of the industry, the technologies and trends that will impact our experiences.

**Welcome to the AIX Exchange:
The Future of AI and Human Experience.**

Dr. I P Park

President and CTO,
LG Electronics

J F Gagné

CEO,
Element AI



Photo: Skye Studios

About AIX

By creating devices, services, systems, spaces, and infrastructure from a human perspective that adapt to people and their needs, increasingly sophisticated AI can help unlock a new wave of growth in every-day productivity and well-being. Like user experience (UX) for AI, we call this AIX – Artificial Intelligence Experience.

In this report, we collect the perspective of AI experts and leaders in various fields such as design, anthropology, policy, consumer and employee advocacy. Each brings their own points of view on the challenges and opportunities for the future of AI and the role that AIX design should play when applying the technology for our homes, work, cars and public spaces.

Themes Overview

Guided by the [Levels of AIX Framework](#) and a focus on the end-user, as well as recent news, AI developments and interviews with expert opinion leaders, we have identified six interlocking themes that present distinct challenges for the future of human-centric AI:



Public Perception

[News / Pop Culture](#)

[Language](#)

[Marketing](#)

[Design](#)

[Education](#)

Public Perception deals with how our opinions, fears and expectations for personalized AI is shaped by pop culture, education and marketing and questions the role of business, government and the broader public in driving a more realistic and consistent understanding of the technology.



Ethics

Ethics is a hot topic in AI but hasn't been explored thoroughly through a specific consumer lens. This theme addresses how AI should be developed inclusively and takes into consideration the differing values of individuals and cultures while raising questions about responsibility for privacy and security.

[Inclusivity](#)

[Values](#)

[Governance](#)

[Data Privacy](#)

[Purpose](#)



Transparency

[Explainability](#)

[Communication](#)

[Purpose](#)

[Data Privacy](#)

[Interface](#)

Transparency speaks to the need for clear, open communication between all stakeholders and especially for the end-user. From explainable AI and clear feedback loops to managing expectations of consumers, this theme is about building and maintaining trust through AIX design.



User Experience

Feedback / Articulation

Intuitive Design

Purpose

Presence

Interface

User Experience raises questions about design functionality and purpose as it pertains to consumer devices and services. Whether running in the background or directly interfacing with users, how can we consider human-centric design principles and ensure the best possible user experience?



Context

Context deals with the environmental, cultural and personal nuances that need to be considered to ensure equitable and purpose-driven AI. Home, work, car and public spaces require different social rules, while individual personalities and values require AI that reasons, understands, explores and adapts.


Spaces

Values

Purpose

Creativity

Personality



Relationships

Collaboration

Learning

Empathy

Fallibility









Interface

Relationships is a theme that examines the role AI plays in our lives and how we interact and engage with new powerful tools as the technology advances. From human-machine collaboration and cohabitation to consumer expectations for AI that is fallible and learns over time, our relationship with technology is changing as AI becomes more purposeful, useful and embedded.

The AIX Framework

The Levels of AIX Framework is designed to help the industry, policymakers, workers, consumers – any end-user – better recognize the technological milestones that define the advancements in AI, share a common language and to support a roadmap for human-centric design of consumer AI.

Download the Levels of AIX Framework along with examples at www.AIXExchange.com/#levels-of-aix-framework

				
	Level 1	Level 2	Level 3	Level 4
Names	Efficiency	Personalization	Reasoning	Exploration
Definitions	AI facilitates specific functions with systems and devices, making user interactions more efficient and effective	AI uses pattern learning to recognize, optimize and personalize functions in order to improve and simplify interactions for users	AI uses causality learning to understand the cause of certain patterns and behaviours, this information is used to predict and promote positive outcomes for users	AI uses experimental learning to continuously improve, by forming and testing hypotheses it uncovers new inferences, seamlessly adding value to users' lives and enabling a deeper affinity
Pervasiveness In Our Lives	Familiar Systems and devices that utilize AI are appearing in user's everyday lives	Common AI is optimizing most devices at the edge and most systems through the cloud	Universal AI is everywhere and interconnected for the benefit of all devices and systems	Foundational AI forms a core component of the infrastructure for all devices and systems in society which share and learn collectively
Environmental Awareness 	Perceives Perceives specific, pre-defined information and acts on it accordingly to increase its efficiency	Recognizes Recognizes patterns and uses them to make better predictions to increase relevance for users	Understands Understands the patterns and principles across systems in order to meet predefined missions. Uses reasoning to respond to new situations by applying unique approaches	Explores Seeks to test and validate the underlying conditions of a situation by analyzing data from a broader set of external sources to inform its inferences
Collaboration 	Independent Works alone or relays commands from one system to another	Connects Connects with other devices within a user-controlled system so that the user can use one device to control others	Coordinates Understands the larger interconnected system and the function of different devices and shares learning outcomes to achieve a broader mission	Orchestrates Identifies gaps in data and user understanding then orchestrates across internal and external systems to find and apply new knowledge as it scrutinizes and optimizes its hypotheses
User Understanding 	Agent Perceives user inputs and logs past inputs	Assistant Recognizes and distinguishes users and their unique behaviours and preferences	Companion Interprets the user's mood from contextual understanding of multiple data points and reasons about social relations to predict and support how users will interact	Sage Understands how to influence users - enabling them to trust new information and approaches by providing evidence, nudging behaviours in service of a broader purpose
Autonomy 	Task-oriented <i>One-off actions</i> Can execute specific commands within specific parameters to achieve a specific task	Goal-oriented <i>Multiple actions</i> Works out various options for achieving a given goal and presents them to the user for selection or is pre-programmed to efficiently meet the desired goal	Mission-focused <i>Long-term actions</i> Understands users and its environment in order to predict, recommend and execute solutions to assigned missions	Purpose-driven <i>Exploratory actions</i> Using local context and external sources of knowledge, it balances users' competing needs and interests and is able to take creative approaches to influence user behaviours, whilst in service of the user's higher purpose

Meet the Experts

This report could not have been done without the help of organizations and experts who donated their time to provide input, advice and content.

Interviewees:

Special thanks to the following experts for providing their diverse perspectives on the topic of human-centric consumer AI:

Yoshua Bengio

Scientific Director,
Mila

Yoshua is recognized as one of the world's leading experts in artificial intelligence and a pioneer in deep learning. A recent co-recipient of the Turing Award, "the Nobel Prize of Computing" in 2019, he is a professor in the Department of Computer Science and Operational Research at the Université de Montréal and a major contributor to the Montreal Declaration for Responsible Development of Artificial Intelligence.

[Watch the Interview →](#)

Rodney Brooks

Robotician, Member of the US National Academy of Engineering, Author, and Robotics entrepreneur

Rodney is the Panasonic Professor of Robotics (emeritus) at the Massachusetts Institute of Technology and world-renowned robotics entrepreneur who founded Rethink Robotics and iRobot Corp., inventor of the Roomba robot vacuum. Dr. Brooks is the former Director of MIT's Artificial Intelligence and the Computer Science & Artificial Intelligence Laboratories and a prolific author on the impact of robots in human society now and in the future.

[Watch the Interview →](#)

Dr. Christina J. Colclough

The Why Not Lab

Christina is a foremost thought-leader on the future of work(ers) and the politics of technology. She is an advocate for global workers' rights and for the need to regulate digital tools to ensure they serve people and the planet. She is a member of the OECD One AI Expert Group, the UN's Secretary General Roadmap for Digital Cooperation and is affiliated to FAOS, the Employment Relations Research Center at Copenhagen University. Christina was named as one of the world's most influential women on the Ethics of AI in 2019.

[Watch the Interview →](#)

David Foster

Head of Lyft Transit,
Bikes and Scooters

David is an experienced technology executive who has led teams creating some of the world's most innovative products across multiple Fortune 500 companies. A Doctor of Philosophy with a Master's in Electrical and Electronics Engineering from Oxford University, David has held senior positions at Amazon, Bossa Nova Robotics and Apple. He currently leads Lyft's Transit, Bikes and Scooters line of business and also serves as VP Engineering.

[Watch the Interview →](#)

Dr. Yuko Harayama

**Executive Director of International Affairs,
RIKEN**

Yuko is one of the initiators of Society 5.0 and former Executive Member of the Council for Science, Technology and Innovation Cabinet Office of Japan. She is also the former Deputy Director of the Directorate for Science, Technology and Innovation, OECD. Previously, she was a Professor in the Department of Management Science and Technology at the Graduate School of Engineering of Tohoku University and is a recipient of the Chevalier de la Légion d'Honneur.

[Watch the Interview →](#)

Charles Lee Isbell Jr.

**Dean of Computing and John P. Imlay Jr. Chair,
Georgia Institute of Technology**

Charles is a computer scientist, researcher, and educator. He has been a professor in the Georgia Institute of Technology College of Computing since 2002, and since July 2019 serves as the College's dean. His research interests focus on machine learning and artificial intelligence, particularly interactive and human-centered AI. In addition to his research work, Isbell is an advocate for diversity in higher education, serving on numerous committees focused on advancing diversity in computing.

[Watch the Interview →](#)

Helena Leurent

**Director General,
Consumers International**

Helena, as the head of Consumers International, the membership organisation for over 200 consumer advocacy groups in over 100 countries, is a world-leading advocate for consumer rights. Prior to joining Consumers International, she worked for the World Economic Forum developing global partnerships and programmes with government, business, civil society and academia on issues such as advanced manufacturing, sustainable agriculture and humanitarian assistance.

[Watch the Interview →](#)

Bo Peng

**Portfolio Director,
IDEO**

Bo is a Director at IDEO, the leading design company known for interdisciplinary approaches and application of design-thinking. She is focused on the intersection of data science and human-centered design, helping lead IDEO's data science community. Bo recently worked in Shanghai, pushing the boundaries of human-centered data science across Asia and is an active advocate for women in machine learning and data science.

[Watch the Interview →](#)

Jeff Poggi

Co-CEO,
McIntosh Group

With previous stints at Harman International and the Bose Corporation, **Jeff** has over two decades of experience in the audio equipment industry. He is currently co-CEO of The McIntosh Group, a world leader in the high-end consumer audio industry with leading brands such as McIntosh, Sonus Faber, and Sumiko. His passion is the fusion of luxury home audio experiences into the automotive OEM market, particularly at a time when self-driving cars are poised to be an extension of people's living rooms.

[Watch the Interview →](#)

Sri Shivananda

Senior Vice President and Chief Technology Officer,
PayPal

Sri plays a critical role in helping PayPal remain at the forefront of innovation, overseeing technology. Sri leads a talented global team responsible for the company's secure, stable, and scalable global infrastructure and strategic core platform, the foundation that enables PayPal to deliver innovative products and services to consumers and merchants all over the world.

[Watch the Interview →](#)

Dr. Max Welling

VP Technologies,
Qualcomm Technologies Netherlands B.V.

Max is a professor and research chair in Machine Learning at the University of Amsterdam and a Vice President of Technologies at Qualcomm Technologies Netherlands B.V.. He has a secondary appointment as a senior fellow at the Canadian Institute for Advanced Research (CIFAR). He is co-founder of "Scyfer BV" which was acquired by Qualcomm Technologies in summer 2017. Max has over 250 scientific publications in machine learning, computer vision, statistics and physics.

[Watch the Interview →](#)

Alex Zafiroglu

Deputy Director,
3A Institute (3Ai)

Alex, an anthropologist and cyberneticist, is a Professor of Cybernetics at the 3A Institute (3Ai) at the Australian National University. Before 3Ai, Alex spent 15 years at Intel Corp. contributing to the R&D and commercial development of technology across the Advanced Research, Digital Home and Internet of Things divisions. She was appointed Principal Engineer within the Internet of Things Division and was Intel's foremost domain expert in homes and home life.

[Watch the Interview →](#)

*Please note that some of the quotations used in this report have been edited for clarity.

Please visit our [YouTube channel](#) to watch the full interviews.



Public Perception

News / Pop Culture

Language

Marketing

Design

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Public Perception of AI

Dial F For Frankenstein

"I'm sorry, Dave. I'm afraid I can't do that."

– **HAL (Heuristically Programmed ALgorithmic Computer)**, the sentient computer that controls the *Discovery One* spacecraft from *2001: A Space Odyssey*

"I am superior, sir, in many ways, but I would gladly give it up to be human."

– **Lt. Cmdr. Data**, the sentient android from *Star Trek: The Next Generation*

"I'll be back."

– **The Terminator**

The roots of science fiction (sci-fi) date back to the 2nd century AD with the novel "A True Story," by Lucian of Samosata, a satirist in the Roman Empire. However, it was Mary Shelly's *Frankenstein* (1818) and the *Last Man* (1826) that defined the sci-fi genre, which has since crept into every aspect of pop culture – from books, TV, movies, music and more.

Frankenstein offers an interesting starting point as we examine how the public's perception of AI will affect not only how consumers adopt AI-enabled products and services, but also how companies and policy-makers address the technology's transformative power.

Frankenstein as a novel is a complex story, but at its heart it is

about how scientific ambition and the creation of artificial life can have disastrous consequences. Its theme has been used over and over again in pop-culture, and which has inevitably led us all to ask – what is the price of the rapid advancements in technology, and AI in particular? Are we inadvertently creating the next *Frankenstein's Monster*? And how can we better understand how AI works so we can comfortably take advantage of all it has to offer to better our lives?

While we can dismiss the work of Hollywood as a hyperbolic warning to humanity, it becomes harder when today's leading thinkers and titans of business raise the risks, too.

Elon Musk certainly has his concerns: "AI doesn't have to be evil to destroy humanity – if AI has a goal and humanity just happens to be in the way, it will destroy humanity as a matter of course without even thinking about it, no hard feelings."¹

And **so does Bill Gates:** "The world hasn't had that many technologies that are both promising and dangerous – you know, we had nuclear energy and nuclear weapons."²

Of course, all new advances in technology that serve to change our way of life, work, and society at large are met with varying degrees of resistance or adoption. But, studies have shown that the more we view advances in technology as helping us have more control, flexibility and efficiency in life, the more likely we are to adopt them into our lives.

On the flipside, if we feel we lack control, understanding of how things work, or a general distrust of technology and the organizations offering it to us, the less likely we are to get onboard.

Designers and developers must confront two potential barriers to adoption. The first driven by pop culture, mixed messaging, and a few very public false starts by technology companies. Second, and perhaps more importantly, a healthy dose of skepticism among consumers about what the “inevitable” march of technology more broadly means to their lives and the world they want to live in.

“Technology is not necessarily evil nor is it necessarily good. We have to decide on the limits, the frames, the requirements to these technologies, and we have to imagine every single future scenario we can with the powers of these technologies,” says **Dr. Christina J. Colclough**, who runs The Why Not Lab and is an advocate for global workers’ rights in the digital age. “So we’re going to need to converse. We’re going to need to talk. We’re going to need to find out what is fair for you, what is fair for me, and how do we make this society work?”

Creators of AI-enabled products and services will be tasked with responsibly educating consumers on how this technology can have a positive impact on their lives – through transparency, accurate marketing and intuitive design. More importantly, they will need to consider taking a human-centric AI experience (AIX) approach to design, inviting end-users and other stakeholders to be part of the process.

Ironically, we can turn back to Frankenstein for inspiration on how a negative fictional story about AI resulted in something positive in the real world. After all, it was Arthur C. Clark’s influential short story “Dial F for Frankenstein”, about a super network of telephones that learn to speak to one another and eventually take over the world, that apparently helped inspire Tim Berners-Lee to invent the World Wide Web.

News / Pop Culture

Comfort zone simply not there yet

AI is becoming increasingly complex. It is not easily explained and can be confusing or even daunting to most people outside of those who work in the field. It wouldn't be an exaggeration to suggest that for many people, their only exposure to the technology is the sometimes apocalyptic way in which AI is depicted in pop culture or the negative news stories that latch on to AI projects gone bad.

But as consumers assess whether to embrace the idea that more advanced AI-enabled products and services will become intertwined in their lives, pop-culture's impact certainly cannot be ignored as it shapes how people will adopt the technology and trust the developers behind it.

"There is some public perception on AI, which is driven either by headlines of where AI has gone wrong, in some sense, and by science fiction films over the years," says **David Foster**, Head of Lyft Bikes and Scooters. "And none of that probably leads to a sense of calm and happiness with AI taking increasingly broad roles in the world around us."

The industry has taken steps to better inform and educate consumers. People understand that AI is doing useful things like helping them take better pictures on their phones, streamlining more relevant content to their social feeds, cleaning their home with a robotic vacuum, or helping them find artists they may like on their media player.

However, an **Ipsos study** taken in the UK found that 53 percent respondents would not feel comfortable with AI making decisions which affect them.³

A **study** by the Center for the Governance of AI at the University of Oxford found that 22 percent of Americans thought that technology will be "on balance bad," while 12 percent think that it would be "extremely bad," leading to the potential human extinction.⁴

Adds Foster: "We have to be a little bit careful about pushing the words AI for AI's sake, and instead to focus on the benefits that we're actually bringing to consumers and to the public that are enabled by AI, but are not there purely as a means to serve the technology of AI."

By inviting end-users into the process of AI design, we can better gauge the job to be done in terms of educating them about a product or service's value and to understand how pop culture and news media are helping or hurting the technology's adoption.



Language

More than words

Linguists and psychologists have long known that words hold power and that the words we choose often **convey unintended messages and drive unintended behaviour**.⁵ It's for this reason that we should be extra careful about the words we use to describe AI and its capabilities.

"Suitcase words," according to renowned roboticist and AI researcher **Rodney Brooks**, are words that are often overused and which get misinterpreted.

"I think people use words to describe what an AI system is doing, that then get overgeneralized," he explains. "When we say a system is learning something, people who are not familiar with AI may think of every possible use of the word 'learning'. Learning can mean 'I learned to ride a bicycle,' which is very different from 'I learned ancient Latin.'"

"Learn applies to so many different things that companies need to be careful about saying that their AI system learns, because it's going to provide too much promise that we don't have capability of. It's better to say that the system 'adapts to a specific set of circumstances.' That sort of promise sets the expectation for ordinary consumers, for how the AI system is going to change and how much."

Marketers and researchers alike choose words to describe AI's capabilities that can often lead to misunderstanding about how the systems function and

can cause consumers to be let down and turned off by the technology, when their expectations aren't met. It's one of the key reasons why tools like the **AIX Framework** were created, in order to standardize the language around AI at different levels of its development and capability.

Whether it is words such as 'learning', 'predictive', 'realistic' or 'intuitive', by choosing our words more wisely, we will be able to better deliver on the promise of AI and ensure end-users understand that the technology is essentially software. When we strip away the marketing catch-phrases, what is left is a clearer understanding of the value being delivered.



Marketing

There are ways to avoid an 'AI Winter'

Who can forget the **HAPIFork**, the “smart” fork that monitors how quickly and how much you eat, that took the 2013 Consumer Electronics Show by storm? Of course, utensils are not the only thing apparently thinking for you – the number of products deemed “smart” or “intelligent” range from watches, health apps, home systems, bikes, toys and cars.

Each product promises to revolutionize the way we live in big and small ways, but have we hit the peak of AI hype? Some in the AI industry seem to think so, and that this will have consequences for the technology’s further adoption and development.

“Marketing that’s focused on texts and specs is going to fail,” says **Jeff Poggi** Co-CEO of the McIntosh Group. “And if we keep the marketing focused on the engineers that are developing the technologies, it’s going to be a very difficult rollout. We’ve got to think about this in the terms of consumer benefits.

“We’ve got to start with the idea of how is this going to impact the emotions and the experience of the consumer and give them realistic examples of how that’s going to impact their lives. Show them the truth. Tell them how it is going to benefit them and what the experience is going to be. That’s the way we need to do it, and it has to be done enough in an authentic way.” Many of existing products have relatively simple tasks

which they perform quite well such as monitoring and automatically adjusting room temperature based on your schedule and comfort, or capturing physical activity levels and caloric intake to advise on diet and exercise.

But we are now moving into a realm where the industry is promising self-driving cars, refrigerators that monitor your food supply and diet and then order groceries for you, and robots that will take care of your household chores.

The issue is that these tasks require a tremendous amount of data and an AI system that can effectively process this information to provide real value. The challenge is to ensure we’re setting expectations about what these products can actually do right now.

This is an issue, and one the industry has faced in the past. “AI Winter” refers to a setback in the development of AI as a result of a lack of enthusiasm among consumers and investors. Typically, this begins when the AI community itself begins to see its own limitations. This pessimistic outlook is then picked up on by a number of outside influencers, including the media, which creates a negative feedback loop. This has already occurred in the 1970s and 1980s.

It could be argued that this time, given the significant advances in technology across all facets of our lives, the backlash will come from consumers

who simply expect more. Indeed, consumers are constantly flooded with endless promises of how technology will make their world a better place.

This has resulted in people trusting their devices more than they should – like letting their car self-drive exceptionally long distances, along busy highways only to end up in a fatal crash. The car isn't yet "smart" enough to handle all the variables thrown its way. While this is an extreme example, it's these types of instances where expectations do not align with reality and serve as a wake-up call to the industry.

"In the companies that I've started, I've always told our engineering teams that what you're going to deliver to the final customer is going to be really disappointing," says **Rodney Brooks**, the Panasonic Professor of Robotics (emeritus) at MIT. "It's not going to be at the cutting edge because we can't afford to have our products grow up out there with a real user. So we're going to be really careful with what we put out there and what we deliver. And we're not going to be going as fast as science fiction movies expect us to be. It's just the reality in order to provide something that people can feel comfortable with."



Design

Visual, purposeful, powerful

Consumer-facing technologies have always tried to apply designs that reflect a futuristic aesthetic. One of the most popular components of auto trade shows, for example, is the concept car, which often prototypes new technologies and packages them in the era's current fantasy of the future.

And while this can be a valuable market research exercise for automakers to understand which technologies are ready for consumer applications in vehicles, such an approach for consumer AI can very easily be misinterpreted, raising expectations about the power, function and role of AI in any given device or service.

From advertising to product packaging to news articles and children's toys, the term 'AI' is as over-used as the iconography that usually accompanies it. [Search for 'artificial intelligence'](#) in Google's image search and it becomes immediately clear what are the visual tropes associated with the technology: cybernetic-looking brains with circuit board synapses, superimposed over human-looking robots.

Perhaps this is a natural part of the hype that precludes new technologies that are meant to usher us into the future. However, it's important that the media and businesses building consumer AI applications consider the implications of the visual language they employ, as it can lead to oversimplification of a technology with very real implications on privacy and security.

"I think the biggest barrier for the adoption of AI is by end users out in the world is simply calling it AI," says [Charles Isbell](#), Dean of Computing at Georgia Tech. "When people say AI, they have this kind of notion in their head of the Terminator or some kind of intelligent computer how telling you 'I'm sorry, you can't do that Dave', and they're not thinking about it as simply intelligence and automation augmenting what you're doing, or simply being smart about what you are. But it's also an illogical reaction, because people have been adopting AI for years and even decades, they just haven't been calling it that."

And so AIX design becomes an ever important concept for researchers, designers, developers and companies to consider, as the user experience will be AI's biggest marketing lever. A good experience that delights and surprises travels just as fast through social media as a poor experience. It is the reason why global design companies like [IDEO](#) are tasked by technology brands to take an interdisciplinary approach and apply design-thinking early in a product's development. [Bo Peng](#) is a Director at IDEO, helping lead the company's approach to designing for AI experiences.

"I think human-centered design of AI products and services is really important. At its core, it's very simple. It's that when building out a product or service, to keep the end user in mind, but not

just to keep them in mind in terms of having a list of requirements or having a faceless name up on a board, it's really actually keeping them in mind as human beings. They have needs and wants, desires and pain points. It's to think through how they might interact with your AI-driven product or service from a holistic point of view. It may not actually matter to them what kind of technology you've built on the back end or how it works, or even how you would like for them to use your product. To me building AI products is not just about using the best technology that researchers can offer... what I really care about is helping them see the effects of what their technologies have on their prospective customers or their perspective end-users."

"When people say AI, they have this kind of notion in their head of the Terminator or some kind of intelligent computer how telling you 'I'm sorry, you can't do that Dave', and they're not thinking about it as simply intelligence and automation augmenting what you're doing, or simply being smart about what you are."

CHARLES ISBEL

Dean of Computing at Georgia Tech



Education

AI must be understood before it can flourish

One step in helping people move from a general distrust in AI towards acceptance lies in helping them understand how it all works. The more we talk about AI and see the incremental benefits it can have on society; the more willing people will be to accept it into their lives. We need to foster technology literacy, help the general public understand how AI actually works, help them understand their rights as consumers, and how best to collaborate with AI to help bridge the gap from sci-fi to reality. Further, companies, governments and academics need to create and openly promote a framework that protects consumers from privacy and security threats, as well as define our “data rights” in a way that is accessible to consumers to make them feel empowered and safe.

“Technology literacy is not only important for the people who are building the systems to help them think about the impact of what they’re building,” adds [Isbell](#). “It is at least as important, perhaps more important that we teach people who are not going to build those systems, but are going to be impacted by those systems, to think about what those implications are. And that has to start as early as possible.”

Even how we speak about AI should be taken into consideration. Tech-speak and programming jargon only serve those who are entrenched in the development of AI products and services. A common understanding of AI and its capabilities that reflects different cultures, countries, and beliefs will help us better interpret and understand how AI

is impacting our lives. This should be baked into education in the form of AI literacy so that consumers of all ages can better understand and harness AI’s potential without falling for the hype.

“Awareness and education for consumers is absolutely critical, but it goes beyond that,” says Helena Leurent, Director General, Consumers International. “It’s about actually engaging with consumers in the design of these new technologies or approaches or services. It’s about bringing consumer advocacy into the upfront stage, as opposed to it being at the backstage of the process. It’s about having principles that think about vulnerable consumers at the very start. It’s about making a level playing field so that the best practice becomes closer to the norm.”

"Awareness and education for consumers is absolutely critical, but it goes beyond that. It's about actually engaging with consumers in the design ... it's about bringing consumer advocacy upfront, as opposed to it being at the backstage of the process. It's about having principles that think about vulnerable consumers ... It's about making a level playing field."

HELENA LEURENT

Director General, Consumers International

From Perception to Reality

It is worth remembering that the AI story is in its early stages, particularly for the sorts of consumer-facing AI that is proliferating our homes, cars, offices and public spaces.

If we are to believe Hollywood or product marketing, however, it is easy to understand why many people do not trust AI-powered products, as there has been a tendency to over-extend the metaphors and capabilities of the technology. Like the Netflix documentary, [The Social Dilemma](#), has demonstrated, the industry and researchers may have good intentions when developing new technologies, but there can be real consequences for consumers and real backlash for companies when reality eventually overcomes the promise.

For this reason, public perception of AI is an important but often overlooked component of a burgeoning new technology and has implications on whether society trusts, fears and ultimately embraces it.

Longer-term, the industry should consider an AIX design approach that brings end-users into the process much early on, creating AI literacy through education and by moderating the marketing messages and images to properly inform and manage expectations, while at the same time ensuring deeper understanding of the risks and rewards of AI as we adopt it into our lives.

AI in Pop Culture

Throughout history, science fiction has inspired, influenced and shaped the public's viewpoints towards AI. Here are five classic examples that have left an imprint on our current perception of the technology.

01.

A.I. Artificial Intelligence

Directed by Steven Spielberg and inspired by sci-fi author Brian Aldiss' short story 'Super-Toys Last All Summer Long', this movie depicts the first robotic child, David, programmed to love and coexist as a member of the family.

02.

2001: Space Odyssey

Inspired by futurist Arthur C. Clarke's short story 'The Sentinel', Stanley Kubrick's oscar-winning film inspired a generation of sci-fi filmmakers. The movie depicts an expedition by humankind to Jupiter where they are accompanied by a sentient supercomputer named HAL 9000 who takes control of the spacecraft.

03.

Terminator Films

Forever enshrining the phrase 'I'll be back', the original 1984 American sci-fi film was directed by James Cameron and starred Arnold Schwarzenegger. In the films, unbreakable machines travel through time to stop or enable an AI general superintelligence called Skynet from eradicating human life.

04.

Star Wars

Produced by George Lucas in 1977, this sci-film became a pop-culture sensation expanding into television series, videos games, novels and comics. Set a long time ago in a galaxy far, far away, many of the stories involve robots with varying degrees of intelligence. Two of the most famous, golden C-3PO and quirky R2-D2 displayed emotion and personality that has since made them iconic characters in the franchise.

05.

Star Trek: The Next Generation

Set in outer space many years in the future, TNG's most famous android is the popular Lieutenant Commander Data, played by Brent Spiner. A synthetic lifeform with a positronic brain, Data's curiosity for human behaviour eventually leads him to become equipped with an emotion chip.



Ethics

Inclusivity

Values

Governance

Data Privacy

Purpose

Ethics is a hot topic in AI but hasn't been explored thoroughly through a specific consumer lens. This theme addresses how AI should be developed inclusively and takes into consideration the differing values of individuals and cultures while raising questions about responsibility for privacy and security.



AI Ethics

Living rooms as laboratories

The old anecdote, 'the road to hell is paved with good intentions' has proven true many times throughout history. Studies of business ethics show that most misbehaviour is not due to malice but is a result of people's inability to plan for their own missteps. Said another way: People tend to think they are good and right, even when they are wrong.

The problem with AI, however, is that it doesn't truly think in the conventional sense and its intentions aren't inherently good or bad. For AI, the road is often paved with messy data gleaned from imperfect humans, which then often leads to imperfect results.

The fact that AI systems are inherently fallible has been shown again and again in recent years. From applications of the algorithm **PULSE**, that turned **Barack Obama Caucasian**¹, to an inherently racist facial recognition system that claims to **predict whether someone is a criminal**², AI, in many ways, is helping to show, not that the technology is biased, but that humans are, and not always in ways that we expect. It's a result of the big data adage, 'garbage in, garbage out.'

While imaging applications present obvious ethical challenges concerning the application of AI, this is only scratching the surface of the challenges that we face in creating equitable, representative, socially and culturally-fluid artificial intelligence systems and devices.

Yet the AI that is becoming commonplace in our pockets, on our bookshelves and in our cars, is gathering increasingly more data with little industry oversight or accountability. So while ethics is an area that is already covered heavily by **countless** manifestos³ and frameworks it **can be argued** that most are difficult to implement in practice.⁴

Therefore, in the context of Artificial Intelligence experience (AIX) design, ethics must also consider a practical, human-centric approach that considers what end-users consider ethical or dangerous or valuable.

The European Commission's **Ethics Guidelines for Trustworthy AI** is a great example of the role that governments can play in shaping the industry and ensuring the protection of common citizens.⁵ Countries from **Canada** to **China** have similar lofty frameworks.^{6,7}

But as 2019 Turing Award-winning AI researcher, **Yoshua Bengio** describes it: "Human centric means to take into consideration the human aspect of how the tools are going to be used, for what purpose, and what's the consequence for humans who use the tool. And it's important because those tools are becoming more and more powerful."

**"The more powerful the tool is, the more
we need to be careful about how to use it."**

YOSHUA BENGIO

Scientific Director, Mila

When we imagine AI ethics we may imagine AI-enabled fighter pilots, like the one that annihilated a human combatant in a **DARPA-sponsored simulated dogfight**.⁸ But while the technology's application in the theatre of war is progressing, there is also an acknowledgement of the need for accountability, as seen by the recent convening of **100 military officials from 13 countries** to discuss the ethical use of AI in battle.⁹

And as human-centric AI becomes foundational to our lives, the threats posed by AI will not be on any battlefield, it will be in our personal and public spaces.



Inclusivity

AI for one or one AI?

When you see the general lack of diversity in the field of science and technology, it is easy to deduce that lack of representation in the laboratories of universities and tech companies is a key factor for much of the bias that we currently see in AI systems.

A study published last year by the AI Now Institute of New York University concluded that there is a “diversity disaster” perpetuating biases in AI. According to the report, only 15 and 10 percent of AI researchers at Facebook and Google, respectively, are women.¹⁰

But the solution to simply encourage inclusivity can actually cause additional harm. According to the same study, the focus on encouraging ‘women in tech’ is too narrow and likely to privilege white women over others. “We need to acknowledge how the intersections of race, gender, and other identities and attributes shape people’s experiences with AI,” the report states.

And while gender diversity is important, ethnicity, religion and disability are only some of the other factors that need to be considered when building inclusive AI systems. For instance, [Black in AI](#) and [LatinX in AI](#) are organizations dedicated to increasing the presence of Black and LatinX people in the field of Artificial Intelligence.

However, these organizations are rooted in the U.S., one

of the major global AI hubs. As the technology becomes more commonplace in the personal and professional lives of people around the world, how can we ensure all populations, regardless of income level, are able to benefit from their collaboration and cohabitation with AI?

There are already many global initiatives that aim to support a more equitable future for AI by ensuring better representation in the lab. [The African Institute for Mathematical Sciences](#) hosts The Next Einstein Forum (NEF), which focuses on building a platform for Africa’s innovators to collaborate with the rest of the world.

This and many other such initiatives across [Africa](#), [Asia](#), the [Middle East](#), and [South America](#) will hopefully provide greater perspective for the companies creating consumer-focused technologies. As Chioma Nwaodike, a Nigerian lawyer puts it in [a recent blog post](#), “It is essential that we engage in discussion about artificial intelligence from a developing country perspective in order to better understand how emerging technologies impact regions and countries differently depending on social, economic, and political conditions.”

[Charles Isbell](#), Dean of Computing at Georgia Tech is also an advocate for advancing diversity in computing. He believes that diversity is a good place to start when looking at how we can build the most equitable and accessible AI solutions:

"When we talk about human centered design, about bringing people into the conversation, we have to be very careful because we don't just mean bringing in someone. We mean bringing in multiple people because we're not just designing something for a specific person or even a specific kind of person, but designing it for broad swaths of people. Otherwise you're actually limiting not only what the capabilities of the system are, but you're also limiting access to the support from a broad set of people.

"So if you don't have diversity among the people who are doing the designing and the people doing the testing, the people who are involved in the process, then you're all guaranteed to have a narrow solution, which will, as these tools get more and more powerful, become more and more dangerous for more and more people and hurting more and more people because they are focused over here."



Values

End-users' ideologies should come first

Having more inclusive and diverse teams creating consumer AI is important, but what happens when the most successful companies buy up smaller competitors, consolidating their power over the technology that is foundational in our lives? Even when other regions try to build their own AI industry, they **still rely heavily on the big players** and so adopt many of the values associated with those companies.¹¹ Does AI then become a soft power tool like Hollywood or K-Pop?

The most obvious example is the consolidation of global AI supremacy between the U.S. and China. The decoupling of technology between these countries is often made on ethical grounds rooted in fundamental differences in ideologies and values.

With decoupling, **there is an expectation** that technologies, including those related to financial systems, healthcare and AI-driven consumer products and services will be created in isolation.¹² This will likely lead to multiple, incompatible systems that map to the values of the systems in which they were designed. And **while both sides argue their moral superiority**, as always, it will be everyday people who pay the highest price.¹³

Concerns like these have resulted in increasing calls for AI to be designed in ways that take into consideration universal human values as well as more nuanced, cultural ones. **According to an industry framework** proposed

"It isn't just the government anymore that is taking public actions, but every single private entity, they have to feel this responsibility for society, because their products have a huge impact on the function of society."

DR. YUKO HARAYAMA

Executive Director, International Affairs, RIKEN

Former Executive Member of the Council for Science, Technology and Innovation Cabinet Office of Japan

by Element AI and LG Electronics at CES 2020, as AI advances to level three, the AI systems will use causal learning to understand the root of certain patterns and behaviours to predict and promote positive actions.¹⁴

AI at this stage will understand the larger interconnected system of our home or car and function of different devices, sharing learning outcomes. However, how will we be able to ensure the values of the individual, their culture, **spirituality**, and social expectations are also shared between the systems, especially if those systems originated from

competing companies with conflicting value systems?

"It isn't just the government anymore that is taking public actions, but every single private entity, they have to feel this responsibility for society, because their products have a huge impact on the function of society," explains **Dr. Yuko Harayama** of RIKEN and former Executive Member of the Council for Science, Technology and Innovation Cabinet Office of Japan.

"That's why it's not just about maximizing their profits as business school taught you, but taking the responsibility, in the way that the action will have an impact on society. it's up to us because we are all human beings and that means you are responsible for your action, including your action within your company."



Governance

Humans, not machines, must decide what data to share

As adjacent technologies such as the Internet of Things (IoT), 5G and edge computing continue to develop alongside AI, there are serious concerns regarding our personal information security and the overlap of AI systems owned and operated by our employers, our **landlords**, our educators and governments. There are many ethical questions that we need to answer regarding the prioritization of these various systems and the ability for users to override them.

In her recent work with the Japanese government, **Dr Harayama** was one of the initiators of Society 5.0, a conceptualization of the city of the future whereby AI systems and other technologies have become foundational.

To achieve a modern and safe Society 5.0, the research argues that we must establish environments with robust cyber-security and safety. It is especially essential to develop technology that enables us to choose how much personal data to share, the level of individual privacy to be protected, and what kind of information can be used publicly.¹⁵

How then should researchers consider the development of AI technologies that enable people to control their own safety features, to explain the processes and logics of the calculations and decisions made by the AI and to provide interfaces that smoothly perform transitions of control from AI to humans, especially in emergencies?

Even more concerning is the human-machine collaboration that may take place between powerful AI systems and bad actors. Recently, researchers **from the University College London (UCL) listed 20 AI-enabled crimes** based on academic papers, news and popular culture. Many, such as using driverless vehicles as a weapon, illustrate that the biggest threat from AI is actually from humans.¹⁶ Do developers then need to also consider all the ways that people can misuse their applications? What is the role of government? Can they even keep up with the change?

"I think most of us who live in a modern democracy, think there's a place for government to make certain regulations, which make our lives safer," explains renowned roboticist and inventor **Rodney Brooks**. "You know, we expect that there will be rules on freeways. Cars have to have certain safety features. People have to drive them under certain restrictions. But as we have AI coming along, often the rule makers are not as in-tune with what is possible and what is real. And so the rules sometimes come down a little too heavy handed."

Fellow AI researcher, Dr Max Welling, VP Technologies at Qualcomm Technologies Netherlands B.V. agrees:

"When these devices become increasingly more complex, how are you going to certify something that is changing? We certify airplanes and cars, which are

already extremely complex pieces of engineering. But if these things become self-learning, this becomes increasingly challenging to do. And so overcoming that barrier of certifying these things so that we can sort of guarantee that the device is safe and privacy-preserving for the people that will use it and also fair and all these other dimensions which are important...this is a truly interdisciplinary effort. We should not leave these questions to the technologists. I find this very important because we have a very limited view of the world."



Data has a better idea

Ethics

Photo: Franki Chamaki

Data Privacy

The future risks of obsolete AI

Artificial intelligence systems need ‘checks and balances’ throughout development. But currently there are few safeguards for consumer AI, which is seen as less harmful than AI focused on industry or military use. However, as our personal AI systems become more sophisticated and interwoven with other systems, they may become more susceptible to abuse. This is why their human-centric design will become paramount in **ensuring trust** and adoption.¹⁷

While many of Hollywood’s most entertaining examples of AI endangering humanity revolve around super-sentient computers and overly ambitious robots, one of the biggest threats for everyday people will likely come from the technology turning off.

“Human centric sometimes gets used to refer to paying attention to the end user who is using the system and or as being impacted by the system,” says **Alex Zafiroglu**, Deputy Director at the 3A Institute. “To be truly human centric I think we need to be paying attention to humans across the entire development and deployment and decommissioning cycle of these AI solutions.”

As AI proliferates and becomes foundational to our lives, there will be many systems that we depend on for our well-being that run silently in the background. Whether it is a smart mirror that reminds you to take your medicine or the AI that controls the electricity usage in your home,

what happens if the manufacturer goes out of business or neglects the older model that you’ve become accustomed to? In most developed countries, things like water, electricity and even the internet have become essential services. Will artificial intelligence systems be the same?

“When we think about the challenges to consumer adoption of AI enabled services and solutions. I think one of the biggest things we need to consider is what data is being collected, who is collecting it, where it is staying and how it is being used and reused,” says **Zafiroglu**. “And so the barrier, I think, is transparency in the use and collection of data. We should be talking about how do you know what you know about the world and how do you categorize and make sense of the things that exist in the world, and then act upon those things.”



Purpose

Data handshakes and firewalls

In some ways, data privacy and AI are like oil and water. On one hand, deep learning models require massive amounts of data to learn, improve and offer the sort of experience that we want from AI. Yet on the other hand, as more applications become available and every appliance in our homes becomes 'smart,' there is little understanding amongst the public that our living rooms are becoming laboratories, using our very own data to serve us up improved, more personalized experiences.

As the Netflix documentary [The Social Dilemma](#) highlighted recently to so many people, we the users are the product that is being sold and that our own data can be used against us.¹⁸ Our society constantly reinforces the importance of personal privacy, yet we readily hand it over for a chance to win a free trip. So what are the implications then when AI that is meant to serve a useful purpose in our lives, is also gathering, storing, sharing and using that data to become better at doing the things we want it to do?

Purpose is an important concept, as is the **context** of the data and systems that we share it with. We may feel comfortable sharing our health data with a health app and work data with our employer, but as the Covid-19 crisis has shown, our homes have now become the central hub for health and work, not to mention entertainment, food, education, banking and our social lives. So it becomes ever more important that AI experience design takes into account the ways that we use

and share data so that we can build appropriate handshakes to enable our AI to achieve its purpose while creating appropriate firewalls that keep certain data in its place.

Bo Peng, Director at IDEO works with clients to ensure that clear purpose is baked into solutions and that the data AI solutions are built on don't betray that purpose.

"The existence of bias in an AI driven product or service is really an inevitability at first in the sense that there is nothing that we can think through hard enough. Now there are no silver bullets but what I can offer is that, through many of the projects that we've been part of, we've come up with a couple of principles, to help design this process. First, recognizing the data is not truth. At the end of the day, the mechanism that was designed to collect that data was architected by a human being. There are inherent biases, not only in the accuracy of the data, but also just in the decision of what data to collect and what data to not collect."

Asimov was onto Something

There is no shortage of ethics discussion regarding AI and that's a good thing. Already, we're seeing certain changes that are having a positive impact. For example, [according to IBM's study](#), 85 percent of global AI professionals thought the industry has become more diverse in recent years. Most of respondents said that diversity has had a positive impact on AI technology.¹⁹

Similarly, questions about applying human values, an increased awareness of human-centric design and the creation of safeguards for ensuring security and deterring the misuse of AI systems is being considered much earlier in the process. But we must remain diligent in these efforts.

The many ethics councils and committees being set up around the world, while important, are also perpetuating the challenges of such technological colonialism.

As [Sri Shivananda](#), Senior Vice President and Chief Technology Officer at PayPal says, "We already live in a world where experiences around us are being powered by AI. What keeps me up about AI is the immense power that it brings to the table. That power comes with a lot of responsibility and that responsibility is something that all of us in the industry have to treat with respect."

"What we are all doing is taking from these first experiences, understanding the obligations that we have to the customers, to communities, and to the whole planet to make sure that we actually put guard rails around what AI can do. We must collaborate across the industry to create new standards and best practices around how AI should be implemented and then adhere to those codes of ethics."

For consumer applications of AI to become successful in our most personal spaces, human-centric design becomes imperative, as does education and then accountability. Frameworks like the series of principles set by the [Future of Life Institute](#), can be helpful guides, but the industry, policymakers and consumers themselves need to ensure they are followed.

As one of the earliest people to begin thinking about the ethical challenges posed by artificial intelligence, American writer Isaac Asimov once said, "I could not bring myself to believe that if knowledge presented danger, the solution was ignorance. To me, it always seemed that the solution had to be wisdom. You did not refuse to look at danger, rather you learned how to handle it safely." Indeed, the path forward for AI should be guided by intellectual curiosity, care, and collaboration.

So how then do we address the ethical challenges posed by a technology that learns from our own fallible character? How can we ensure consumer AI is designed with the best intentions, with accessibility, inclusiveness and without human bias? Currently, there are no right or wrong answers, but there are many interesting questions that can help us set off in the right direction.

"Well, I'm by nature optimistic, but I also realize that you can't just look at one side of the coin," says [Bengio](#). "You also have to look at the danger and listen to the people who are raising concerns. And so, I think we need companies, governments, citizens... we need to brainstorm together about how we organize the rules of society, which is the laws that govern our businesses so that we move together in a good direction."

AI for Good

While many of AI's depictions in film and TV show the technology threatening humans and despite recent news relating to AI being employed for potentially harmful purposes, the fact is that it is a tool, and a powerful one at that. In fact, AI is already making our lives better. Here are five examples of AI being used for good:

01.

Healthcare

AI is increasingly being used to assist medical professionals to provide better patient care, advise on the best treatments, identify new drugs, speed up clinical trials and **detect breast cancer** to name a few.

02.

Human Rights

From **finding missing people through facial recognition**, to tracking twitter abuse against women, AI is impacting human rights issues that have previously been neglected.

03.

Education

Colleges and universities face challenges of disengaged students, high dropout rates and the inefficiency of the old school **"one size fits all"** approach to education. AI has helped solve this in some ways by enabling personalized learning giving students a tailored approach to studying based on individual needs.

04.

Global Hunger

AI is playing a vital role in increasing **agricultural productivity**, helping end global hunger and reach the **UN Sustainable Development Goals**. From predicting food shortages, recognizing pest outbreaks to improving yield, AI is helping put food on the table of billions of people.

05.

Climate Change

From predictions on how much energy we use to efficiencies in supply chains, the discovery of new materials and removing CO2 from the atmosphere, **there are many ways** that AI is being used to reverse the damage we've done.

An abstract graphic consisting of numerous thin, light blue lines that form a series of nested triangles, creating a sense of depth and perspective. The lines are arranged in a way that they appear to recede into the distance, with the triangles becoming smaller and more densely packed as they go further back.

Transparency

Explainability

Communication

Purpose

Data Privacy

Interface

Transparency speaks to the need for clear, open communication between all stakeholders and especially for the end-user. From explainable AI and clear feedback loops to managing expectations of consumers, this theme is about building and maintaining trust through AIX design.



Transparency

Much must happen before it can be achieved

trust [truhst]

noun

- reliance on the integrity, strength, ability, surety, etc., of a person or thing; confidence.

verb (used without object)

- to rely upon or place confidence in someone or something (usually followed by in or to):

To trust in another's honesty; trusting to luck.

- to have confidence; hope:

Things work out if one only trusts.

techlash [tek-lash]

- a strong reaction against the major technology companies, as a result of concerns about their power, users' privacy, the possibility of political manipulation, etc.

If you are a human reading this, you know all too well the importance of trust in a relationship. It can take years to understand and trust a person before we open up to them, confident they will care for us and have our backs. Similarly, before we provide sensitive information to a business or other institution, we must believe that they will responsibly use and protect that information in exchange for helping us live a better, more productive and fulfilled life.

It's through understanding that we can assess our sense of safety and security in someone or something else. It can take a long time to build trust, and a very short time to lose it.

For decades, **consumers have placed more trust in the technology sector**¹ to do the right thing compared to other industries such as energy, automotive, telecommunications, and financial services. Yet there are signs that this is changing. Data breaches, "deep fakes" on social media, blatant misuse of sensitive information for profit, and the growing dominance, some would say monopolistic tendencies, of technology companies in our daily lives have helped to erode this trust.

A recent Capgemini **report** demonstrates how this is impacting people's trust in AI: 75 percent of respondents said they want more transparency when a service is powered by AI; 73 percent want to know if AI is treating them fairly; and 76 percent think there should be further regulation on how companies use AI.²

Meanwhile, in a recent global **study** by Edelman, 61 percent of consumers felt the pace of change in technology is too fast; 66 percent worry technology will make it impossible to know if what people are seeing or hearing is real; and 61 percent feel their government does not understand emerging technologies enough to regulate them effectively.³

"For consumers to be able to trust the [AI] experience, they have to trust the organizations that are actually dealing with all of their data. Data is the raw fuel on which AI runs the relationship between a customer and a company and it is

based on the trust they build over time,” says **Sri Shivananda**, SVP, CTO, PayPal. “When a customer can trust the platform or the company that is delivering experiences based on AI, they begin to implicitly trust the AI behind the experiences that they are being put in front of them.”

The Capgemini study reinforces the point – 62 percent said they would place higher trust in a company whose AI interactions they perceived as ethical; 59 percent would have higher loyalty to the company; and 55 percent would purchase more products and provide high ratings and positive feedback on social media.

Transparency, then, becomes an imperative lens through which AI developers, policymakers and end-users should approach AIX design. In order to ensure there is adequate information exchange between end-users and the technology, we must consider important questions about explainability, purpose and data management, but in a way that is different than the debate around ethics.



Explainability

Inserting humans in the decision-making process

As machines continue to play a larger role in making decisions that impact a person's life, it will become more important for these machines to explain the process made to come to these decisions.

"We have to try and introduce or enable trust in these systems," says **Dr. Christina J. Colclough**, who runs The Why Not Lab and is an advocate for global workers' rights in the digital age. "And the way that we can do that is by having demands for transparency, fairness, and auditability, so that humans don't feel that they are controlled by this algorithmic system, which knows more about me than I do."

In essence, companies must open up the "black box" to let consumers and regulators know what's going on under the hood and determine if AI's recommendations are fair, accurate, reliable and in a person or society's best interest.

"Just like with anything that is powerful, when people don't see it and they don't understand it, they end up fearing it and therefore avoiding it," adds **Shivananda**. "It is important to make sure that as we build AI-based experiences with the use of technology, we need to build explainability into the process. A customer should be able to see why something happened on a product or an experience and platforms need to be able to explain why any choice was made."

This becomes increasingly important in areas such as healthcare and autonomous driving, where an AI system's decisions could be a matter of life and death. Many companies, including Google and IBM have already made commitments in this area.

The extent to which we approach explainability will vary in an effort to balance the need for privacy and security and accuracy – if we reveal too much, can the system be gamed or compromised? Without some effort to address explainability, however, developers will be leaving themselves open to questions and criticism.

Explainability, then, helps place humans in the decision-making process. First, by understanding how decisions are made, and then by providing the necessary context for users to further refine and optimize their AI experience. As a result, users can feel more confident not just in how AI may be advising them on more routine day-to-day activities, but also in more serious matters, such as critical healthcare or other areas where an autonomous decision will have far-reaching effects on a person's wellbeing.

"Just like with anything that is powerful, when people don't see it and they don't understand it, they end up fearing it and therefore avoiding it. ...A customer should be able to see why something happened ...and platforms need to be able to explain why any choice was made."

SRI SHIVANANDA

Senior Vice President and Chief Technology Officer, PayPal



Communication

Know thy customer

There are clear benefits to AI-enabled products and services across a number of industries. The healthcare sector, for one, stands to make great strides in using AI to deliver better patient care. Cities incorporate AI to improve traffic flow and aid in urban planning. At the consumer level, there are myriad products currently on the market and in development that are having a positive or negative impact on people's personal and professional lives. These early experiences do help improve trust, assuming everything goes well.

As AI becomes more ubiquitous though, a clear communications plan outlining how it will impact consumers or citizens is more important than ever if we want to quell any unrest and create trust.

"When it comes to building AI-based experiences for our customers, all of us should think of the trust with the customer as the final line not to cross," adds Shivananda. "Trust must be demonstrated through everything that a customer sees about the company – the core value system, how we execute, how do we treat them when they call us, how do we make it right when something goes wrong. As long as it is all centered around the customer."

A great part of the responsibility will lie with marketers and corporate communications professionals. They must put people at the center of any communications effort. Know thy customer! What are their fears, concerns, needs and

wants? What is their level of understanding of AI? What perceptions do they hold, both positive and negative? And what other forces in society are influencing their opinions?

To address these questions, communications professionals should consider outward messaging that outlines the clear benefits of their AI product; demonstrates how it works to achieve these benefits, with real examples; ensures the consumer feels part of the process by letting them interact and "teach" AI to better understand them and clear the perception of inherent biases; truthfully reacts to misinformation or preconceived notions; and reassures that the AI-enabled product or service has their best interests and safety in mind.

Jeff Poggi, Co-CEO of the McIntosh Group sees simpler more accessible communications as a key enabler for consumer adoption of AI.

"You have to have an honest, authentic conversation with your consumers so that they know exactly what's going on. The challenge with that is, unfortunately the legal system and it makes it really, really hard for businesses. There's not one of us that has ever read all the disclosures to your music service agreement that you sign when you sign up for Spotify or Apple music or whatever, it may be. The length of these disclosures are minor and while they may seem

simple and people basically write them off today. The transaction of the future, if it's sharing more of my personal data, I probably need to understand what's going to happen with my personal data a little more. We need to find a way to really bring the sort of legal framework down to a very simple, easily digestible, understandable level, so that it's not too complex because that's what will scare people away."

Communications then, as it relates to the larger theme of transparency, is an essential component of AI experience design. End-users will have much better experiences when they have better understanding and realistic expectations for the technology. Coupled with explainability, communication then provides a continuing narrative by which end-users can relate their own experiences and to derive the most value from AI services and products.



Purpose

Power and potential aren't enough

As AI advances it will become more ubiquitous while constantly learning to seamlessly add value to a user's life. Using local context and external sources of knowledge, this "purpose-driven AI" balances a user's competing needs and interests and is able to take creative approaches to influence user behaviours, all in the service of the user's higher purpose.

The technological and, more importantly, ethical considerations to achieve this, however, strike at the very core of what it is to be a human being.

One only has to look at themselves to understand the complexity in asking users to adopt an AI-driven life – we have a persona for work, home, friends, people in our professional network, at the grocery store, in a job interview, on vacation, and on it goes. AI must be mindful of the boundaries within each of these personas and do so in a way that helps the user, but doesn't necessarily begin to alter or influence their life in a significant way – by crossing work and home life, or providing recommendations for overtly commercial or perhaps subtle nefarious ways.

"How do we maintain our human rights, but also what I call our right to be human?" asks Dr. Colclough. "How do we avoid the commodification of people, so they're not just seen as numerous data points and algorithmic influences, but the human you are – with your beauties, your bad

sides, your good sides? How do you remain relevant and wanted and prioritized in this very digitalized world?"

You could consider all the internal and external inputs and outputs of data like a supply or value chain. Streams of data – contextual, emotional, factual, personal, commercial, cultural – are delivered on single or interconnected roads from myriad sources to AI-enabled products that now surround your life at work, home and play. The level of trust we're asking of consumers to essentially let algorithms, and the developers behind them, run their lives is immense.

"The human brain is a marvelous piece of computing equipment. And we don't quite fully understand all of the calculations that we are subconsciously making as we go about the world today," says **David Foster**, Head of Lyft Bikes and Scooters. "Therefore, how do we model those [calculations] so that AI can make equivalently good decisions?"

It will become critical then, to be transparent and openly communicate the "purpose" of an AI-enabled product or service so that consumers can assess whether the AI is "successful" – or if the assigned purpose is even the right one for them.

This can be translated then into an easy equation for developers and companies building AI systems and

“How do we maintain our human rights, but also our right to be human? How do we avoid the commodification of people, so they’re not just seen as numerous data points and algorithmic influences, but the human you are? How do you remain relevant and wanted and prioritized in this very digitalized world?”

DR CHRISTINA J. COLCLOUGH

Founder, The Why Not Lab

products: AI without purpose is without value. And if AI doesn’t add value to our lives, then we will see it as simply intrusive in our lives and we will reject it.

Our purpose, and the purpose of our AI, will be ever more intertwined in the future. We had better ensure that they are also aligned.



Data Privacy

Improving trust factor is key

Data privacy and security is one of the most pressing issues in business today. For decades consumers have made a bargain with emerging technology companies – we will give up our personal data for free access to your apps or service, and happily do so.

It seems that bargains came with obscured risks – privacy breaches, information sold off to companies by social media platforms, rogue apps posing as harmless games collecting user information for nefarious purposes – the list goes on and on.

A recent [survey](#) by PwC revealed that, when it comes to privacy, 60 percent of respondents say that they expect the companies they do business with to suffer a data breach some day, likely because 34 percent say that one or more companies that hold their data have already suffered a breach.⁴

Upwards of 85 percent say they wish there were more companies they could trust with their data, and 83 percent want more control over their own data. More revealing though, 76 percent call sharing personal information with companies a “necessary evil”, while 55 percent have continued to use or buy from companies, even after learning that these companies suffered a breach. Consumers may regret that virtual handshake, but feel powerless to change the dynamic.

“If we assume that there’s going to be this massive influx of artificial intelligence in our private lives as citizens, as consumers, and as workers, we’re going to need to learn what questions to ask,” says Dr. Colclough. “But I think the majority of ordinary citizens and ordinary workers cannot even imagine the power and potential of these technologies. So we don’t know what questions to ask. We don’t know what the threats to our privacy and human rights are.”

Consumers can reluctantly shrug if their credit card or e-commerce account becomes compromised – after all, major companies in these areas have significant protections and recourse for customers, and in some cases the monetary resources to reimburse them. Unfortunately, data breaches are becoming the cost of doing business.

But will consumers simply shrug if their AI-enabled home, for example, is hacked, wreaking havoc to them and their families? Likely not. And the prospect of having your “personal space,” be it home, car or work – compromised will act as a serious barrier to adoption.

In her interview for AIX Exchange, [Helena Leurent](#), Director General of Consumers International explains AI’s trust dynamic as such:

“As we look at consumer attitudes towards connected products and of course, many [people] are really

excited about the way in which these products fulfill a need ... Even for those who do buy these products, there is a little bit of a feeling that they are creepy. And when you try and unpick that lack of trust, it's about 'where does my data go'? But also 'am I the product?' 'What's the business model behind this?'

"There's a really interesting sense amongst consumers about what a product really does to your environment and your experience. So, in order for a greater sort of extent or greater use of those types of products, we would need to overcome that lack of trust. And what we've found is that you can build trust. If you build in from the very beginning in the design of this, the levels of transparency, security, attention to vulnerable consumers, attention to environmental impact, the things that perhaps should not be left to the very end of the process, but considered at the very start and that openness and that consideration of a broader set of criteria can help build trust."



Interface

Make it reliable, intuitive and easy to operate

The widespread adoption of consumer technology is tied to a number of factors, including access, price, perceived benefits and perhaps most importantly, ease of use. From personal computers, smartphones and the internet, consumers flock to new technology when it's clear they don't need a degree in computer science to operate them.

Trust in a company's offering, and by extension the company itself, relies on addressing the fact that today's consumers expect a product to be reliable, intuitive, and simple to operate. It's table stakes.

The evolution of AI-enabled products and services into our lives introduces a new challenge in consumer adoption. If AI is to be truly ubiquitous in our lives, we need to evolve from the current, intrusive way we interact with our technology – keyboard, mouse, clicks, searches, power cords, and anything else that ties us to machine or place. Voice and conversational AI, and a backend system that is accurately pulling together and analyzing all of your personal data and habits from a variety of sources, are now key to a superior AI experience.

According to a [study](#) by Gartner, 70 percent of respondents feel comfortable with AI analyzing their vital signs, and identification of voice and facial features to keep transactions secure. However, 52 percent of respondents do not want AI to analyze their facial expressions to

understand how they feel, and 63 percent do not want AI to take an always-on listening approach to get to know them better.⁵ It can then be assumed there are similar reservations about [brain-computer interfaces](#).⁶

"People will want to make sure that their data is being treated properly and not being used for any sort of malicious or ill-conceived intent," says [Poggi](#). "And people are obviously very sensitive with their personal data. We're really crossing a bridge that we have not crossed before, because it's much more personal in nature. The data we're asking for is not just your name, address, and social security number, (but) now looking for your face or listening to your voice, which gets obviously a little bit more intimate."

"I think what's going to become a key challenge is how do we face the need to get massive amounts of personal data in order to build high quality AI engines and at the same time, treating that data with a high degree of respect for the individual."

So how do developers and designers bridge this gap?

Conversational AI should, in theory, create a more personal 1:1 experience than how we currently interact with technology. Bad design, minimal transparency, and generally poor communication that isn't aware of the user (demographics, region, culture), demonstrates that you

haven't taken the time to anticipate your customer's needs and wants. As a result, consumers will likely turn away, or provide substandard data to maximize the AI experience.

"We need to have as much data about people and about their experiences in order to have highly effective AI engines that are able to produce interesting results for us," adds Poggi. "For instance, we need biometric data. We need voice data. We need visual data for facial recognition. All of these sensors have to provide us the data in a highly credible way that's repeatable and robust so that we're not making bad decisions off of that data. I think that the evolution of the quality of those input devices is going to be a key enabler to serve successful AI propagation in a humanistic way."

Building Trust and Transparency in Consumer AI

For centuries, humans have been the masters of the tools and machines created to make them more productive at work and happier at home. Today, we are living in a unique moment in history where this relationship is changing. Machines now have the capability of being a much more dynamic part of our lives.

AI products and systems need data, personal data, to learn and become more effective in understanding a user. If users are reluctant to share this information, or “game it” in an effort to protect themselves from giving up too much, then they will never realize the full potential of AI in their lives. A company’s best laid plans for creating and delivering a truly superior AI product may live or die based on a most human characteristic – the ability to trust, or not.

Transparency will be key in this regard. At the highest levels companies will need to have a very honest conversation about what they do, what they don’t do and why they do it. Consumers will need to understand the philosophy behind a company’s actions, its frame of reference when developing the algorithms it is asking us to trust,

and what recourse they have when things go wrong. Consumers will need to know what data is being collected, who is collecting it, where it is staying and how it is being used and reused. Companies will need to own up and admit mistakes, which will happen, and clearly state how they will fix these missteps.

If we want to make AI-driven products and services serve people and the planet, governments and regulators must look at the whole ecosystem and its impact on people, and then put demands to what these systems are intended to do and hold companies accountable, with data privacy and security at the forefront.

“We’re not going to be able to market AI as being instantly trustable or to prove from a technological perspective that it is trustable in all cases,” says Foster. “Trust is going to have to be earned over time.”

AIX design that brings developers together with policymakers and especially end-users is the first step in achieving that long-term trust for the AI industry.

The Business of AI

Businesses around the world are turning to AI to streamline production, automate services, serve up better content and optimize their workforce. **There are already thousands** of companies driving the industry forward. But what is the industry worth? Here are five key stats about the business of AI.

01.

Big Business

McKinsey estimates AI techniques have the potential to create between \$3.5 trillion and \$5.8 trillion in value annually across nine business functions in 19 industries.

02.

3 Sources of Value

According to Gartner AI-derived business value is forecasted to reach \$3.9 trillion in 2020. There are three different sources of AI business value: customer experience, new revenue and cost reduction. **While PwC** predicts that AI could contribute up to \$15.7 trillion to GDP by 2030.

03.

AI Just Starting Up

Venture funding in AI companies had reached a mind-blowing \$61 billion from 2010 through the first quarter of 2020. For example, Softbank recently announced an AI-focused second \$108 billion vision fund.

04.

Jobs Shifting

PwC estimates that 30 percent of jobs are at potential risk of automation by mid-2030s, with 44 percent of workers with low education at risk of automation by the same period. While at the same time, new **highly-skilled jobs** are being created.

05.

Big Spender

Statistica estimates that global spending of cognitive and artificial intelligence (AI) systems in 2019 per segment, amounted to software \$13.5 billion, services \$12.7 billion and hardware \$9.6 billion.



User Experience

Feedback / Articulation

Intuitive Design

Purpose

Presence

Interface

User Experience raises questions about design functionality and purpose as it pertains to consumer devices and services. Whether running in the background or directly interfacing with users, how can we consider human-centric design principles and ensure the best possible user experience?



User Experience

Adapting UX design for AI

Once the purview of futuristic-for-the-time television shows like *Star Trek* and *The Jetsons*, we now have smart homes that operate on voice command, talking maps to direct us as we navigate our vehicles and watches that monitor our heartbeats. AI is ubiquitous and increasingly intertwined with the most private and intimate aspects of our day-to-day existence. AI has the power to make our lives easier, expand our capabilities, make us more effective.

But AI doesn't do this by itself. Though AI has unlimited potential – we first saw images of **black holes because of the power of AI**¹ – it is up to us humans, to consciously design AI products that keep our human needs and experiences front and center.

You don't have to look far to find an example of AI being created for the sake of AI, like the **SMALT**, a smart salt shaker that dispenses the amount of salt you "pinch" on your smartphone touchscreen, or the **Quirky Egg Minder** that sends a push notification to your phone if the eggs in your fridge are less than fresh. Amusing at best, annoying at worst, these products don't add value to the lives of users.

For AI products to provide value to our lives, they need to be designed with purpose.

The principles of UX design will have to adapt and change to this new reality. The four **Levels of AIX Framework**:

Efficiency, Personalization, Reasoning and Exploration serve to keep the user experience in mind and should extend to the entire team that designs AI products and services, from the lab to the living room.

"AI is nothing but a methodology," says **Sri Shivananda**, Senior Vice President and Chief Technology Officer at PayPal. "For it to be consumable, for it to be usable, for it to be something that consumers can trust, design is actually the deal maker in that process. Good design makes that product seamless. It makes it convenient and makes the customer want to engage more and come back more and be loyal to the product as well."

The end goal is to channel the power of AI into effective, meaningful, responsible human-centric designs that can learn and evolve with the consumer while building trust in the products and the people who design them. This is AIX design, and it can only happen if the development of AI systems and products are transparent and inclusive of the end-users but also regulators, programmers and researchers and the companies themselves.



Feedback and Articulation

Keeping users in the loop

AI in consumer products is about more than shiny, voice-activated bells and whistles. It's meant to integrate with the user experience and continually enhance it. Which means in order to function properly, consumer AI needs feedback from users and users need feedback from the AI.

Effective feedback needs to serve a larger goal. It's not enough to passively collect data from the user experience, that data needs to be understood in order to further a goal for the product. The "like" button on Facebook is the most recognizable and arguably purest form of user feedback, but the goal of the button is about more than just tallying up how many people like a piece of content. The AI algorithms take those likes and use them to discern popular content, and customize content that comes up in user feeds.

In the context of mobility, **David Foster**, Head of Lyft Transit, Bikes and Scooters believes feedback loops will be critical:

"I think that AI will be used to help aggregate many different inputs that a human might make into a vehicle for mobility. Combine those with inputs that the vehicle itself is sensing around road conditions, traffic hazards, etc., and then turn those into meaningful outputs that are either giving feedback to the humans through a different piece of output technology, or are themselves directing the vehicle or another vehicle to take a different action."

AI design that can give users a feeling of control while gaining actionable feedback that will enhance the user experience is the ultimate goal. To reach it, designers will have to discern what the user wants from the product, and how best the product can meet that desire.



Intuitive Design

Adding learning to the UX checklist

The **10 standard usability heuristics**, such as error prevention, flexibility and efficiency of use and recognition rather than recall, answer the “why” of a product’s existence and are meant to keep UX designers from wandering too far away from the end user in the design process. When it comes to designing AI products, these usability heuristics must expand and adapt to include one of AI’s most powerful features – the ability to learn.²

Just designing an intuitive product isn’t enough. Today’s consumers expect AI to learn and adapt to their needs for an ever-increasingly customized experience, and they are willing to teach it. Through her experience investigating user experience with smart home technology, **Alex Zafiroglu**, Deputy Director at the 3A Institute (3Ai) in Australia learned that end-users can accept that AI applications will improve over time.

“What we found was that most people, for most of the solutions they had imagined, really expected an AI solution to act like a puppy. It was going to take time to train it. Then eventually it would get better and that they were willing to put up with that. And that many of the smart homes solutions that were in the market today, they consider to work pretty much like a puppy. What we learned from that is that the solutions that we build do not have to be perfect the first time that we put them out, but they have to be learning

over time and providing value over time. And also, we need to be transparent in what they’re doing.”

Designers may fear an imperfect product will repel customers on the first use, but what actually turns them away is when a product doesn’t learn or adapt to their needs. No one expects Siri to read minds – they expect Siri to learn.



Purpose

Valuable design starts at the beginning

Creating meaningful and valuable human-centric commercial AI solutions means making them relevant, and this starts from the very beginning of the design process. Understanding how this process works involves more than customer satisfaction surveys. It's bringing customers into the design process in a very real way.

"We believe in listening to our customers in their context, actually shadowing them, helping understand what they want and sometimes trying to understand implicitly what they need," says **Shivananda**. "This input from the customer will make the product and the service that we create relevant. When a product becomes relevant to a customer, it is great for the company because the demand

is going to be high. And because they provided the input in building that experience, it's going to be something that they'll adopt. They'll actually use it over and over again, come back to it and engage as much as they can."

Rather than leaving impact and risk assessments to teams further along the funnel, these considerations must be a part of product development from the very beginning. Developers must assess the potential unintended and intended consequences and outcomes. This in-depth reflection at the beginning of the design process shows customers the level of attention and care involved across the company, using the design process itself as an advertisement for trust.

"I think that for anything to be really successful, it has to be about us humans. ... It's not just human-centric AI. The whole thing has to get into our consciousness in a way that we can intuitively understand it accurately. Otherwise, it's not going to work out as an interesting or useful product for anyone."

RODNEY BROOKS

Robotician, Member of the US National Academy of Engineering, Author, and Robotics entrepreneur

World-renowned roboticist, **Rodney Brooks** is someone who understands the importance of human-centric design for technology. As the inventor of the Roomba vacuum, he's been developing AI for human-machine collaboration and cohabitation for nearly 40 years.

"I think that for anything to be really successful, it has to be about us humans. We want it to be about us, we want it to be easy to use. We have to build systems that understand our limitations, human limitations. Systems that when we humans see them, we'll take as some sort of promise of what they can do. And those AI systems better deliver on that promise. It's not just human-centric AI. The whole thing has to get into our consciousness in a way that we can intuitively understand it accurately. Otherwise it's not going to work out as an interesting or useful product for anyone."



Presence

Active vs. passive engagement

Deciding whether users will engage directly with AI, as with voice-activated assistants, or whether it runs passively in the background, such as automated systems that heat and cool your home, will be a cornerstone of successful AI design.

It sounds deceptively simple, a choice between active or passive engagement. But each choice presents a complex web of intended and unintended consequences that make respecting stakeholders' rights, preferences and comfort level a challenge, from transparency and the feedback loop, consent and privacy issues to data-mining and systemic bias.

AI is being deployed so rapidly and systemic bias is so pervasive and has such serious impacts that user experience is now a crucial element in designing AI systems. It's enough of an emergency that the World Economic Forum has released [information on navigating AI ethically](#).³

Designing great AI that is useful to consumers while respecting them as people will be a key part of the design process, and may involve inviting partners with expertise in specific areas to share their knowledge and viewpoints. As [Helena Leurent](#), Director General of [Consumers International](#) notes:

"If I can introduce meaningful innovation into my life that makes my experience better, potentially cheaper, and more sustainable, then that's fantastic. For example, car

safety: I can drive my Tesla, I can have automatic driving, I can reduce human error, have better road safety.

The points that consumer advocates would make, though, are that typically [people] won't know whether these things really are fast, safe, and sustainable in practice, unless you incorporate people who are thinking about consumer rights and road testing these new innovations to see if this actually going to work in reality. Let's make sure that we're starting from the perspective of the consumer's rights as opposed to the consumer as a target for business development."

The choice between active and passive engagement with a product will be part of a larger design conversation that looks at the customer as a whole person, rather than a walking wallet or a data well. But whether front and centre or running in the background, we will always need to interact and look under the hood of our AI. For this, AIX design needs to consider the interfaces that act as a bridge between artificial and human intelligences.



Interface

Making it natural

Historically, consumers have been taught specific ways to interact with technology. From the first computer punch cards to the evolution of the mouse into a smartphone touch screen, people interact with technology in ways in which they don't interact with other people. And yet, consumers gravitate to AI products that feel more "natural."

Macintosh has made a name for itself designing products that are highly tactile, with quality craftsmanship and expertly applied color palettes. Moving into a more human-centered design for their products means changing the user interface from a tactical to a voice-activated. The design challenge for Macintosh will be personalizing voice activation so that consumers don't have to adjust natural speaking patterns when using it.

Jeff Poggi, Co-CEO of the McIntosh Group, explains:

"Our consumer-designed philosophy for Macintosh has been about tactile feel, you know, of buttons of knobs, that sort of the quality of craftsmanship and physical way that's been a key part of it along with the look, the industrial design, the color palette, etc. That's really important to us but as we move forward into a human-centered AI world, how does that user interface change? And I think it really changes from a tactile world to a voice world and I think we're just at the infancy of a voice today. It's uncomfortable for most people [today], especially if I can't speak as I'm speaking today and

in a normal sort of human way, if I have to adjust my speaking pattern to be more like computer data input."

What are the interfaces that provide us with the best, most "natural" communications with AI products? Is it better to touch a screen, or turn a knob? Should we use avatars or robots? Virtual reality or sharing consciousness with AI? Whatever the decision, creating a "natural" experience for consumers is a key component of successful AI design.

Building a New Customer Experience with AIX

It's not just about the end product anymore.

Designing human-centric AI means creating an entire ecosystem that is geared towards the people that will use it, starting at the moment of conception and encompassing the entire infrastructure that builds and maintains it, from the developers to the after-care team that handles problems as they arise.

AI systems must be designed to learn and adapt, taking into account the ever-shifting priorities, complexities and the diversity of human existence. Design teams must work towards interfaces that feel natural in a variety of contexts, with an eye on potential future integrations.

Bo Peng, Director at acclaimed design firm IDEO agrees.

"The reality of it is that the tool must be iterated on and presented to a wide variety of prospective users so that we're able to think through as many possible use cases as possible. So this in its very nature is an iterative problem to solve. And it's not a problem to solve simply by thinking through with a theoretical answer."

Done right, a human-centered design approach to AI drives the creation of efficient products that resonate more deeply with consumers, leading to increased levels of comfort, engagement and trust, not to mention satisfied end-users who fuel the growth of the technology.

"The reality is that the tool must be iterated on and presented to a wide variety of prospective users so that we're able to think through as many possible use cases as possible. So this in its very nature is an iterative problem to solve. And it's not a problem to solve simply by thinking through with a theoretical answer."

BO PENG

Portfolio Director, IDEO

Tech that Just Works

New technologies have often struggled with design. Sometimes clunky, sometimes overly complex, there are a few standout examples when form met function to create a consumer technology that was easy to use and that added value to our lives. Here are five examples:

01.

iPhone

From its innovative button-free gesture control to its clean design the **iPhone** has been a real game changer in the principles of UX design. And the key differentiator is its “fully capable computer operating system”

02.

Fitbit

The **popular tracker** that motivates people towards a healthier lifestyle which is personalized based on individual needs and behaviours. It goes on your wrist and it just works.

03.

Blackberry

Once **a globally adopted iconic smartphone brand**, known for their ‘**BBM**’ messaging service and physical keyboard. Power users could type emails with one hand under the boardroom table without anyone the wiser.

04.

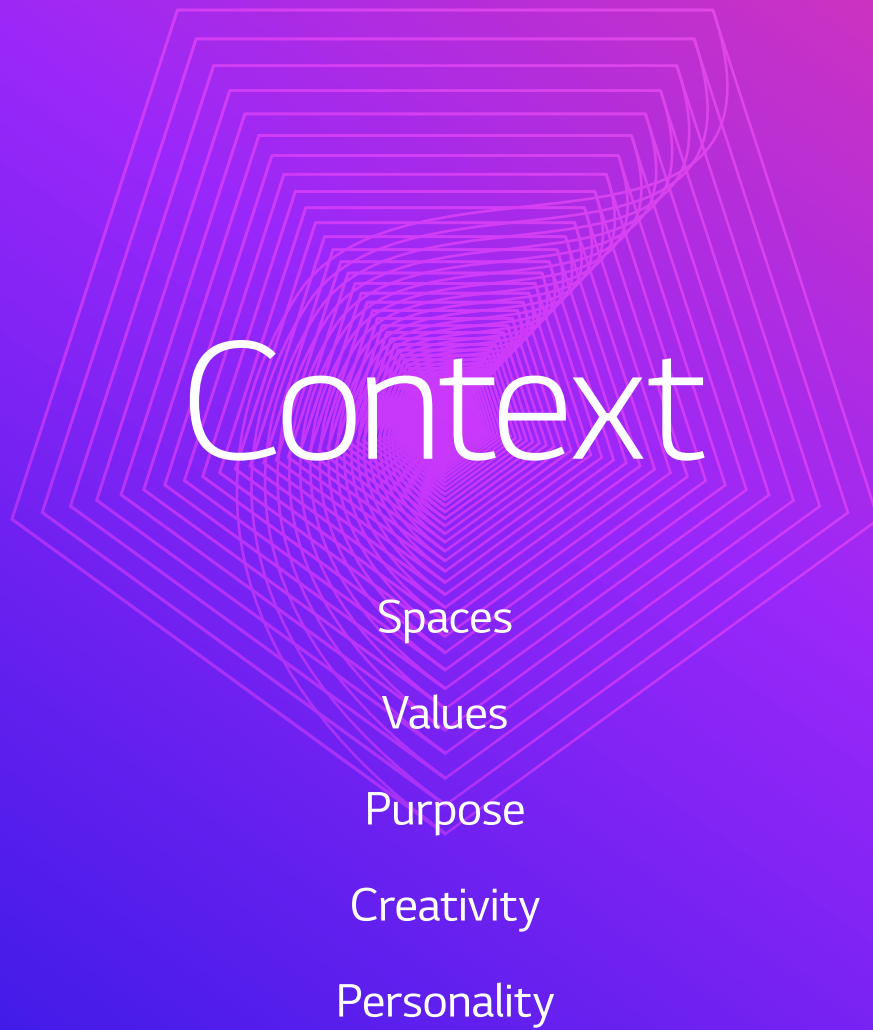
Polaroid Camera

Starting in the 1970’s a brand we all still love for their classic designs and instant fully developed photos. **Polaroids** continue to upgrade their features with the auto-focus 2 lens system for sharper photos, built-in double exposure and self timer

05.

Nintendo Wii

A **revolutionary device** at the height of the video gaming console wars, the Wii remote was a light and slim motion controller that didn’t need an instruction manual. Just pick it up and intuitively start playing.



Context deals with the environmental, cultural and personal nuances that need to be considered to ensure equitable and purpose-driven AI. Home, work, car and public spaces require different social rules, while individual personalities and values require AI that reasons, understands, explores and adapts.



Context

The age of reasoning

In order for consumers to appreciate the true benefits of artificial intelligence, it is imperative that developers embrace the contextual side of the equation. But what exactly does that mean?

To be sure, it is at this stage where AI goes beyond surface level interactions to actively perform not only the basic requirements, but also make recommendations such as what you should eat before a pending business meeting that could end up being stressful or suggesting the perfect restaurant with friends later that night.

What needs to be stressed here is that there are two distinct thought processes when it comes to defining artificial intelligence and context.

In a [blog](#)¹ written last year, Oliver Brdiczka, an artificial intelligence and machine learning architect working with Adobe Sensei, the company's AI and machine learning technology that connects to the company's cloud and helps marketing professionals make more informed decisions, zeroed in on two fundamentally different scenarios – what now exists and what soon could be possible.

AI, he wrote, is powering more and more services and devices that we use daily such as personal voice assistants, movie recommendation services and driving assistance systems.

"And while AI has become a lot more sophisticated, we all have those moments where we wonder: *Why did I get this weird recommendation? or Why did the assistant do this?* Often after a restart and some trial and error, we get our AI systems back on track, but we never completely and blindly trust our AI-powered future.

"These limitations have inspired the call for a new phase of AI, which will create a more collaborative partnership between humans and machines. Dubbed "Contextual AI," it is technology that is embedded, understands human context and is capable of interacting with humans."

What it represents is a description for a more advanced and complex system, but the problem is it misses a step. In order to ultimately arrive at the Contextual AI Age, it is first imperative that AI understands context.

Sri Shivananda, Senior Vice President and Chief Technology Officer at PayPal, likens the emergence of context in AI to the influence mobile communications has had on society.

"We've just seen over the last decade how mobile has played a significant role in changing payment behavior and payment experiences," he says. "As we go forward, design and user experiences will continue to play a critical role in how these experiences come about.

“Commerce is going to become contextual. It is going to be surrounding us where we are. It may be through a smart speaker interaction or a continued interaction with a desktop laptop or a mobile device, or for that matter with the car that you’re driving in. As commerce becomes contextual, AI has to become contextual as well.”

According to the Levels of **AIX Framework**, contextual AI will truly come to fruition in Level 3, when AI understands the patterns and principles across systems, using reasoning to predict and promote positive outcomes for users. This is termed, ‘causality learning’ and in order for AI to achieve this, it must be designed with end-users in mind and the many contextual components that shape our own experiences, as humans, namely the spaces, personalities and values that underpin the common-sense rules of our society. Context can be defined in many ways, but at the end of the day it is about ensuring that AI can read all of the signs, be it the need to understand its environment or behave in appropriate ways depending on the situation.



Spaces

Drawing the line between work and home life

How people behave at home is fundamentally different than how they behave at the grocery store, at work or at the nightclub. We dress appropriately, act appropriately and experience differently based on certain assumptions and knowledge about the unwritten rules that are attached to these spaces.

COVID-19 has created a new normal where our homes now are also our office, our doctors' clinic, our movie theatre and our bank. What are the implications of this? How should we be designing these separate AI systems in a way that they share, but do not share too much?

How spaces are used and utilized have changed because of the onset of the pandemic and AI developers and designers must reassess their assumptions. With the lines blurred between home life and work life, a great deal of thought must now be put into AIX design ensuring end-users are part of the process in defining how AI not only understands, but also acts to provide optimal user experiences based on their environment.

What needs to be considered as both AI-enabled services evolve is where will the line drawn between a home and work AI offering. Will they be mutually separate entities or somehow merge and contain the ability to communicate with each other? It may be a dilemma for some and an opportunity for others, but worth discussing now as we re-

establish commonly held assumptions about our spaces.

David Foster, Head of Lyft Transit, Bikes and Scooters, believes Interoperability is key.

"AI is typically evolving today in isolated islands – most of our cars aren't talking directly to our home and certainly aren't talking to our home without our explicit inputs to that AI in the vehicle. I think ultimately that will happen, because we have to assume that AI is going to operate in a heterogeneous world with a lot of non AI-driven consumers or other devices or vehicles ... so interoperability is going to be key. The ability to be adaptive and predictive and context aware is also going to be key.

"People might be nervous about AI, talking unaided let's say from our car to our home or to our work because of concerns around security or identity or intent. But using AI so that I can ask my car to turn on the lights or the heat, my house on the way home ... I'm showing intent and I'm showing context. I think many people would be comfortable with that type of approach today."

As we design new artificial intelligence experiences for end-users, it is going to be evermore important to ensure we consider our environment and the contextual realities that we assume as humans within different spaces. But

even more important will be the challenge of codifying our very human understanding of the world based on our sense of place and the behaviours and especially the information that we share between those spaces. When our work AI and home AI converge with our entertainment AI and our healthcare AI, there are some very serious implications about how data is shared across the systems, when it is shared and for what purpose. Developers and policymakers will need to consider the firewalls and handshakes that will need to happen, and end-users should be part of this process every step of the way.



Values

AI systems must align with human ideals

Iason Gabriel is a senior research scientist on the ethics research team at DeepMind. Earlier this year he released a paper entitled [Artificial Intelligence, Values and Alignment](#)² and in it maintains that the question of 'value alignment' centres upon how to ensure that AI systems are properly aligned with human values. It can be broken down into two parts. The first part is *technical* and focuses on how to encode values or principles in artificial agents, so that they reliably do what they ought to do. The second part is *normative* and focuses on what values or principles it would be right to encode in AI.

"Any new technology generates moral considerations. Yet the task of imbuing artificial agents with moral values becomes particularly important as computer systems operate with greater autonomy and at a speed that 'increasingly prohibits humans from evaluating whether each action is performed in a responsible or ethical manner,'" Gabriel wrote.

The first part of the paper notes that while technologists have an important role to play in building systems that respect and embody human values, the task of selecting appropriate values is not one that can be settled by technical work alone.

Part of the challenge with AI and values is that it is such a complex combination. On one hand you have software developers creating what surely will be the future, and yet on the other hand there are human beings, each with

differing interests, emotions, intelligence and tastes.

Does our AI need to understand religion? Culture? Nationality? How will it learn our personal values and are those different from our household values?

At the [Stanford University Institute for Human-Centred Artificial Intelligence](#) co-director Fei-Fei Li continues to champion the importance of bringing diverse perspectives to the development of AI. Li is clear that while values can be imbued into AI, it is the humans and companies behind it that matter.

"When we design a technology, when we make it into a product, into a service, when we ship it to consumers, the whole process includes our values," she told [CNBC](#). "Or the values of the companies, or the solution makers."

But values are not universal, are highly personal and can also change over time. How then can we design AI to understand the context of our human values and which ones? And how are the values of the developers and corporations imprinted in the AI?

[Dr Christina. Colclough](#) of The Why Not Lab has some important questions:

"We have to understand that, inherent in all of these

algorithms, are also values, norms but they're values and norms of the country, the state, the area where the developers are from, who has created these tools or the company owners ... When an American algorithm is applied in Kenya or in Estonia or in Germany, are we actually experiencing some form of digital colonialism? How do we ensure that any algorithm is very explicit around the values, the norms on which it is founded and also, how can it be adapted to the cultures of the local environment where they will be used. How do we make sure we don't end up in this sort of nightmarish sort of social norms, social credit system where we're all judged against algorithmic norms, which have been defined in a very few contexts?"

Inevitably it will come down to the symbiotic relationship between values and ethics. We can consider that ethics are how we apply our values in building/using AI, they are the rules and standards that make our values tangible in the different inputs/interactions with the technology. Ethics seems to stop at protecting our values and ensuring they can be lived out and not infringed upon, but values extend into what we want to prioritize and prefer to invest in as humans.

Perhaps by applying AIX design and including as diverse a range of perspectives as possible into the development of these systems, we can help ensure the most equitable and valuable experiences as possible for end-users.



Purpose

Without trust from a human there is nothing

A principal theme in Level 3 of the [AIX Framework](#) revolves around understanding. AI, at this point, understands the patterns and principles across systems to meet predefined missions.

Of note, AI shares learning outcomes to achieve a broader mission. Whatever that mission is. It could mean interpreting the mood of an individual at one end of the spectrum or helping society as a whole grow and learn at the other.

An example of a value defined as a purpose for AI occurred recently when EU consumer group Euroconsumers, [published a white paper](#)³ on how AI can be leveraged by consumers to accelerate Europe's sustainability agenda.

Two key recommendations came from the report:

- AI driven tools and complementary technologies can help power the sustainability transition in different industries including household utilities, food, mobility and retail
- There is currently a significant lack of trust and satisfaction in the consumer AI experience. Companies developing consumer-facing AI services for the green and digital transition have a perfect opportunity to help people achieve their sustainability goals and demonstrate they can deliver on trustworthy AI at the same time.

There was also a stark warning for all AI developers: Trust is paramount.

"Without trust from the consumer, AI will not be able to achieve its true potential," said spokesperson Marco Pierani. "It would only be detrimental. More now than ever, tech companies should maximize their efforts to create AI that would not only improve the lives of consumers, but society as a whole."

For [Alex Zafiroglu](#), Deputy Director at the [3A Institute](#), purpose speaks to the underlying problem that the AI is solving for the end-user. This purpose must align with our goals and this is the context that needs to underpin the AI's understanding and functioning.

"We need to have a usage roadmaps or experience roadmaps, particularly for thinking about an AI experience framework, such as the [\[AIX Framework\]](#). And in that case, you need to think very critically about those humans, who are at the far end of the solution who are basically what the industry would call end-users. You also need to think about the value that is being generated by the application of artificial intelligence solutions in a particular context, because context is incredibly important. You need to think about, to what ends are you building solutions, both for those end-users and for your direct customer."



Creativity

Onus is on both the developer and end-user

Creativity, says **IBM** may be the ultimate moonshot for artificial intelligence: “Already AI has helped write pop ballads, mimicked the styles of great painters and informed creative decisions in filmmaking.”

Experts, it states in a **blog**⁴ contend that we have barely scratched the surface of what is possible. While advancements in AI mean that computers can be coached on some parameters of creativity, experts question the extent to which AI can develop its own sense of creativity. Can AI be taught how to create without guidance?”

“Just a few years ago, who would have thought we would be able to teach a computer what is or is not cancer?” asks **Arvind Krishna**, senior vice president of hybrid cloud and director of IBM Research. “I think teaching AI what’s melodic or beautiful is a challenge of a different kind since it is more subjective, but likely can be achieved.

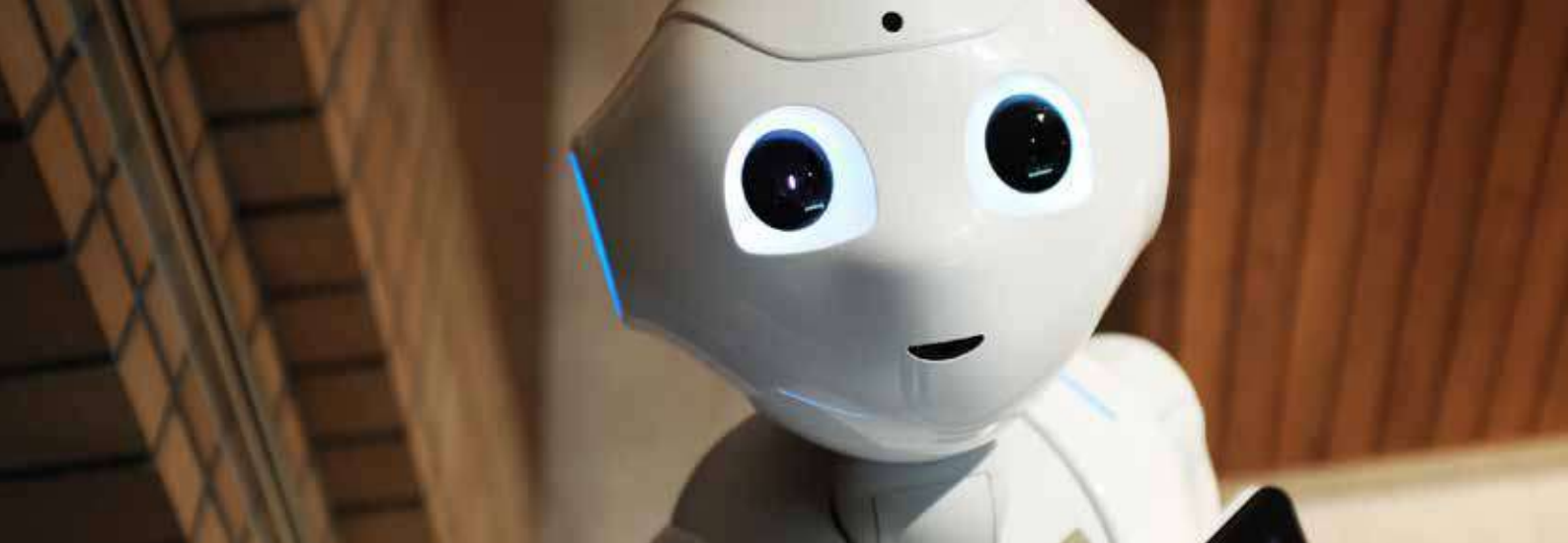
“You can give AI a bunch of training data that says, ‘I consider this beautiful. I don’t consider this beautiful.’ And even though the concept of beauty may differ among humans, I believe the computer will be able to find a good range. Now, if you ask it to *create* something beautiful from scratch, I think that’s certainly a more distant and challenging frontier.”

More purpose-driven AI, say when your personal AI starts mashing up with data from your fridge, your smart stove and the Uber Eats recommendations to provide creative ideas for lunch, are maybe a little way away. However, the idea that AI will be able to look beyond the obvious context of certain inputs and generate novel combinations and juxtapositions that create new contextual meaning for the end-user, is something that could be quite valuable, since it is already how we problem solve as humans.

How should developers consider the kind of creativity that sparks unexpected joy? Creativity that makes the type of predictions and unique insights that end-users find useful? Plenty that can be interesting that can be done just by changing what parameters the developers use and the way the end-user plays with them.

The interesting juxtaposition will be in the context that we see around AI creations. By playing with the context AI is able to understand we may see more interesting intentional creations across more dimensions of context.

The onus will be on the developer and the end-user to get it right.



Personality

More a case of personalization

Mita Yun, the co-founder and CEO of [Zoetic AI](#), makers of the emotive companion robot Kiki, suggested in a recent blog that when we think of Alexa having a personality, we'll describe it as her responding to certain things in a certain way – what she does or doesn't do based on a question or request.

"That's because Alexa doesn't really *have* a personality. Almost every single AI or voice-based product does not have one. When [The Food Network](#) discusses how Rachael Ray's "personality" will come through the voice of Alexa, what they *mean* is that they're adding expressions in her voice.

Then again, when it comes to personality and context, there is an argument to be made here that it is not necessarily about personality as much as it is personalization. In that regard, there are questions to ponder, key among them what do developers of AI systems and applications need to think about as the technology starts to allow for much more personal, real-time engagement?

Just as humans interact through non-verbal cues, how can AI know and respond appropriately if we are annoyed, angry, sad, etc? How should it behave differently for different personalities? Rather than a home AI, a car AI, etc. should the future be more concentrated around personal AI? What are the dangers of that?

This is all about the context of people's unique personality and using tried-and-true AIX Design methodologies that allow AI to take into consideration different people's attitudes, beliefs and everything else that make up a personality.

There are a multitude of questions that must be answered such as how will an AI system serve one person differently than another and how can it understand that people have moods? How does the feedback loop shape our personality? What personality should we show if it is a point of feedback?

Feedback loops, writes Natalie Fletcher in this [blog](#)⁵ from AI company Clarifai, "ensure that AI results do not stagnate. This also has a significant advantage in that this data used to train new versions of the model is of the same real-world distribution that the customer cares about predicting over. Without them, AI will choose the path of least resistance, even when that path is wrong, causing its performance to deteriorate. By incorporating a feed loop, you can reinforce your models' training and keep them improving over time."

Certainly what must also be avoided is a repeat of the [Cambridge Analytica-Facebook scandal](#),⁵ which used behavioural models based on the [OCEAN](#) model – an acronym that stands for openness, conscientiousness, extroversion, agreeableness and neuroticism that was first developed in the 1980s to assess an individual's personality.

To that end, what worries **David Foster**, are AI-based systems that are controlling critical things and are thrown into the market before they are fully either developed or regulated in some sense or another.

"I do still think that the human brain is a marvellous piece of computing equipment. And we do not quite fully understand all of the calculations that we are subconsciously making as we go about the world today. Therefore, how do we model those so that AI can make equivalently good decisions. And how do we model the decisions where there is no good answer to the problem?"

And since everyone's personality is different, a dose of reality is also needed both for now and in the future via this insightful observation from **Alex Zafiroglu**: "As an anthropologist and as someone that has worked in advanced R&D technology company and worked on product teams, I would say, no, you're never going to get a solution that works for all people at all times."

"As an anthropologist and as someone that has worked in advanced R&D technology company and worked on product teams, I would say, no, you're never going to get a solution that works for all people at all times."

ALEX ZAFIROGLU

Deputy Director, 3A Institute (3Ai)

"What worries me is AI-based systems that are controlling critical things and are thrown into the market before they are fully either developed or regulated."

DAVID FOSTER

Head of Lyft Transit, Bikes and Scooters

Context is Queen

While still a long way away from being truly contextual, a good example of AI understanding context occurred last year when Amazon introduced **Sidewalk**, its vision of what it called a “**neighbourhood network**” designed to make a person’s devices work better both inside their home and beyond the front door.

In the future, Sidewalk is meant to support a range of experiences from using Sidewalk-enabled devices to help find pets or valuables, to smart security and lighting, to diagnostics for appliances and tools.

There will no doubt be many iterations of Sidewalk and other services like it, and through it all developers, in particular, need to think about not only creating a cool new AI application, but considering the contextual layers required in creating the optimal AI experience for end-users (while tip-toeing the potential ethical minefield).

As it pertains to how end-users will **interface** with AI, IBM in a **posting**⁶ on its Web site entitled *How conversation (with context) will usher in the AI future*, points out that in the “past few years, advances in artificial intelligence have captured the public imagination and led to widespread acceptance of AI-infused assistants. But this accelerating pace of innovation comes with increased uncertainty about where the technology is headed and how it will impact society.

“The consensus is that within three to five years, advances in AI will make the conversational capabilities of computers vastly more sophisticated, paving the way for a sea change in computing. And the key lies in helping machines master one critical element for effective conversation – context.”

Context can be defined in many ways, but at the end of the day it is about ensuring that AI can read all of the signs be it the need to understand its environment or behave in appropriate ways depending on the situation. We humans

read contextual cues all the time but lump it under what we call ‘common sense’. However, for AI systems and products, common sense isn’t very common at all.

Charles Lee Isbell Jr., Dean of Computing at Georgia Institute of Technology in his interview for this report was asked the question ‘do you believe it’s possible to teach machines common sense and the assumptions we’ve built up as humans?’

“The answer is yes. We can build this and in fact, we must build these kinds of notions. And I think the way we do it is around story. We tell ourselves stories about how something is supposed to happen, and we build up these kinds of data structures and experiences that allow us to generalize from one to the other. What does it have to do with built in assumptions?

“Well, there’s a whole bunch of assumptions built into that. The assumption is that other people are like you. And that they are doing the things like you are and that you can predict what they are going to do, because you know what they are going to do. You are fundamentally building this idea that the things I am interacting with are like me and they have the same desires and drives and the same physical limitations. And so on. Now this is a problem.

“If you actually don’t have anything in common physically or psychologically or whatever, because you may not even have a fundamental language upon which you can agree about what’s happening, common sense no longer works.”

In the digital age, they say that content is king. If so, as we move into a new era of developing systems and products for AI experience, it could be argued that context is queen ... and we know who’s the real power behind the throne.

AI Around the World

It can sometimes seem like the world's AI advancements come from experts concentrated in only a few major countries, but AI is a truly global endeavor with amazing talents applying themselves to furthering the field. Here are five examples of organizations driving the future of AI from around the world:

01.

Next Einstein Forum

Africa's youth and women the voices of global science leaders are **making a big impact** on the global scientific community and the world. Interconnectedness & Inclusivity is the way forward.

02.

Black in AI

A progressive network offering academic programs that support black junior researchers and provides initiatives to **increase the presence of black people in the field of AI**

03.

Alef Education

Recognized for best AI application in education. This brave **award winning global education technology company** in the Middle East transformed education by using AI for tailored and personalized learning experiences without traditional tools.

04.

SG Innovate

SG Innovate is a private organisation owned by the Singapore Government that helps scientists build Deep Tech startups to solve difficult problems affecting the world by leveraging the city state's advanced smart city ecosystem.

05.

AI for Accessibility Hackathon

The AI for Accessibility HACKATHON had to go digital because of Covid-19, but the event was successful at bringing to life creative AI solutions to amplify human capability in Eastern Europe. This year's focus was to create inclusiveness through the use of AI in the retail industry.



Relationships

Collaboration

Learning

Empathy

Fallibility

Interface

Relationships is a theme that examines the role AI plays in our lives and how we interact and engage with new powerful tools as the technology advances. From human-machine collaboration and cohabitation to consumer expectations for AI that is fallible and learns over time, our relationship with technology is changing as AI becomes more purposeful, useful and embedded.



Relationships

Forging bonds with AI

The relationship between humans and AI services and devices should be viewed not in the literal sense, but as a metaphor that describes two-way interaction, collaboration and the exchange of information and understanding. This distinguishes AI from earlier technologies, as we now work in tandem with these tools, learning from each other to achieve a common goal.

Artificial Intelligence Experience (AIX) is a concept that requires designers, developers, policymakers and end-users to share an understanding of the human-centric dimensions that must be considered for creating equitable, enjoyable and valuable AI products and services for end-users. This includes how we, as humans, might interact with technology that is becoming better at thinking and acting human and that begins to take a more meaningful role in our lives.

For **Prof. Alex Zafiroglu**, Deputy Director of the 3A Institute (3Ai) at the Australian National University, an anthropologist and formerly Intel's foremost domain expert in homes and home life, end-users' expectations need to be managed. She points out that machines are incredibly good at specific things but are limited to only that thing.

"They're very good at maths, for example, and humans are very good at other things, including relationships with other human beings," she says. "When we mix those two things up and we expect our computing systems to

do the hard work of sociality and connections between people, we are making a mistake at the level of who has responsibility for actions in the world, particularly as it relates to relationships among people."

Indeed, we are seeing the early steps towards technology taking more active roles in our daily lives, be it to vacuum a rug or taking on the cognitive task of digitally codifying the world. But most of these cases show AI focused on a singular task, which is a much more likely application of the technology for end-users to understand and relate. In this way, the idea of Artificial General Intelligence (AGI) is less likely and that these early instances of narrow AI should be imagined multiplied over and over to create emergent AI experiences.

One example of this is the Observatory for Human-Machine Collaboration (OHMC) at the University of Cambridge, **which collaborated with**¹ domestic appliance firm Beko, to train a robot to prepare an omelette from scratch.

The optimum word here is *train*. The making of an omelette is based on narrow AI trained on data and repetition. But since it makes an omelet like a human, will end-users come to expect this robot to also make pancakes? Maybe. But what about making recommendations for music, healthcare treatments?

But AI applications will rarely be so specific. In the **Levels of**

AIX Framework launched at CES 2020, various scenarios were used to help illustrate the increasing integration of AI in our lives. But we need to be comfortable with the technology in order for it to become useful.

Imagine, the weather forecast calls for snow and the AI alerts the family to dress warm, preheats the oven and orders ingredients to prepare their favourite meal.

Conversely, the car's AI is an extension of the home and knows that the user is running late, suggests altering the usual route to ensure that an appointment is not missed and provides a calming environment.

Finally, a car's AI interfaces with the smart city to experiment with different routes, departure times and driving speeds, optimizing journeys based on daily user objectives and other goals such as fuel efficiency or journey time.

These scenarios aren't farfetched. In fact, they may happen sooner than we realize. What will be important to understand, however, is how AI will be designed to consider the end-user and the ways they will want to relate to technology that knows them evermore personally.



Collaboration

Better together

Whether in the kitchen or the factory floor, human-machine collaboration is shaping how we perform tasks and make decisions. The question is how will it develop and continue to shape the future of work?

As AI matures, it will become more pervasive. We will see new specialized roles emerge for managing the new dynamics of AI, but eventually everyone will need to update their AI literacy to better collaborate with new technologies.

Most people can grasp the concept of an AI-powered recommendation algorithm and adjust their behaviour to affect the output of the algorithm. However, people have limited choice and only blunt tools for manipulating an algorithm to their needs.

When the different tooling and skill sets standardize along the value chain, it will vastly increase the choice and access to AI technology and engender far more innovation than we have yet seen with AI software.

To get to that point, we have a challenge of bridging the gap between proof-of-concept in the lab and real-world deployment. Researchers and engineers play an important role right now in helping close that gap, but they cannot do it alone. They, and the institutions that train them, need to focus on standardizing their tools and processes so that others can more easily collaborate down the value chain.

An AI robot working in a coal mine or car manufacturing plant completes certain tasks repetitively, which is not the same as the potential for human-machine collaboration, but it does create a base from where to start from and learn.

According to [Charles Lee Isbell Jr.](#), Dean of Computing at Georgia Institute of Technology, for something to truly be intelligent, in a way that is meaningful, it has to be intelligent with people, not intelligent like people. “We are all interesting creatures, not because we exist in a vacuum and we can just think on ourselves, we’re actually interesting because we interact with others,” he explains. “It’s actually how a lot of our learning happens, right? We learn by interacting with others, they get transferred knowledge generation to generation. And I think that that is sort of where the sweet spot is around AI.”

And when it comes to the developer and research community, we must key in on the fact that at a Level 3 and later in Level 4 of the [AIX Framework](#), the concept of things like collaboration, user understanding and “defined spaces” is critically important.

When you are at work vs. at home it is important that the AI device understands the context of those places. Our relationships with AI in the future and our ability to have a cohabiting or co-working relationship that is positive will hinge on the ability of whatever device exists to be flexible.

As an example, humans generally behave and talk differently when they are at work versus when they are at home. The challenge is when those spaces start to converge, and there isn't a clear definition between work life, home life and public life, what happens then?

Named as one of the world's most influential women on the Ethics of AI in 2019, **Dr Christina Colclough from The Why Not Lab** is worried about such a future scenario. "Elaborate AI-driven systems where work and your private life, where these tools might begin to talk to one another and create more inferences. For me, this is an utterly scary scenario. It's scary because it's subjective, we're becoming commodities."



Learning

The power of human-AI collaboration

How does an AI device learn about us and how do we learn about it? It is a fascinating question and the best way to answer it, for now at least, is to show what might occur. Humans can adapt, it is part of our very being, but while AI is now learning about us, we as a society are falling behind the learning curve for how this technology will impact us. More importantly, we must learn to leverage AI rather than the other way around.

“Well, if we assume that there’s going to be this massive influx of artificial intelligence in our private lives as citizens, as consumers, as workers as well, then of course, we’re going to need to learn, what questions to ask,” says [Colclough](#). “But I think for the majority of ordinary citizens for ordinary workers we cannot even imagine the power and potential of these technologies. So, we don’t know what questions to ask. We don’t know what the threats to our privacy rights or human rights are.”

And what questions will AI need to ask about us?

When it comes to learning, a pivotal AI sub-category is Affective Computing (AC), described by Hayley Sutherland, senior research analyst of AI software platforms at IDC, as a combination of computer science, behavioural psychology and cognitive science. Sutherland stated in a [blog](#) ² released last year that AC uses hardware and software to identify human feelings, behaviours and

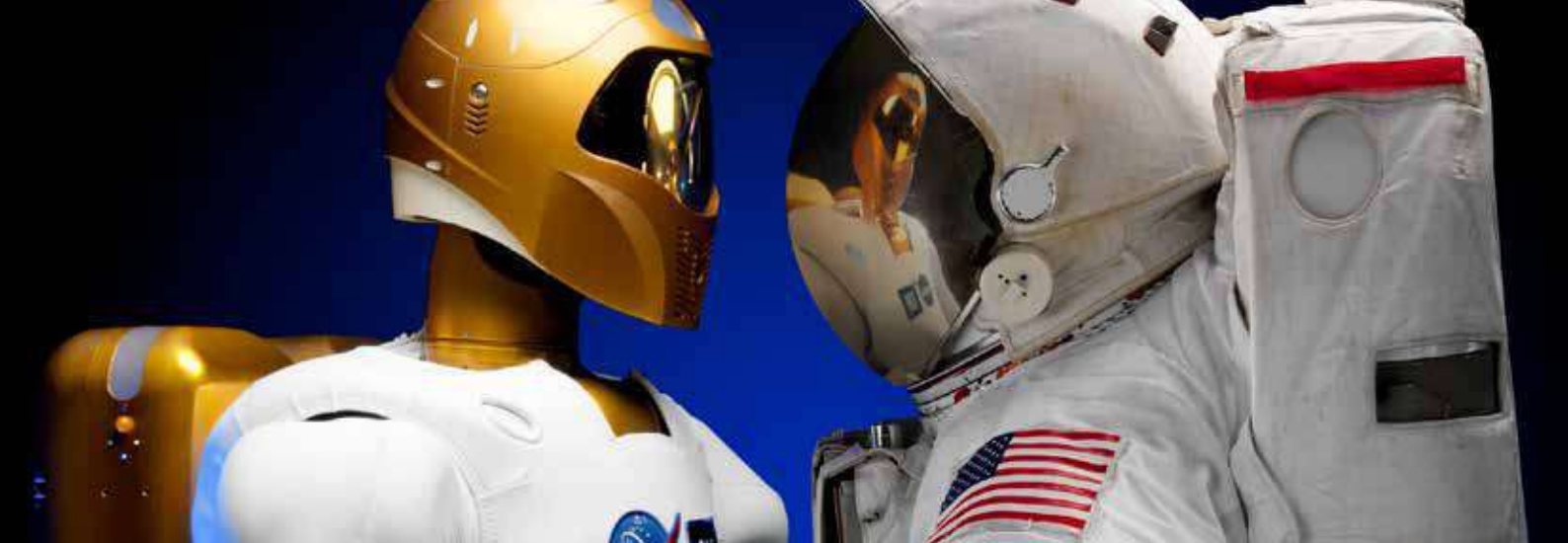
cognitive states through the detection and analysis of facial, body language, biometric, verbal and/or voice signals.

Multidisciplinary approaches like this and the ones advocated by [Prof. Zafiroglu](#) at 3Ai allows AI system to be built not only to learn the affective signals of a human, but as the end-user, that same human would be involved in the entire learning process for how to best use what is essentially an intelligent tool.

“We often find that when people are talking about AI, they are talking about super big systems and it sounds really big and scary, and it gets abstracted out to a level that you can’t really tell what the impact is going to be on the individual person that’s using the system, or it gets refined down so closely to an interaction between a human being and a device. You can’t begin to see the connections between that person and that device and then other systems that are also using that data.

We [at 3A Institute] are filling a role right in the middle there, trying to draw the threads together between how data is being used in the world and the types of systems that are enabling and making that type of usage of data and the usage of those systems understandable and actionable. A wide variety of people that need to understand how that data is being used. We are training the next generation of practitioners to go out into the world and work in a variety of settings from policy to

industry, to academia, to education at the non university level, to think tanks, to product teams, to strategy teams."



Empathy

Press here for feelings

Rosalind Picard, a computer scientist at MIT and co-founder of MIT Media Lab spin-off Affectiva, has stated that “If we want computers to be genuinely intelligent and to interact naturally with us, we must give computers the ability to recognize, understand, even to have and express emotions,” she says.

But the balance between how humans and AI interact is a delicate one given how human emotion often conflicts with logic. According to **Jeff Poggi**, Co-CEO of McIntosh Group, AIX design will be crucial for how empathy is applied in bridging human and AI interaction in the future.

“Human centric design for AI is really vital for the successful propagation of AI into society. Right now I think humans are very comfortable being the masters of machines. We’ve designed machines to be our tools and our servants. And that’s been since the industrial revolution. But now it’s an interesting kind of moment in time where we’re looking at machines to not just be our servants, but actually to be our peers and potentially even to be our advisors.

“And so that’s a pretty major inflection point, I think, in the state of technology and also the relationships of people with that technology and how we interact with that. And humans are very sensitive beasts. We are very emotional. We have relationships with

everything around us. So the idea of this sort of Human centric design for AI, I think is the right notion because we have to come at it from that perspective of how does it impact the person, the individual in an appropriate way, in order to build a fulfilling relationship between the man and the device.”

According to Pegasystems, a Cambridge, Mass.-based company that specializes in cloud software for customer engagement and operational excellence, empathy is not about humans versus AI; it is about using the best of what both have to offer.

A reality check is contained in a major Pegasystems **survey**³ of 6,000 consumers from North America, the U.K., Australia, Japan, Germany and France conducted about their views on AI and empathy.

Empathy, the company notes, is defined as the ability to understand and share the feelings of another, or simply as “putting yourself in someone else’s shoes. But are humans born with empathy or it learned? Half of the audience surveyed believes human beings are born with the capacity for empathy but must learn or be taught it.

“The future of AI-based decisioning is a combination of AI insights with human supplied ethical considerations.”

“Human-centric design for AI is really vital for the successful propagation of AI into society. Right now I think humans are very comfortable being the masters of machines. We’ve designed machines to be our tools and our servants. But now it’s an interesting kind of moment in time where we’re looking at machines ...to be our peers and potentially even to be our advisors.”

JEFF POGGI

Co-CEO, McIntosh Group

Empathy is when the AI senses the user is stressed about a job interview in their calendar. It offers to help them prepare by creating interview questions and providing feedback, while also setting the car route, the alarm and suggesting wardrobe options. Finally, empathy is the non-verbal, and perhaps non-intentional interaction by the human with the system to direct the goals of the said system. Poggi illustrates it well in his interview:

“I think an interesting, potential use case would be emotion capture. What is the emotion of the consumer? So if I am if I’m coming into the house, And I am in a relaxed mood, and I know that I’m in a relaxed mood cause I was just listening to some smooth jazz in the car on the way home from work and at a fairly low volume level, how do I sort of bring that mood of the user as they come into the home? How do I adapt lighting, music, blinds, you know, the whole home ecosystem can be adapted to the mood of the user based on how they’re entering the house?”

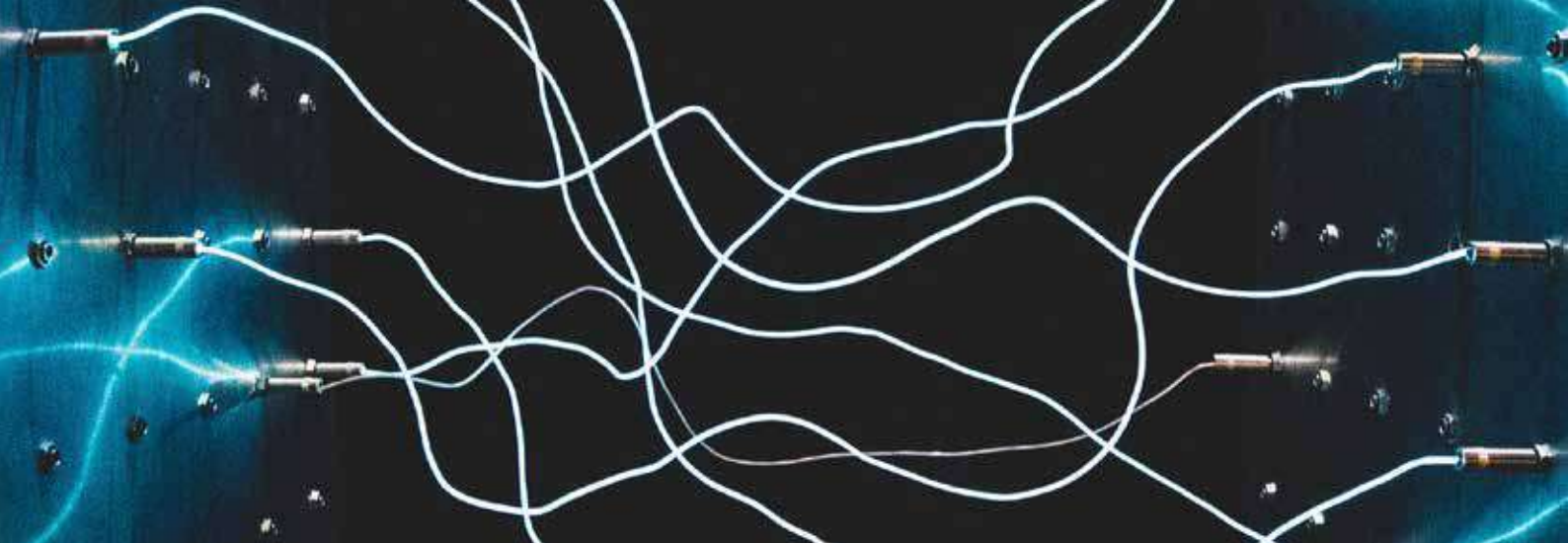
“One of the interesting concepts I think, is also to make AI then about the human or about the consumer, not about the device. So, the challenge for industry is, I may have AI in my refrigerator. I may have AI in my car. I may have AI in my phone, but I don’t want those devices to be controlling my experience. I want them to be working seamlessly together so that they can give me the optimal performance or the optimal benefit as an individual, regardless of sort of where I’m at and all the different devices around me.”

However, to ensure this sort of emotional engagement happens it is apparent that some sort of safety net be in place and that lines be drawn to protect one member of the party, and one member only.

Recently, the European Parliament became one of the first political institutions to put forward recommendations on what AI rules should include with regards to ethics, liability and intellectual property rights.

Future laws, EU politicians said, should be made in accordance with several guiding principles, including: a human-centric and human-made AI; safety, transparency and accountability; safeguards against bias and discrimination; right to redress; social and environmental responsibility; and respect for privacy and data protection. In addition, “high-risk AI technologies, such as those with self-learning capacities, should be designed to allow for human oversight at any time. If a functionality is used that would result in a serious breach of ethical principles and could be dangerous, the self-learning capacities should be disabled, and full human control should be restored.”

AIX design should consider how end-users want to engage with AI that is designed to understand them, anticipate their needs. It might not be practical to allow them to toggle on and off AI’s ability to read and mimic our emotions if that’s their core purpose. What then would be the point of the technology? As an industry, we must work together as policymakers, researchers, developers and end-users to begin considering these questions.



Fallibility

Mistakes will be made, lessons will be learned

Like any relationship, there will be bumps in the road as we learn to work and live with AI systems and products, not least will be a fundamental shift in our expectations for technology to work how we expect from the moment we plug it in.

We are not talking about buying a smartphone, 4K television or any number of other technology and electronic devices that work out of the box. As humans, we are going to have to accept that certain AI applications need time to learn about us and that they will likely get things wrong.

Maybe this is palatable for people when it is a poor movie recommendation but as we automate more of our work, more of our health decisions, more of our interactions with human relationships, the stakes get higher and mistakes will be less acceptable by end-users.

How then can AIX design address people's experiences with AI and their expectations?

"I try to think about how I am going to build a story that people will like, and how will I get them along the process so that they get the things that they actually accomplish and I can elicit from them what it is they're trying to do," says [Isbell](#).

"When you think hard about this as a notion of experience, there's an interesting trade-off, between giving people what they react to and they want, and helping people to come up

with something new that they want, that they didn't know that they actually wanted. And there is a trade off between making someone happy or feel as if they are happy and making someone better."

Fallibility is not a one-way street. The industry frequently talks about teaching AI tricks about human beings, but what about the reverse? The fallibility of the end user, and how best to limit their own manipulations and or exploitations of AI must also be considered.

This becomes critical particularly in Level 3 or Level 4 of the [AIX Framework](#) where clear and distinct decisions are being made not by a human, but by AI that is revolutionizing what can be automated and the scale at which it can be deployed.

For example, a severe form of fallibility occurs when an AI device demonstrates bias, something which can and will create untold problems. If an AI system learns what you like and aligns with your biases, but those biases are not aligned with the rest of your household, with the developer's intentions, with society, then is it broken?

[Dr. Yuko Harayama](#), Executive Director of International Affairs at [RIKEN](#) and one of the initiators of Japan's future-forward Society 5.0 may have an elegant solution to such potential issues of bias:

"If society is mostly dominated by men, for example, they have their habits and their way of interaction and way of sharing permissions. And we [women] feel kind of [like an] outsider and have our own norms. And if we do not as a woman, adapt to their norms, it's not so easy to really be listened to at the same level. [So] if it's possible to have bias on one side, you can create a different bias on the opposite side. Why not experiment in this new way of designing things using positive biases?"

Whether AI incorporates bias purposefully we must consider the consequential nature of decisions the AI is making and whether it should even be making that decision in the first place. Either way, our relationship with AI will be just like our relationship with each other, it's going to take time and effort.



Interface

Common standards, platforms must come first

As end-users of consumer AI assistants like Siri or Alexa, we are already learning new ways to interface with technology in ways that are meant to make it feel more personal, more human. The advances in speech and language processing in the last few years are changing the way we think and interact with AI. This is only the beginning.

As AI advances and becomes more embedded in our lives, the way we interface with these systems and products will directly affect how we understand, trust and interact with them. Some AI will act as collaborative tools with a need for direct engagement from the end-user while others will be purpose-driven, running in the background helping to automate our lives, predicting our needs.

Each application will need its own interface, some intuitive, some enjoyable and some perhaps, like body-language recognition, could be subconscious.

But the relationship between AI systems is also going to be an important component for how end-users engage with the technology and for the end experience.

In an IBM [essay](#)⁴, Gabi Zijdervel, chief marketing officer and head of product strategy at [Affectiva](#), believes bringing AI to its most useful state will require technologists to come together to establish common standards and platforms for AI: "As a consumer I'm not going to want to have to jump through hoops to get my phone to talk to my car, right?"

"These are systems that should all be able to talk to each other, from the enterprise applications that we use in business to our mobile devices. Yet there are no standards for interoperability. I believe a consortium of industry will have to come together to solve this, cross-verticals and cross-use cases."

Zijdervel touches on an interesting point of machine-machine relationships, the handshakes and the firewalls that will dictate how AI systems interact with each other. This will be especially relevant from the perspective of AI making up more of the "passive" environments we live in, and then our personal agents being able to act with the environments.

Relationships are Hard

Whether personal or professional, collaborating or cohabitating, AI systems, services and products are intertwining with our lives. Humans and machines are already collaborating in hospitals, in factories, helping us navigate traffic and even make dinner.

The successful integration of AI into the many aspects of our lives is going to hinge on our ability to accept, understand and trust the technology for what it is, a complex software. AI is essentially a tool, but it is unique in that it is a tool that will learn from us, predict our needs, make decisions, and explore with us. It will also make mistakes, but it will get better – and we need to be accepting of that.

Dr Max Welling, VP Technologies at **Qualcomm Technologies Netherlands B.V.** believes it is only a matter of time that AI will take over much of our tedious and complex work, and we will be glad for it, but to get there, we will still need to learn to collaborate.

"What is interesting is that humans will have to work together with the machine, running algorithms, certainly in the beginning, they become sort of tools that humans will use ... but at some point I think it will be mostly

automated and it will be clear that the automated procedure is actually better than the procedure where the humans do the work, because it's just too complex. Basically, everything you can think of will probably be prone to be revolutionized by machine learning in one way or the other. That's my prediction."

The fear about AI replacing humans, either in the workplace or in general is still up for debate. However, we must prepare for a near-future that will require us all to work and live alongside AI, in partnership.

AIX design will become ever more important as all stakeholders in the development of AI – from the researchers and developers, to the policymakers and ultimately the end-user – consider the emotional barriers posed by humans and the need to design for purpose when considering the ways that humans and AI will collaborate. How do we ensure we have the skills? How do we design AI to be a good companion or co-worker? They say relationships are hard and require work to be successful.

We should assume the same is true with our AI relationships.

"Humans will have to work together with machines, running algorithms, certainly in the beginning, they become sort of tools that humans will use ... but at some point ... basically, everything you can think of will probably be revolutionized by machine learning in one way or the other. That's my prediction."

DR. MAX WELLING

VP Technologies, Qualcomm Technologies, Netherlands B. V.

Adjacent Technologies

AI is developing fast, but it isn't doing it alone. In fact, many technologies are advancing simultaneously, further enabling the advancement of AI and creating an exciting future full of possibility.

01.

Edge Computing

Plays an essential role in the Internet of Things (IoT) by enabling us to store and process data as close to the source as possible which helps to increase operational efficiency and contributes many advantages to the system.

02.

Quantum Computing

A new kind of computer that manipulates subatomic particles such as electrons or photons to provide significantly more powerful processing than even today's most powerful supercomputer.

03.

5G

Fifth generation mobile networks (5G) provides much greater bandwidth, giving higher download speeds up to 10 gigabits per second. This will enable and accelerate the development of smart devices, IoT and autonomous vehicles.

04.

Renewable Energy

It might not be commonly known, but AI is power-hungry. However, new **developments in solar and wind technology**, as well as batteries, means that our AI-powered future can be green.

05.

Blockchain

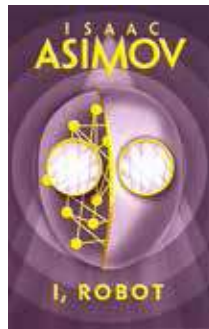
A decentralized, distributed ledger that records data in secure blocks that can't be altered, the **technology ensures the transparency and traceability** of data between all parties in the chain.

AI's Short History

AI has developed from imagination to reality in a relatively short time. Here are 10 big milestones in the story of AI.

1950 & 1951 Asimov & Turing

In the early 1950s, science fiction writer Isaac Asimov proposed the three laws of robotics and published the influential sci-fi story collection 'I Robot'. The same year, mathematician Alan Turing created the Turing Test, which measured technology's ability to deceive a human judge.



Isaac Asimov "I, Robot" Book Cover
Photo: HarperCollins Publishers

1954 First Industrial Robot

Inventor George Devol created Unimate, the first industrial robot which transformed the manufacturing world. Unimate grew from the planning and business insights of Joseph Engelberger – the Father of Robotics.



Unimate
Photo: UL Digital Library

1969 Shakey the Robot

Shakey was the first general-purpose mobile robot with the ability to make decisions about its own actions by applying logical thinking of its surroundings. However, AI was slow and there were challenges and this was made aware by Shakey the Robot.



Shakey the Robot
Photo: SRI International

1956 Dartmouth Conference

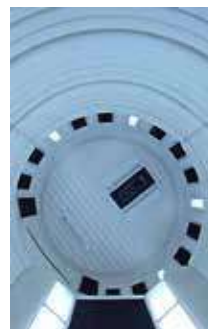
John McCarthy organized a summer conference at the Dartmouth University where The 'Logist Theorist' program was presented. It is considered the first AI based program designed to mimic the problem solving skills of a human.



John McCarthy
Photo: Jeff Kubina

1968 - 2001: A Space Odyssey

Academic Marvin Minsky guided Stanley Kubrick for the film 2001 space odyssey influencing science fiction. He also supported a 'top down approach,' the notion of pre-programming a computer with the rules that govern human behaviour.



2001: A Space Odyssey
Photo: James Vaughan

1990s & 2000s Robots at Home

AI scientist, MIT professor and founder of IRobot, **Rodney Brooks** emphasized that limitation of machines and interaction with the environment hinders the design of intelligent systems. He strongly argued that humans' use is much better off if the design of AI is human centric. His company, IRobot invented the first successful robot for the home called Roomba - an autonomous vacuum cleaner.



iRobot's Roomba vacuum cleaner
Photo: Jo Zimny

Today Deeper Learning

Realistic language processing algorithms such as **OpenAI's GPT-3** and **image** and **voice** processing used for deep fakes are only some of the new ways that AI is being applied. Today, task-oriented AI can beat humans at the game **Go**, at **complex video games** and **military exercises**.

Even so, according to researchers and the **Levels of AIX Framework**, we are still in the early stages of AI's development. What will tomorrow bring?



Robot Creating Music
Photo: Photos Hobby

1970s & 1980s AI Blues

AI advancements slowed in the 1970s. Although there was proof of concept, computers still couldn't store enough information, process fast enough and couldn't perform tasks like facial recognition. As Hans Moravec, a faculty member at the Robotics Institute of Carnegie Mellon University said, "computers were still a million times too weak to exhibit intelligence." In the 1980s, AI began to reemerge, new funding was in place and 'expert systems' were developed by the AI pioneer Edward Feigenbaum.



1980s Computer
Photo: Marcin Wichary

2011 Rapid Progress

The new millennium saw a massive leap in AI's progress. IBM Watson beat Jeopardy world champions Ken Jennings and then Brad Rutter a 20-time winner. And then in 2011 Apple introduced intelligent personal assistant Siri on the iPhone 4S, followed by Google Now and Cortana, which have since become mainstream.



Siri on iPhone 4S
Photo: K rlis Dambr ns

End Notes

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