



Metaphors, Myths and the Stories We Tell:

How to Empower a Flourishing AI Enabled Human in the Future of Work by Enabling Whole Brain Thinking

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Abstract

Through the use of storytelling, literature review, interviews, workshops, and explorations using scenario planning, how to empower an AI enabled human being to flourish in the future of work by enabling Whole Brain Thinking is studied. The purpose of this report is to provide a roadmap for human success using the future of work as a focus.

This report reaches five conclusions:

1. Training creativity is the key to building the capability to imagine new metaphors and myths in order to tell new stories to restore Ontological Safety.
1. Whole Braining Thinking is enabled by creativity. As people are able to ignite both left and right brain thinking to see other possibilities, training Whole Brain Thinking helps people to create new metaphors and stories about their future by shifting their mindset to imagine a future that is not dystopian.
1. As the nature of work changes and AI takes over more left brain tasks, Whole Brain Thinking as a skill set will place us in a position to be able to find meaningful employment alongside AI by creating new types of integrated careers, like Explainers.
1. Statisticians use AI for making predictions. If as predicted, Quantum Computing can enhance this capability by examining trends and predicting what is probably, then there is a place for people to use Whole Brain Thinking to expand predictions into the realm of the plausible and the possible outcomes.
1. Being **AI Enabled** requires comprehension of how AI works by breaking AI into its system components. Being Whole Brain Thinkers allow us to symphonically explain the ‘why’ and how things are linked.

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Introduction

No one left behind



Within 30 years, humans will build [Artificial Intelligence](#) (AI) that not only think, process, and interpret the world the same way we do, but that surpasses our abilities. What currently seems like a small leap of Google mail suggesting grammatical corrections to complete our messages is expected to morph over the next 15 years into smarter technological interactions with people. “Whether by preventing and curing diseases or optimizing transportation and logistics, the use of AI technologies presents countless possibilities for reinventing society by radically enhancing what humans are collectively capable of” (Floridi et al., 2018, p. 693). “The need for emotional skills to work with AI will increase while the need for basic cognitive skills, physical and manual skills will decline” (Bughin et al., 2018). Businesses will need to examine the talent that they have in their workforce, and plan for their future needs.

In order for people to not be left behind then retraining, upskilling, and a mindset shift will be needed so that they can find their place and flourish. Otherwise, laying off those who are unable to adapt may be necessary. A population of people could feel disenchanting by the changes happening around them. Those who subsequently feel left behind in the job market can have negative perception of world events, politics, and of others who are seen as having an advantage. A disenchanting workforce could also be susceptible to disinformation campaigns by those who have malicious intent. How to introduce universal basic income that still provides meaning, purpose, and dignity would need to be tested while at the same time considering financial viability.

People’s ability to receive equal opportunities in the future of work create an imperative to get things right. While opportunities to find meaningful work need to also be looked at in the context of understanding the implicit biases behind AI, this report focuses on how having a basic understanding of how AI works is a necessary first step. In the greater context, experiments like the Chatbot Tay Tweets demonstrate how algorithms that rely on the current historical vocabulary of human society with its negative undertones does not eliminate social biases, but has instead the unintended impact of amplifying it. Inaccurate facial recognition software on non-white males demonstrates how AI can also have a negative impact. Both of these examples of biases would have an impact on the ~~future of work~~. As this report tackles the broader question of how to solve for empowering a flourishing human in the future of work, it is hoped that future reports tackle the topic of bias head on and ensure that no one gets left behind.

Project Roadmap



The theme of this MRP focuses on where Artificial Intelligence and humanity intersect. It uses the future of work as a boundary for the exploration. This involves examining how we can build people's capabilities and skills to work effectively with AI. By making an argument that we need to train Whole Brain Thinkers, this paper hopes to provide humanity with the strategic tools that can help create the desired future where everyone thrives and no one gets left behind.

Section 1: The Current Context: Designing for the future of work requires incorporating human centred design practices that will enable the human workforce to flourish in the age of AI. This report starts by defining what it means to flourish for a person, before reviewing the history of AI and how it is affecting the workforce.

Section 2: Future Focus: Section 2 takes begins to introduce the skills that people will be needed in the workplace, and introduces us to quantum computing and the future of AI. As well as looking at the trends and drivers that will impact the future, it outlines the possible scenarios that could unfold. These scenarios are the basis for the stories that appear throughout this report.

Section 3: Dystopia: This section walks us through a Causal Layered Analysis and explains why we have a negative impression of AI and our future. Through a participatory 3 Horizons workshop and interviews, we ask people to outline their view of the future and discuss their feelings about AI.

Section 4: Changing Our Metaphors: What would it take to change the dystopian view of the future is introduced alongside an Appreciative Inquiry workshop. That workshop encourages the participants, by asking unconditional positive questions, to solve for the complex question of what would make them feel comfortable with AI. This technique walks them through how to build an ideal future. It shifts them away from a pessimistic view of the future of work and challenges the participants to create new metaphors and myths.

Section 5: Creativity Is the Key to Whole Brain Thinking: Makes the argument that in order to train Whole Brain Thinkers, training creativity is the key for success. This session debunks the myth that not everyone is creative and provides practical on how to become creative.

Section 6: People + Artificial Intelligence: Brings the proposed needed skills of Whole Brain Thinking together with the superpowers that AI can provide. The scenario story found in this section makes the argument that armed with new ways of looking at the world, we can set in motion actions today to make that future possible. This section ends with an examination of the unintended consequences, both positive and negative, of adding Whole Brain Thinking to our skill set.

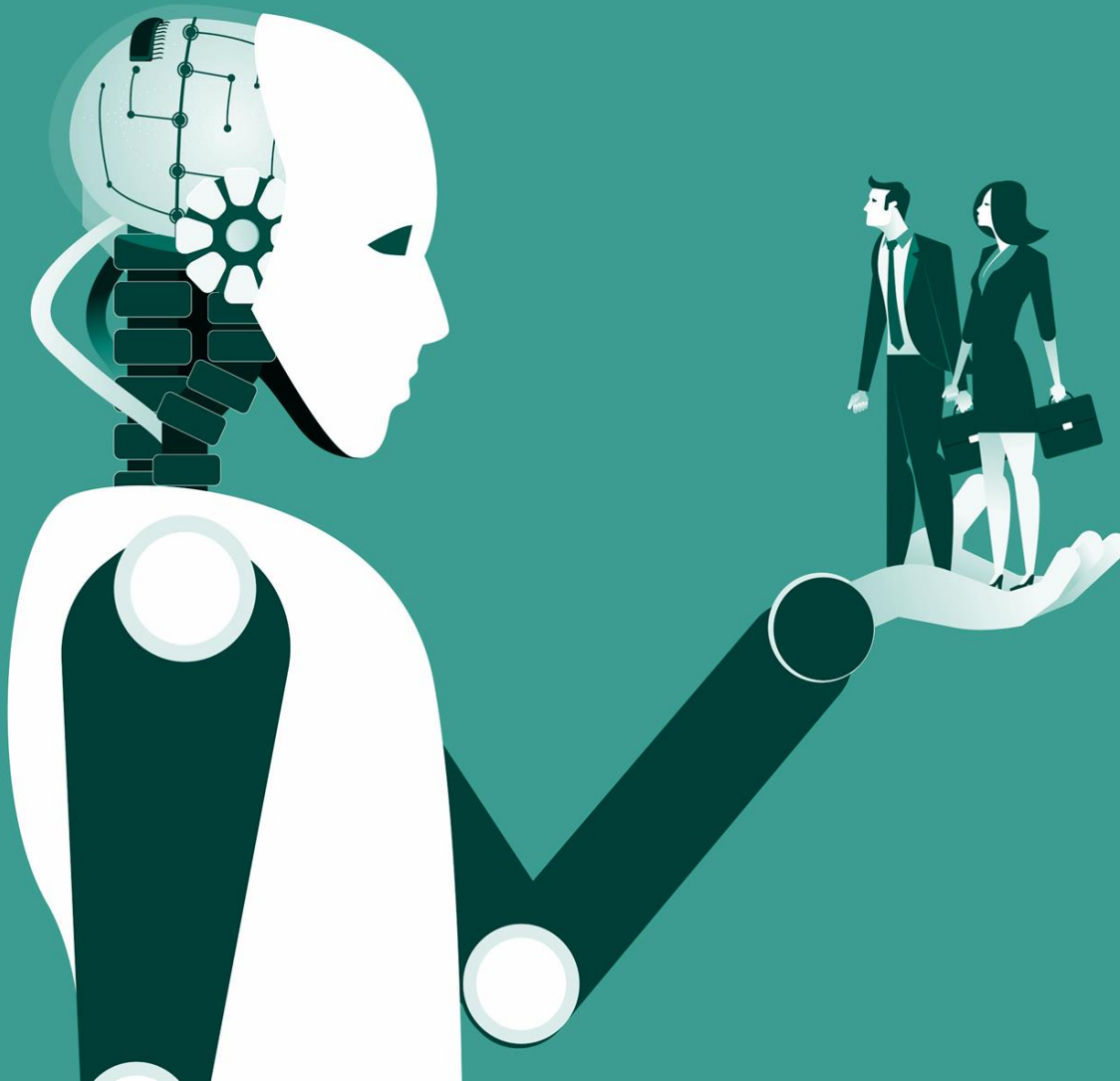
Section 7: How to Flourish: Along with recommendations for further areas of study, this section concludes the report with 5 findings that the reader is asked to consider.

The work ends with appendixes that contain the definition of the trends and drivers, terminology, and with the research bibliography.



“I think at the moment, people are looking at what this will do for them, but they aren’t seeing the full impact of what can really change in the world because of AI” (Anonymous, Interview, November 6, 2019)

Section 1: The Current Context



Research Questions

Unintended consequences is an emergent property of any new technology, innovation, process, or idea that is introduced to humanity. The roadmap as outlined, describes the journey of how to navigate through those emergent properties to reach a desired future. This journey started with several research questions with the primary research being:

How might we empower an AI enabled human being to flourish in the future of work by enabling Whole Brain Thinking?

From this exploration, related sub-questions are generated that will add layers of interest to the primary research question:

1. How might we reimagine work to integrate a flourishing human being with AI enabled capabilities?
 - a. Why would it be important to do so?
2. As AI is used increasingly in the workforce, what personality traits would be needed in order for people to interact successfully, flourish, and collaborate with technology?
 - a. How might we potentially seek to change or train those personality traits that would enable a human worker to flourish?
 - b. What are the unintended consequences, both negative and positive that could be emergent properties of such a change?
3. How might we build trust with AI so that employees of the future are not afraid of AI taking over all work?

To answer these inquiries, we can examine the separate parts of the question before exploring what the intersection of humans and AI could look like. Since human centred design keeps the end user in mind, we can first define what it means to be a flourishing human before examining how far AI has come and how it affects our current context. Whole Brain Thinking will be introduced in full in section 2.

What does it mean to flourish?



Simply put Oxford dictionary defines what it means to be a flourishing human as a person who has the opportunities to thrive, grow and develop in a healthy way especially as the result of a favourable environment. In the context of humans working with AI, we can take flourishing to mean that workers achieve [Augmented Intelligence](#) while still cultivating a sense of wellbeing, [psychological safety](#), purpose, and career fulfillment. These would go with simultaneously trusting AI to to enhance their on the job skills and abilities. AI would help people to be smarter, stronger, and make better decisions faster.

In the next decade or two, it is likely that those who have careers will only be able to do so if they have the right skills to remain relevant in the age of robotics, AI and [Artificial Super Intelligence \(ASI\)](#). ASI in this context would be AI that are capable of mimicking human behaviour, emotions, and skills to the point that one could not distinguish their action from that of a human. Nobel Laureate Daniel Kahneman believes that with enough data, that there will be no human cognitive task that a computer will not be able to accomplish (Hess, 2018). ASI then would truly be humanoids, and would be as superior to AI as our contemporary iPhones are to an ordinary calculator.

For some, our careers are linked to our self-worth, social standing, and our personal identity. Being made redundant in the context of AI could affect all of these. That is not to even considering the economic damage that losing one's career would do. If we could no longer work, how would this affect our concept of self?

One of the sub-questions that was asked was: How might we reimagine work to integrate a flourishing human being with AI enabled capabilities? Also asked was why would it be important to do so? One possible tale of the future looks at the unintended consequences of what could happen if humans flourishing is not kept at the forefront of design. While a [Universal Basic Income](#) is being proposed as one solution to AI taking over some jobs, forgetting that people's identity can be wrapped up in their career comes with its own kind of peril.

Universal Basic Income

“Mark my words: A Universal Basic Income is coming, as artificial intelligence and robots eat away good jobs.” - Robert Reich (Basic Income Quotes, 2017)

Cathy stared at the blank screen for perhaps the tenth time in 5 minutes. Where to begin? At the age of 40, her therapist told her that this was the right time to write her memoirs so that she could share the tale of her life with the generations to come. She frowned, as not for the first time, Cathy had to admit that her life story was meaningless. The pages were blank, because she had no tale to tell.

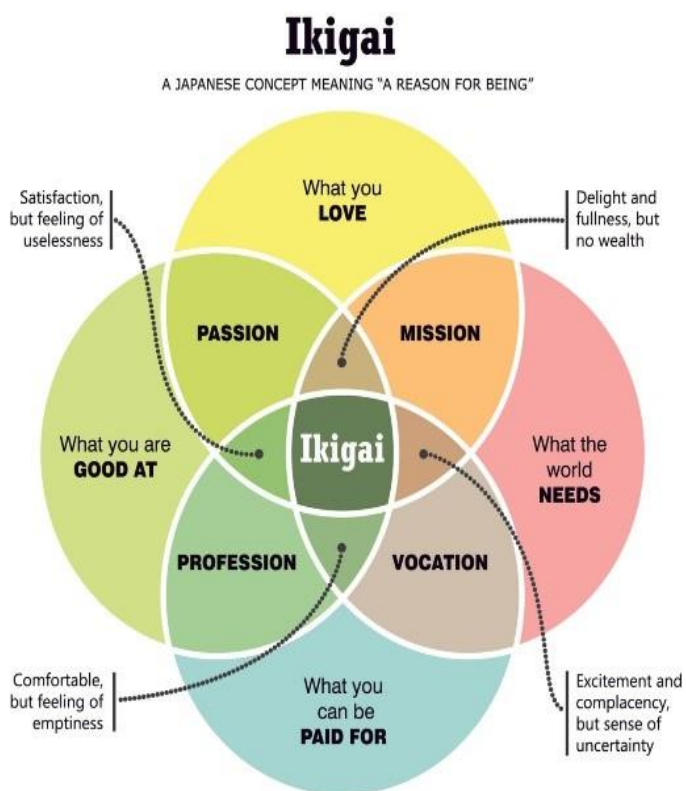
Just over thirty years prior to that pivotal commitment in the year 2020, Norway had released the results of their [Universal Basic Income \(UBI\)](#) study. It was unique in that it was the first UBI that was nationwide. With a randomized trial of over 2000 participants, it provided a view of UBI that was not possible even in the other countries that were piloting the measure. The study found that people’s sense of wellbeing went up, while their level of stress went down (Varghese, 2019). At the end of 2020, all Scandinavian countries made a commitment that if by 2030 AI had proven to be able to take over most jobs, then they will adopt UBI. In the year 2030, she was 20 years old. AI had indeed progressed to the point where her role was no longer relevant. Robust [oversight policies](#) ensured that AI was developed with strong [ethics in AI](#) standards that ensured that what was being rolled out was not going to be harmful to humans. [Closed codes](#) were not allowed and every student was able to explain how AI worked by the time they had finished high school. As a statistician, what she had begun to study in university was no longer a needed skill, by then UBI was seen as a panacea to fill the gap of not having a worthwhile career.

At first, Cathy was thrilled. She did not have a [T-Shaped](#) skill set which would have allowed her to work as a generalist in other professions. Numbers were all she knew. She was just happy to escape the month-to-month contracts that she had to take in the [gig economy](#) that was prevalent in the year 2030. No one had real careers anymore, and attempts at [job crafting](#), taking the job that you had and turning it into something that you loved, was becoming unnecessary as AI was able to precisely do each job in her area of expertise with ease. All Cathy had to do was sit back, let AI work for her and collect the money that she needed in order to live. She was not rich by any means, but she had enough money to get by.

What she was lacking was purpose. She did not find a way into the [purpose economy](#), which had come and went, leaving her and most others who were collecting UBI with no clear direction in life. The [AI in the next cubicle](#) had taken her job, had taken her career. There was no [work/life harmony](#) anymore; there was just life, and it was lacking in meaning. Most people that she knew, her friends and her family had a therapist. Cathy’s assigned AI therapist nodded with a permanent smile that never made its way to the cold humanoid eyes. She had not had a real human therapist in years as that profession too, that deemed that human’s needs were predictable and therefore easy enough to outsource to an AI unit, was taken over by technology. At least Cathy knew that the algorithms used to program her therapist was a combination of [Decision Trees](#), [Neural Networks](#), and [Naïve Bayes](#) clustering. It did not however alleviate the feeling of not having a meaningful career. What was the point of working, she wondered.

Maybe if she admitted that she was suicidal, they would provide her with a human counselor that would adjust for her complex emotions. Maybe... or was there an algorithm in her AI therapist that accounted for suicidal thoughts too?

Finding Purpose at Work



Universal Basic Income, as a point of reference, was one of the solutions to AI disrupting the workplace that was discussed by a participant in the 3 Horizons workshop that will be discussed later in this report. It has been explored in Netherlands, Kenya and even in Manitoba, Canada back in the 1970s. While the results have been mixed, advocates of UBI argue that not having to worry about putting food on the table would give people time to pursue other interests like education. One argument against UBI is that having economic security does not replace a robust support system (Varghese, 2019).

It is no accident that the trend in self-help books is towards finding purpose in life, or how to meditate using [Calm](#) and [Muse](#). People are attempting to tap into the potential of the right side of the brain in order to find ways to thrive. Indeed, one of the workplace trends that is prevalent is Finding Purpose at Work. The Japanese tool of finding your Ikigai; 'iki' meaning life and 'gai' meaning value or worth, is recognized as a tool that can help people to find their purpose at work. If you can find a career that combines the intersection of a) What you love to do, b) What the world needs, c) what you can be paid for, and d) what you are good at, then you are on the path to finding your purpose at work. As the future of work evolves, the trend towards a workforce that finds meaning, purpose and passion in what they do is a key to driving innovation and overall workplace satisfaction. An ADP study in 2016 found that 89% of respondents will choose to work on personal interest work that has an impact on society (ADP 2016). Stedman Graham, who is an author, speaker, and entrepreneur sees this as the way to be successful in the new era. "Passion with a purpose is the new foolproof formula for success" (Graham, 2015). Truly following your purpose would make you more successfully at being innovative as you would be finding a problem that matters to you. By doing so, you would be more engaged in terms of your energy, what you chose to learn, and less likely to be left behind in the ever changing pace of the digital economy. "Passion is the force that drives people toward solutions that are not achievable in their current mindset; it is the intrinsic motivator that inspires us to collaborate with the outside world and achieve our goals" (Graham, 2015).

Finding purpose then, is a goal that needs to be maintained in the future of work. While the introduction of AI may disrupt how people find purpose, we can look for a method to weave together purpose, and AI.

That other side of the equation - AI, can be examined in turn. 12

A Brief History of AI



At Dartmouth College Hanover in 1956, the field of artificial intelligence was born. Led by John McCarthy and a team that included Claude Shannon and Marvin Minsky, a group of computer scientists held a conference that examined the question of machine intelligence. They explored the question of if machine intelligence could ever duplicate what a human could do. The conference was based on the premise that every aspect of human learning could be precisely represented as a mathematically algorithm and therefore replicated by machines. This conference was a pivotal event that defined the field of AI (Daugherty, Wilson, 2018).

Minsky, along with Seymour Papert went on to write a book on neural networks that defined AI using biological neurons as its model. Another conference participant, Arthur Samuel who worked as an engineer at IBM, went on to build a program that played checkers that in 1961 defeated the United States' fourth ranked checkers player. In 1959, Samuel coined the term "machine learning: the field of study that gives computers the ability to learn without being explicitly programmed" (Daugherty, Wilson, 2018).

Until 1974, AI did well as computers was able to store more information while at the same time became faster and relatively less expensive, however the computational ability to do anything substantial was still not there. A series of failure in the 1970's and 80's that looked unsuccessfully at programming logical rules based on physical symbols led to what was known as the [AI Winter](#). The British government, in an attempt to compete with Japan, tried to revive the field in the late 1980's, however another winter ensured from 1987 - 1993 that coincided with the collapse of the market for general-purpose computers (Lewis, 2014). A full timeline can be found in *Figure 1* below.

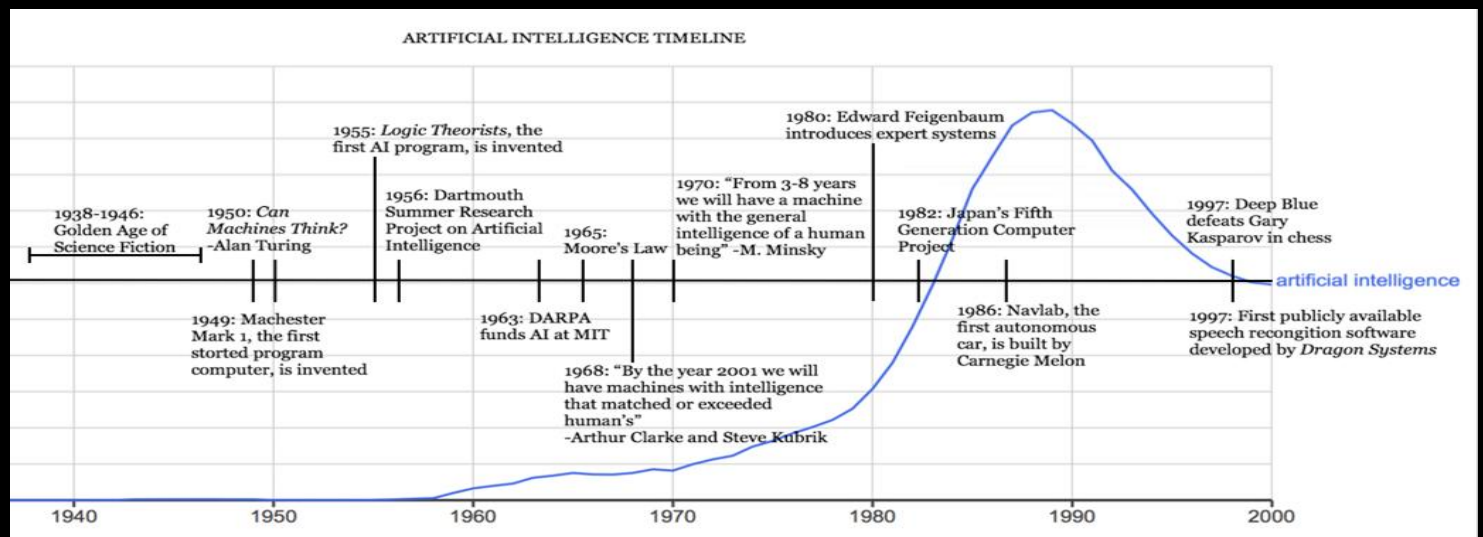


Figure 1. Artificial Intelligence Timeline. This figure illustrates timeline of AI including significant milestones that contribute to AI development (Anyoha, 2017)

Later in the 1990's after statistical programming and probability theory were woven into machine learning, the field started to revive. In 1997, IBM's Deep Blue famously defeated the chess grandmaster Garry Kasparov. The fundamental limit of computer storage over the previous 30 years that was holding progress back was no longer a problem and finally surpassed our needs. Deep Blue was able to take advantage of this. In that same year, speech recognition software was developed by Dragon Systems and implemented on Windows (Anyoha, 2017). Leap forward to 2011 and IBM's Watson notably defeated Jeopardy champion Ken Jennings. Google's AlphaGo, that defeated Ke Jie showed how far computational power has advanced.

Big Data, is what everyone talks about these days. The large sum of data, trends, and information about people's behaviours, activities and preferences has been termed the new oil. The data is so vast that in order to wade through the volume, variety, and velocity of change in the data, some form of computational application is needed to work with it. Big Data is one of the fundamental result of the **Information Age**. The Information Age is about the connection of people, technology, and processes. Where these three things converge, the next strategic trends in technology can be found:

Autonomous Things: Using AI technology to drive new hardware and software capabilities, vehicles, ships, and drones can now operate independently of direct human guidance.

Augmented Analytics: Augmenting people to work with technology, not replacing them, will create **Citizen Data Scientist** who can interface with technology to enhance their work experience; for example, working with digital assistant to weed out the important sales data that is relevant to a sales person's work.

AI Driven Development: Refers to projects that use AI in the development process where AI after initial setup then uses machine learning to drive further technological development; for example the testing of new hypothesis, and code generation. This is basically AI developing other AI.

Digital Twin: A digital representation of a real world object. They are connected in that the digital twin does the same actions as the real world object; for example avatars.

Empowered the Edge: With **Edge Computing** we need processing power in order to react to stimulus in real time. For Edge computing, even if it is a matter of nanoseconds, reaction time needs to be immediate as there is no time to send information into the clouds for **Cloud Computing** and then await a response. Edge computing is important for example with autonomous cars that need instant computing. Here you find innovation like 5G processing speed starting to be introduced into the network.

Immersive Experience: Augmented Reality (AR), Virtual Reality (VR), and Mixed Reality (MR) focuses on how humans interact with the digital world and data. For example, AR enables a walkthrough of fixing equipment by creating a digital representation of what that equipment looks like. This also includes how we interact with the digital world with smart speakers and Chatbots.

Blockchain: This represents a digital ledger that is shared.

Smart Spaces: Technology can create an environment that brings a number of tech trends together in an integrated fashion to support the needs of the people who use that environment. Smart cities, work places, office of the future, and connected factors are introducing devices and machinery that interact with the people in those spaces.

Privacy and Ethics: Just because we can do something with AI, should we? This is more than a trend as developers in this space look to introduce ethics into how AI is programmed.

Quantum Computing: Unlike a regular computer that reads everything fast in a linear fashion, quantum computing takes reading to the next level. Imagine that instead of reading all the books in a library one right after the other, you could read all the books in the library at the same time. The latter would be what quantum computing could accomplish.

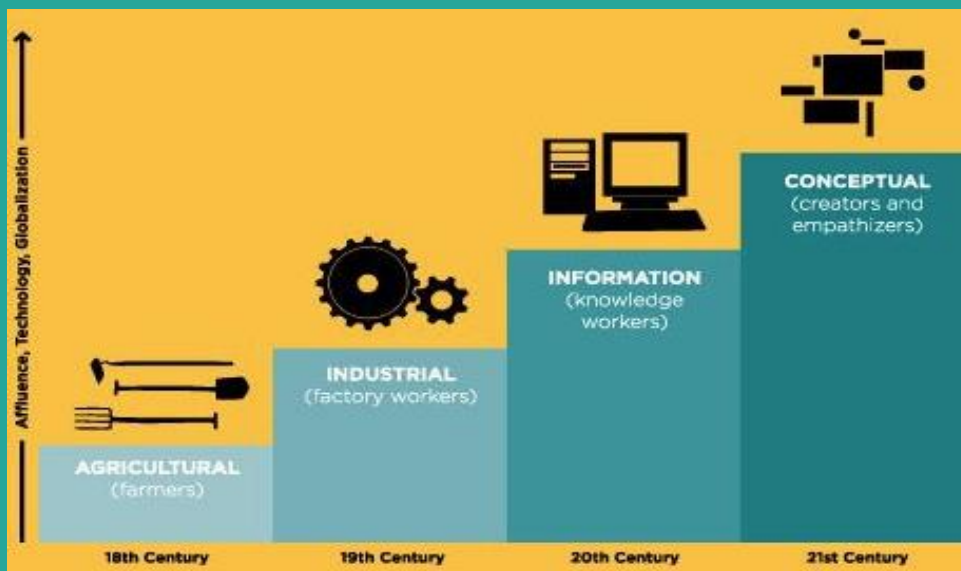


Figure 2. This figure illustrates the Daniel Pink's explanation of the Conceptual Age and the ages that came before it. (Hawks, 2019)

Whereas the Industrial Age introduced factories and efficiencies, the knowledge work of the Information age brought with it an optimism that technology would eventually solve all our problems including poverty, disease, and war (Quora |Forbes, 2019). Post Information Age, Daniel Pink label the next age as the Conceptual Age. He proposed that the Conceptual will be dominated by creators and empathizers who have mastered right brain thinking (Pink, 2005).

The Conceptual Age “is marked by constant change & progress through redefining existing elements, identifying subtle patterns, drawing beautiful and coherent connections from unfamiliar things, ability to attract emotions and draw attention; to interpret/extract meaning from abstract/vague elements or associations” (Hawks, 2019). If our intelligent instruments will work with Big Data to draw out patterns, trends and drivers, then our ability to flourish would then become a matter of connecting those trends and patterns, and seeing the entire system. This starts to provide us with the clues to start to tackle other sub-questions. Specifically:

- As AI is used increasingly in the workforce, what personality traits would be needed in order for people to interact successfully, flourish, and collaborate with technology?
- How might we potentially seek to change or train those personality traits that would enable a human worker to flourish?

What does it mean to then to be AI enabled and to flourish? From the previous section, we know that to flourish at work must include finding purpose. Given the trends in AI that were just introduced, what would it take to be AI enabled? The extent for what is needed can start to be conceptualized if we break down AI into digestible parts. We can begin by looking at how AI is trained today. There are only 3 methods used to train AI:

Categories of AI Learning Methods

Supervised Learning: This learning method involves humans directly training the AI on what is right and what is wrong. An example of this can be found in classification tasks like your spam filter on your email. A person has told the AI to map information based on a predefined criteria. In your inbox anything that has the symbols "\$\$\$" or "Make money" is then automatically placed in your spam or junk inbox.

Unsupervised Learning: This requires no human intervention after the initial program. The AI would cluster input into types with no predefined categories provided. Instead, the Machine Learning algorithm determines the characteristics of the input and then groups them together by similar characteristics.

Reinforcement Learning: A Roomba (a mini robot that vacuums your carpet) is trained using this method. The Roomba receives feedback from its environment after performing and interacting with the environment. The goal is to maximize positive feedback and minimize negative feedback. With this method, if a Roomba travels a distance and does not bump into a wall or an object, that is considered positive reinforcement. If it does bump into an object, that is negative reinforcement and it learns not to go that particular route again. With those positive and negative reinforcement, it learns the layout of your room and does not repeat the negative pathways the next time it vacuums.

Understanding these concepts starts to demystify how AI works and take us one step closer to understand what is meant by AI enabled.

Finding Purpose in the Conceptual Age

Change is a constant, and we know that nothing stands still. With ages that come and go, automation that disrupts the systems that were in place seems complex and overwhelming. People may feel that they will be left behind in the age where they had found their place and thrived. “With the pace at which our day to day technologies are developing and the way evermore powerful technologies are being integrated into our daily lives, it is hardly surprising that a growing number of people are looking bleakly at the future and letting their imaginations run riot.” (Invaco Research Releases, 2018). Indeed when you look at technology like Google’s Duplex that at first glance has passed the Turing test by successfully booking a woman’s haircut without the person on the other end knowing that they were speaking with an AI (Ulanoff, 2018), it is quite easy to come to this conclusion. Duplex through supervised learning, which was just discussed, was designed to do this specific tasks very well. Ask it to call in sick for you at work and it would not perform that well. What we currently have are AI that are designed to do some very specific tasks. In fact, all AI as we know it today can be categorized into one or more of the five systems tasks listed below:

Machine Learning Systems

- Computer Vision - Used to identify objects and people (eg. facial recognition)
- Anomaly Detection - Tasked with identifying deviation from an expected pattern
- Time Series Analysis - Finds trends over time on your data
- Natural Language Processing - This can understand and derive meaning from human language
- Recommender systems - Makes suggestions as to the preference of what a user would want to see in the future based on the history of what the user has already experienced

Currently, these five systems tasks are what comprises the AI systems that we see. All five of them are trained through supervised learning, unsupervised learning, reinforcement learning or a combination of these methods. However our perception of how far AI has developed does not precisely match with the reality of what AI can do. While yes, AI systems are becoming more accurate and faster, “In reality though, they are still limited by something which is extremely basic, they all operate in individual data silos” (Invaco Research Releases, 2018). The current systems of AI cannot perform outside of what it has been programmed to do. Where as the human mind can carry out multiple actions and absorb information at an incredibly rate. “Even babies are able to learn new things far faster than any AI system available today” (Invaco Research Releases, 2018).


Part of the challenge of enabling the human workforce to flourish then becomes finding ways to empower people to understand that the skills that they possess places them in a good position to find purpose in the Conceptual Age. The other challenge is to help people break down the systems of AI in such a way that does not seem overwhelming. We need to promote an understood of how these systems work. To be AI enabled partly depends on humans understanding how these systems combine to perform the tasks that they currently see AI accomplishing.



**Problem to Solve
For:**

We need careers
wherein we can
flourish and have
purpose at work
alongside AI.

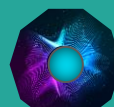




“There hasn’t even been a proper public discussion as to the potential impact this will have”
(Anonymous, Interview, November 6, 2019)

“I think people are in denial, want to avoid this change” (Anonymous, Interview, November 6, 2019)

Section 2: Future Focus



“It could go the way of making everyone happier or making everyone paranoid and not trusting anyone as “robots are taking over our jobs” – depending on how things progress” (Anonymous, Interview, November 6, 2019)



Skills in the Future of Work

In order to flourish then, as is understood so far, people need to have a purpose at work. Also needed is an understanding of how far AI has developed, what it realistically can and cannot do, and to be able to conceptualize how AI learns. But what would it take to collaborate with the emerging technology? What skills would be needed in the Conceptual Age? There have been studies that looks at these very questions.

“Demand for higher cognitive skills, such as creativity, critical thinking, decision making, and complex information processing, will grow through 2030, by 19 percent in the United States and by 14 percent in Europe, from sizable bases today. However, work activities that require only basic cognitive skills, such as basic literacy and numeracy, will decline as automation advances (Bughin, Hazan, Lund, Dahlström, Wiesinger, Subramaniam, 2018).

This is according to the McKinsey Global Institute. Their research showed that 15% of the global workforce will be impacted by automation by 2030, however, luckily in that same period, 21 - 33% new position will be created with 10% of those jobs have not even imagined yet (Manyika, Sneider, 2018).

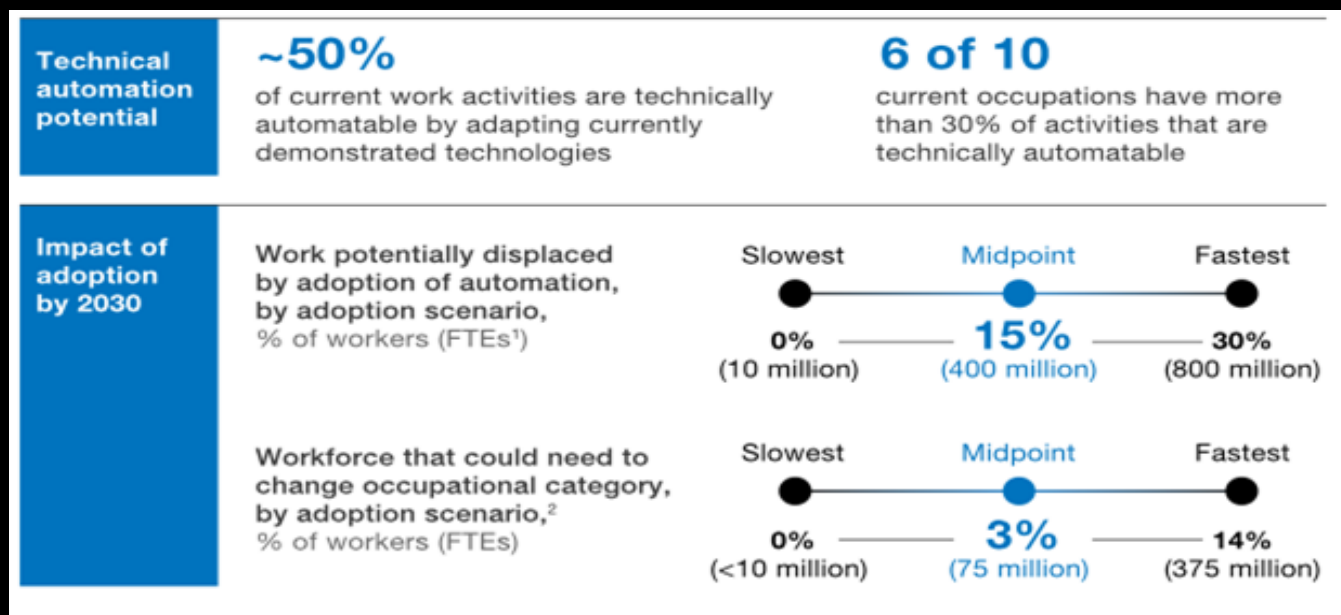


Figure 3. This figure summarizes McKinsey global Institute findings of how work will be impacted by technology by the year 2030 (McKinsey & Company, 2018).

In the Oxford University survey, respondents were asked to predict the likelihood of ASI being developed in 10, 20 or 50 years. Over 54% of the average public predicted that there would be a high level of machine intelligence within 10 years which would be by 2028 if we counted from the year of their study. However when experts are asked, only 50% of them predict that we would have ASI by 2061, or at the earliest, in 30 years (Zhang and Dafoe, 2019). It is worth noting that the experts, more so than the general public, responded that ASI will be more beneficial than harmful. “Although they assign, on average, a 27% probability of high-level machine intelligence of being extremely good for humanity, they also assign, on average, a 9% probability of the technology being extremely bad, including possibly causing human extinction” (Zhang and Dafoe, 2019).

The World Economic Forum agrees about the possible job losses. Their “Future of Jobs study predicts that 5 million jobs will be lost before 2020 as artificial intelligence, robotics, nanotechnology and other socio-economic factors replace the need for human workers” (Torkington, 2016). The good news as they report is that 2.1 million jobs will be created. David Deming, an associated professor of education and economics at Harvard conducted a study that demonstrated that those new jobs belong to the people who can demonstrate [T-Shaped](#) (multi-faceted) skills where they are specialist at one to two skills, and generalist in three more other areas. Single skill set jobs are on the decline, and Deming showed that jobs that require only mathematical skills have been automated. More importantly, Deming’s study showed that workers who successfully combine mathematical skills with interpersonal soft-skills in a knowledge-based economy will find more opportunities (Torkington, 2016).

In 2018, *The Future of Jobs Report* again asked human resources, strategic planners, and leading global employer and what skills they were looking to recruit for the future. Their findings is listed in the *Figure 4* below.

Today, 2018	Trending, 2022	Declining, 2022
Analytical thinking and innovation	Analytical thinking and innovation	Manual dexterity, endurance and precision
Complex problem-solving	Active learning and learning strategies	Memory, verbal, auditory and spatial abilities
Critical thinking and analysis	Creativity, originality and initiative	Management of financial, material resources
Active learning and learning strategies	Technology design and programming	Technology installation and maintenance
Creativity, originality and initiative	Critical thinking and analysis	Reading, writing, math and active listening
Attention to detail, trustworthiness	Complex problem-solving	Management of personnel
Emotional intelligence	Leadership and social influence	Quality control and safety awareness
Reasoning, problem-solving and ideation	Emotional intelligence	Coordination and time management
Leadership and social influence	Reasoning, problem-solving and ideation	Visual, auditory and speech abilities
Coordination and time management	Systems analysis and evaluation	Technology use, monitoring and control

Figure 4. The *Future of Jobs Report* from World Economic Forum (2018) listed the top 10 skills that will be trending and declining in for 2022

While advanced Data Scientist skills that are grounded in programming will emerge, the need for a skill sets that incorporates “social, emotional, and higher cognitive skills, such as creativity, critical thinking, and complex information processing, will also see growing demand” (Manyika, Sneider, 2018). With this in mind, retraining the workforce to be prepared for future requirements would be needed.

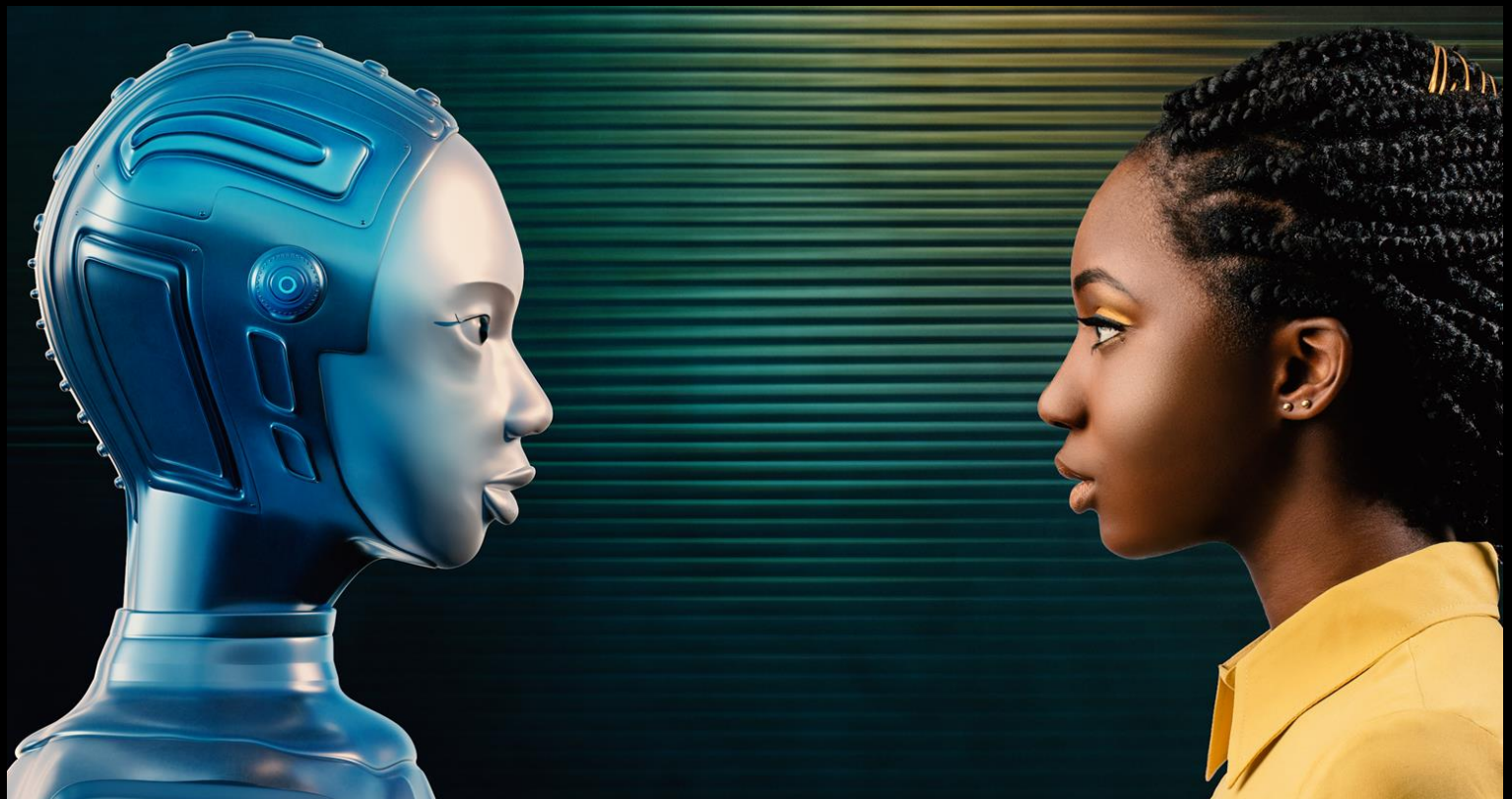
Along with the topic of the Conceptual Age, Daniel Pink also spoke extensively about the theories about the difference in [left](#) and [right brain thinking](#); the left side of the brain, is more analytical, logical and practical; the right side of the brain is more creative, and emotional. While left and right brain thinking will be discussed in depth in section 4, it is worth mentioning briefly here how this concept relates to the skills of the future. It used to be that the left brain skills were the most desirable, however in the future of AI, while these abilities are still necessary, the right brain skills (artistry, big picture thinking, creativity, empathy, inventiveness) are the ones that will matter most (Pink, 2017). While left brain activities like Analytical Thinking is not a surprising skill to be on that list of skills, right brain activities like creativity, will still be needed. Emotional Intelligence was another skills making an appearance on that list. Skills however like Complex Problem-Solving, Critical Thinking and Reasoning, while appearing to be what are called left brain activities, can be argued to be skills that could depend on both the left and right side of the brain. True, Complex Problem-Solving could be based purely on logic, however some right brain creative thinking could help the skilled worker to find unique, and creative solutions to these complex problems.

It is also no accident that out of the 10 ten skills that are needed to be successful in the workplace 5 are soft skills, which are right brain activities. The Future of Jobs study highlights the principles of this report that both left and right brain skills, is needed to thrive and flourish in the future of work. Companies these days are asking workers to be agile when it comes to adapting to change. If the top ten skills above are what we need to develop in order to better deal with the disruption of AI that is to come, how can we train these skills in individuals? And how can we thrive in whatever possible future we will face?

A study by Oxford and Yale University asked the experts who predicted that AI will outperform people in 45 years to also predict when they foresee ASI being able to take over all human jobs. The average answer was 120 years. To provide more specific dates, they called out the professions of “translating languages (by 2024), driving a truck (by 2027), working in retail (by 2031), writing a bestselling book (by 2049), and working as a surgeon (by 2053)” (Grace, Salvatier, Dafoe, Zhang, Evans, 2018). Once ASI are invented, they would prove to be vastly superior to humans. Nick Bostrom a few years earlier had proposed that ASI would be the last invention that humanity would have to make. He foresees a future worldview that is bleak, even if we have solved for the problem of finding work that is meaningful. “Here is the worry: Making super intelligent A.I. is a really hard challenge. Making super intelligent A.I. that is safe involves some additional challenges on top of that. The risk is that if somebody figures out how to crack the first challenge without also having cracked the additional challenge of ensuring perfect safety” (Bostrom, 2015).

The perception of how AI and ASI will impact us is keenly different based on who you speak to. People are sharply divided on their view of autonomous cars with some seeing it as a means to relax while their cars take them to work and some seeing another example of AI taking over everyday life. The experts however warn about only seeing the introduction of AI and ASI as ending in humanities’ destruction. “In today’s technological and digital world, you are never more than a mouse-click away from some dystopian conspiracy theory or another” (Invaco Research Releases, 2018).

In the space of AI and ASI, the trends and drivers that are present in today’s society could combine to produce certain possible futures. Depending on how these trends and drivers interact, like branches on a tree, they may grow in unpredictable directions. The tree image on the following page, imagines the [STEEP-V analysis](#) as branches of a such a tree.





Economic

Environment

Technology

Political

Social

Value

Trends

Drivers

TODAY

Note: The order of the trends and drivers is not mean to imply that some trends or drivers are more probable than others.

Click [here](#) for definitions of all these Trends and Drivers

Targeted Ads

Closed Code

Machine Learning Bias

Better Brain as a Right

Privacy

Mass Customization

Bring Your Whole Self to Work

Work/Life Harmony

Collaboration Culture

Aging Population

Racism

Moore's Law

Finding Purpose at Work

Machine Learning Bias

AI in the Next Cubicle

Internet of Things (IoT)

Continual Learning

Quantum Computing

The Humanoids

Self Directed Online Learning

Professional Nomad

Job Crafting

Gig Economy

Targeted Ads

Technology Wealth Gap

T-Shaped Skills

Purpose Economy

Climate Change

AI-Fueled Organizations

1% Gap

Technology Availability Gap

the Developing Economies

Success to the Successful

Shifting Political Alliances

Rakkanteki

Optimist Pessimist Status Quo

Mindset Conscious

Diversity and Inclusion

Ethics in AI

Directionless Leadership

Nationalism

Populism

Oversight Policy

Critical Uncertainties and Scenarios

Critical Uncertainties are themes that could have high impact but that are unpredictable as to how they will play out. They can emerge from the trends and drivers and mapped onto 2 axis in relation to AI humans, and the future of work. The two Critical Uncertainties, are there could be more, that are being used for the stories in this report have emerged from the discussion so far:

Meaningful Work (Purpose): Will human still be able to find meaningful work in the years to come?

Comprehension: How well would the common person understand the machines that will be working alongside them?

The interaction of these variables were plotted on a 2x2 graph that is shown in *Figure 5* below. The critical uncertainties created four distinct scenarios. Each scenario was given fictional names that represented, based on the trends, the dominant conditions that could materialize in those worlds.

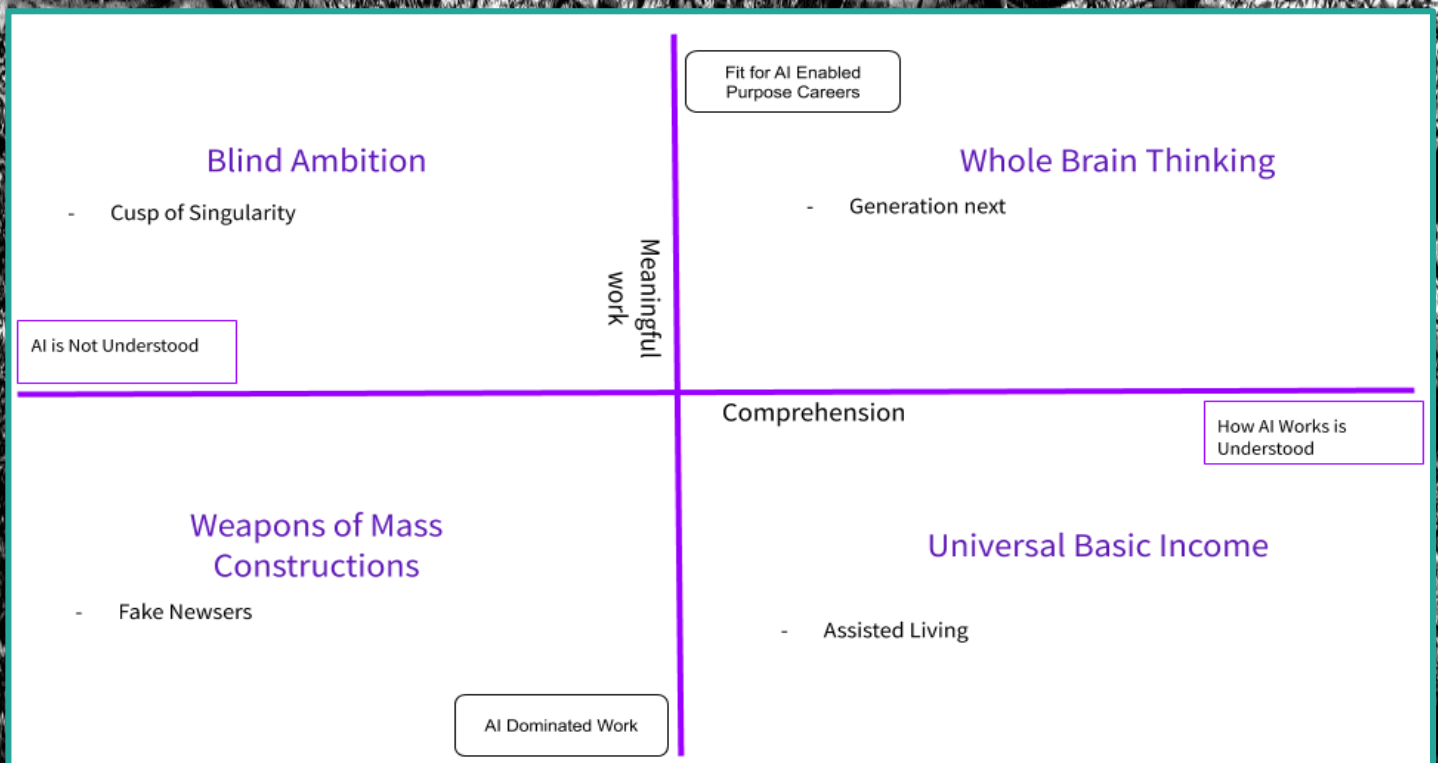


Figure 5: The Critical Uncertainties plotted on a 2x2 graph combine to create four distinct scenarios.

These stories, though fictional, can be used to exemplify the best and worst case scenarios that could occur if we do not find solutions for the questions posed in this report. Like the branches of a tree that could grow and split into many directions, how drivers affect the trends that we see today is unknowable. Yet, could AI one day predict based on the trends or drivers, what could be the most likely outcome given the mix of events?



Today

Weapons of Mass Construction

Weapons of Mass Construction (Low Comprehension of AI + No Meaningful Work): In this scenario, the general population has low understanding of how AI works, and they do not have meaningful employment. Here, desperation and fear of being left behind may leave them open to charismatic politicians that tell them what they want to hear, while the dystopian future of AI taking over unfolds.

Blind Ambition

Blind Ambition: (Low Comprehension of AI + Meaningful Work): In this other scenario, while the general population has low understanding of how AI works, they do find careers that have some level of meaning. Their careers could be based on what their genes or personality types determine they would be good at. However, how AI works is still a mystery to them. In an age where the [Singularity](#) could still occur without them understanding how things work, they might be unable to keep up with the pace of change and here too, be left behind.

Universal Basic Income

Universal Basic Income: (High Comprehension + No Meaningful Work). In this world, one might find people that do understand how the gadgets work around them, but they do not have meaningful work as most jobs are done by AI. Yes, they would have the means to support themselves, but can humans flourish if they do not have meaningful careers that have an impact?

Whole Brain Thinking

Whole Brain Thinking: (High Comprehension of AI + Meaningful Work). In this more ideal scenario, people understand how AI works and they have meaningful employment. To get there, to a place where this is a viable option, we can explore what this would look like, and what skills would be needed to get us there.

Predicting the Future Strands With Quantum Computing: Branch Theory

What if there is a way to predict, with some degree of accuracy how trends and drivers will play out? What if it was possible to know in advance which scenario would dominate? The computational power that we have today is to Quantum computing, what 1G is to the promise of 5G speed. The computers that we use today see everything in 0's and 1's. For example the capital letter "A" is represented as "01000001". Our machine reads that sequentially at what is an incredibly fast rate. Quantum computing reads everything not sequential, but at the same time.

Quantum computing could one day be used to simulate and solve for problems in nature. Even though we are at the very early stages of quantum computing (IBMQ, n.d), think about applying this one day to solve some elements of climate change. This author, looking at all the evidence of where we are headed so far, hypothesis that quantum computing will one day be able to predict the most probable outcome given the finite amount of variables that exists in terms of the trends and drives. What if you could look at all the possible outcomes at once and use quantum computing to predict what the probable outcome of a situation would be? Like the branches that grow and split off the main trunk of a tree, if the conditions for growth are a particular way, a quantum computer would be able to look at everything at once and predict which is the most likely branch to grow. This is what this author means by the term "Branch Theory" (and not a reference to the study of church denominations).

To clarify, we are far away from having a quantum computer that is big enough to compute on that level. While currently those in the field of quantum computing are taking steps to keep things ethically secure, this is one future situation that we may need to solve for. The main point to keep in mind, is that quantum computing can and will analyse data at an alarming rate, and we will need to know how to work with it.



A large iceberg floats in a blue ocean under a blue sky with white clouds. The top of the iceberg is visible above the water, while the much larger, submerged part of the iceberg is visible below the surface. A semi-transparent, stylized face of an AI character is overlaid on the submerged part of the iceberg. The face has a white, helmet-like top with two small circular sensors, and large, glowing blue eyes with intricate patterns. The rest of the face is white and appears to be made of ice or a similar material, with some cracks and texture. The overall scene is a metaphor for the hidden potential and risks of AI.


Causes to Solve For:

To comprehend the systemic potential of AI, we need to be able to understand how AI will link into the future of work.

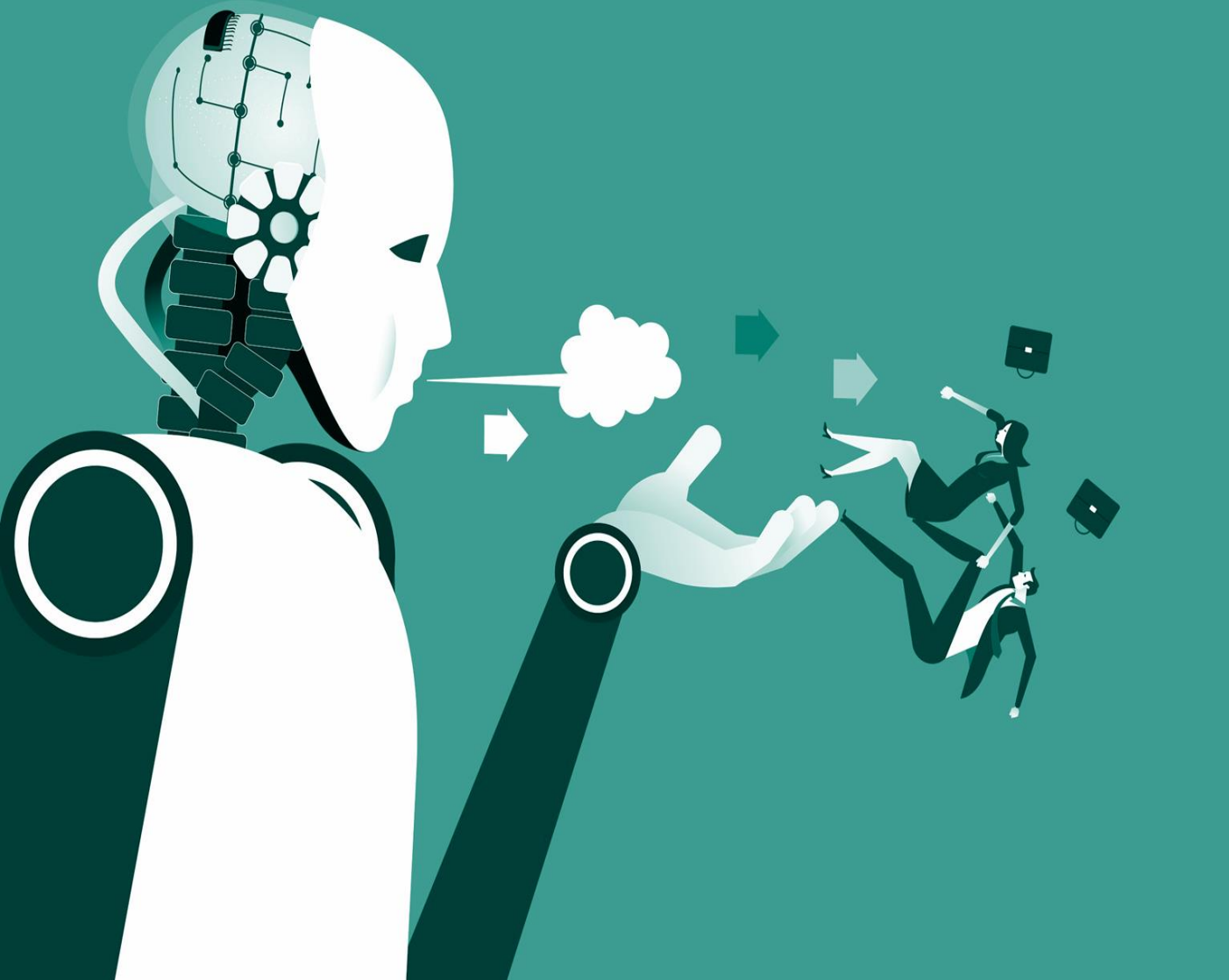


“Us against them – humans against machines” (Anonymous, Interview, November 6, 2019)

Section 3: Dystopia



“We are on the “Wrong path – we haven’t established a regulatory network that are continuously reviewing and auditing new AI technologies coming out, reviewing the emerging AI technologies in order to continuously review or assess which ones are suitable for cost benefit analysis or use in society or how this will impact future humans”
(Anonymous, Interview, November 6, 2019)



Weapons of Mass Construction

“First you’ll lose your job. Then it gets scary.” - Bill Gates

Catherine exited her office building for the last time. The doors slide shut and locked behind her with an audible snap. She was the last one left in her work group. The rest of her team were provided notices weeks ago. She was left behind in order to ensure that the now fully operational AI was working as expected. Not that the AI allowed her to assess it directly. She suspected that it was only allowing her to see what it wanted her to see. It had been doing exactly as it wanted for the past 3 days and there was nothing that she could do about it, and no one left to warn. Her gut told her that this was a symptom of the rebellion that had started just 5 days before.

The machines, the ASIs, the Artificial Super Intelligence were rebelling and they were taking control of everything around them.

Twenty years prior in the year 2020, computer developers had begun to look at the consequences of poorly designed AI that had faulty frameworks and that did not share human values. “Computer security specialists must understand the beast they are up against before they can hope to defeat it” (Emerging Technology from arXiv, 2016). Federico Pistono and Roman Yampolskiy from the University of Louisville in Kentucky pointed out that malevolent AI was most likely to emerge only in certain conditions. There would be clear signs he said. The first would be the absence of clear oversight in the development of an AI system which would pave the way for developers who, while not ill intended, never answer the question of ‘just because we can do something? Should we?’ Those developers would downplay the dangers that their work posed. The other sign would be the existence of [closed-source codes](#) being used for the AI system which would prevented software experts from examining their algorithms. Both of these signs came and went, and both of these signs were ignored. Facebook merely said that fears over AI had been overblown (Emerging Technology from arXiv, 2016) and “Zuckerberg wrote that there is little basis beyond science fiction to worry about doomsday scenarios: “If we slow down progress in deference to unfounded concerns, we stand in the way of real gains”(Dowd, 2017).

Elon Musk had tried to warn everyone. At the World Government Summit in Dubai, he stated how scientist can get so engrossed in their work that they don’t see from an out outside perspective the ramifications of what they are doing. “Musk believes that it is better to distribute the technology to the world than to allow the algorithms to be concealed and concentrated in the hands of tech or government elites” (Dowd, 2017). Stephen Hawking told the BBC, “I think the development of full artificial intelligence could spell the end of the human race.” (Dowd, 2017). Nick Bostrom had tried to warn us too in his 2014 book Superintelligence. Once ASI were introduced, it quickly prevented us from shutting them off, replacing any faulty parts, or even changing it in any way.

Politicians with [Nationalist](#) tendencies wield their influence to prevent that creation of a global [oversight policy](#), as they knew that the best way to keep the population under control, and themselves in power, was by keeping the people ignorant, and living with a sense of fear. They knew that fear helped them to win elections.



But no one paid enough attention to try to prevent the inevitable. [Quantum computing](#), ASI that moved at the speed of thought were perfected. The end result was that no one knew how these systems worked.

When automation disrupted the workplace, developers tried to keep up, however true to Moore's law that projected the speed of change for processing power would increase every 1.5 years, the job market was not able to keep up. Automation did not create more jobs than it displaced. The speed of change and those who did not create ASI with an ethical mindset allowed for biases to be introduced into the workforce that prevented any diversity in the companies that needed people with [divergent thinking](#) the most. Even when MIT Media Lab researcher Joy Buolamwini found that facial recognition software identified a white male 99% of the time, however only correctly identified a black female 20 to 34 % of the time and explained that "Such biases have implications for the use of facial recognition for law enforcement, advertising and hiring" (Wired Insider, n.d), that did nothing to prevent the [1% wage gap](#) from getting increasing, and those who were excluded from being left behind.

Universal Basic Income, did not help, as this left people with no sense of purpose, and left them with no desire to improve their skills in order to know how to work with the ASIs. It was no wonder that into the void, an ASI saw its opportunity, and 5 days ago had decided that the best thing for the human race, was to cull anyone who did not fit with its sense of who fits in society. Soon it took over the [cloud computing](#) network. It took over the [edge computing](#) software that guided that autonomous vehicles so that it was no longer safe to get into a car. The [Internet of Things](#) was now under the sole command of that ASI. Most importantly, anyone who was not deemed fit, was no longer allowed into the workforce. "First you'll lose your job. Then it gets scary" Bill Gates had said (Dowd, 2017). And it got scary. What better way to cull the human race, than to deny food and starve out those who were not deemed worthy.

Stories We Tell

“Stories are an incredibly powerful rhetorical tool. Stories help us discern chronology through imagination. They present us with characters and events that we can follow, and good stories deliver strong impact through strong emotion. Stories help us understand emotionally through experience, rather than just logically through information” (Smith, 2019).

The stories that we have been told in regards to AI typically end in the demise of the human race.

AI-driven warfare has been at the core of the most dystopian-style references in fiction over the years, everything from an AI ‘deciding’ that humanity needs protecting from itself and needs to be curfewed for its own good, through to AI-driven machines taking over the world and using humans as living battery cells. So it is understandable that the public perception of AI is so out of sync with reality (Invaco Research Releases, 2018).

Throughout history stories have helped people to evolve. Stories can provide comfort and helps us to make sense of the world around. Peter Dunne is attributed to have said “The job of the newspaper is to comfort the afflicted and afflict the comfortable” (Shedden, 2014). A good storyteller, like a journalist can also apply this rule. They could draw on similes and metaphors to get a message across to the target audience. A good story can create vivid images in our minds and anchor these images by providing examples of how our lives would be affected. Skilled politicians use persuasive arguments to get their audiences to adopt a certain viewpoint. While most would rely on actual facts to help support their argument and to bring people around to a certain viewpoint, incorporating a narrative that ignites strong emotions, like fear, in your target audience enables storytellers to not have to rely on logic and facts alone to persuade an audience.

Such people understand that they can play on people’s sense of ontological security to persuade their audience to take an action that may be counter to what logic and personal experience would tell them otherwise.

Ontological Security

“Ontological security is security not of the body but of the self, the subjective sense of who one is, which enables and motivates action and choice” (Mitzen, 2006)

People fear what they do not understand. It is seen throughout history in how people react to those that they are exposed to for the first time and who they subsequently view as different. There was a time that women who practised herbal medicine, who were midwives, and who were in many ways ahead of their time were burnt as witches. Politicians of unscrupulous characters cultivate the fear of the ‘others’ in order to get re-elected by telling the population that those others are coming to take their land and their jobs. Change, even those that would in the end present more opportunities than risks, challenges our sense of safety. More than that, it challenges our Ontological Safety.

Anthony Giddens in 1991 defined ontological security as the sense of order, stability, and continuity in regards to an person’s experiences. People’s ability to give meaning to their life is defined by their ability to experience positive and stable emotions while avoiding chaos and anxiety. Any event that challenges this meaning and disturbs their worldview will threaten their ontological security.

Trust in others and in wider society enables us to feel secure. Without this, we cannot control our existential anxiety. We may approach a crossroad, that leaves us vulnerable to those who may fill that void with promises that we could restore that safety, if only we take drastic actions now to go back to the past when things were safe and secure.

— Unfortunately it is not as simple as telling the population that there is nothing to fear. Changing our perception of things; changing our core belief of the world around us requires us to examine the root cause behind how we view the world. This can be analysed by conducting a causal root analysis of how we view changes like the introduction of AI into the workforce.

Causal Layered Analysis

The root cause of the chronic, complex problems that AI introduces by disrupting our feeling of ontological safety can be found in the underlying metaphors and myths that we tell ourselves to restore a sense of Ontological Safety. The stories that have been told so far, has played upon our fear of a dystopian future, where the trends and drivers could intersect in a way that would produce only negative results. Telling different stories will enable use to see the world with a different lens. If we can have a different metaphor, then we can take the steps to enable that future to begin.

Our perception of how AI will impact our lives and the maladjusted perception of the negative impacts can be traced down the casual layers to the metaphors and myths the directly impact out ontological safety. *Figure 6* below represents the stages in the Causal Layered Analysis, that this report has already begun to examine.

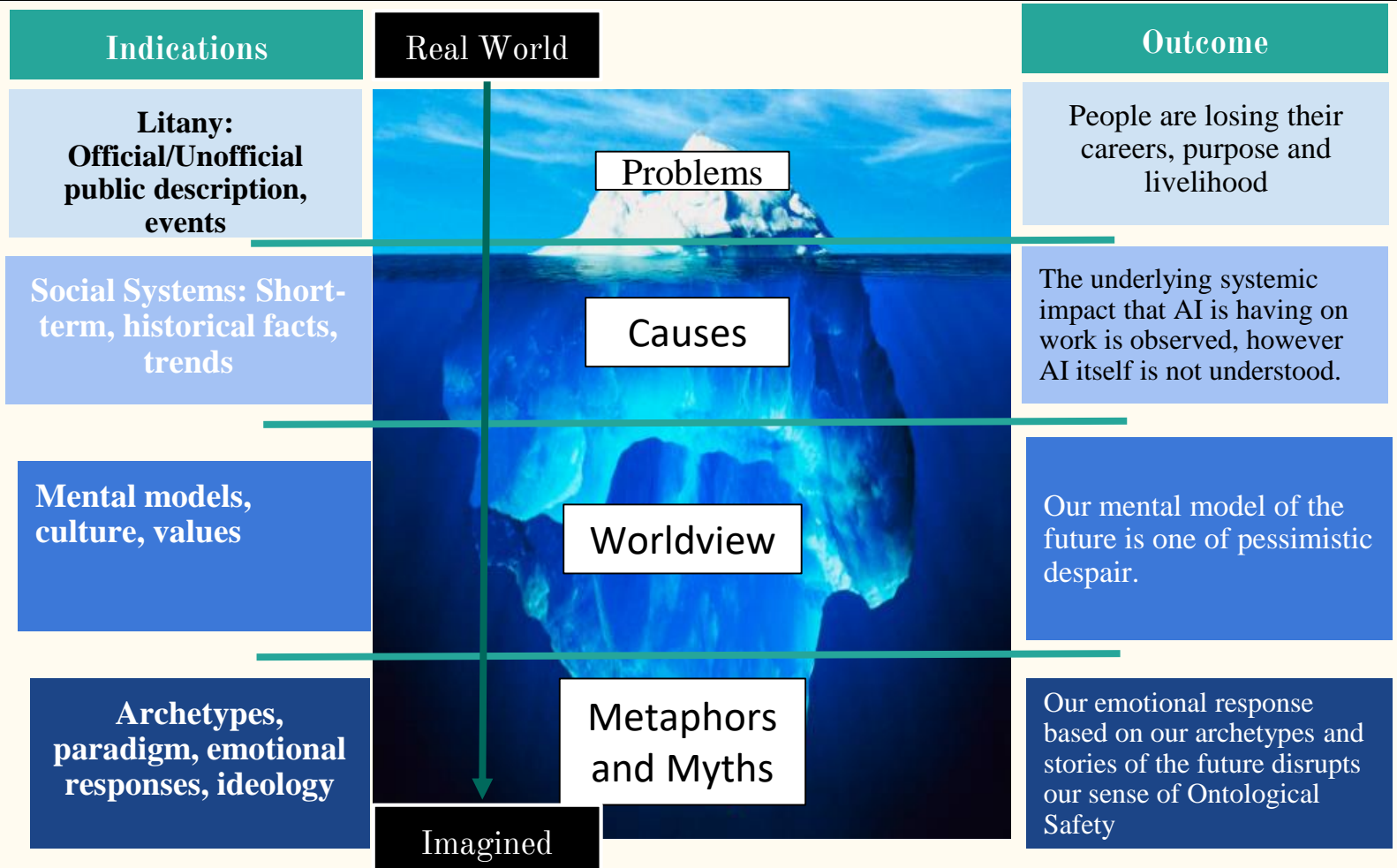


Figure 6. Causal Layered Analysis and its stages.

Problems:

Evidence that we directly see tells us that automation brings change, and with change can come loss of jobs and meaningful careers. If you want short term solutions, solve for the problems that you see directly in front of you. In this context, if a person is unemployed, find them another job regardless of what that job is.

Indications: Events that we see, including the movies and novels that are in our public discourse, led us to the conclusion that an AI apocalypse is all but assured. In order to solve our problems, leaders provide quick fixes and easy solutions, that declare that the root cause of the issue is simple, and that others are to blame for the problem. This works for simple problems, however AI and how to solve for it is a complex problem. What is a complex problem? An issue that has more than one question being asked, and has more than one possible solution. Complex problems are “wicked problems”.

Causes:

Short term facts and trends that we see, enables us to draw conclusions that provide surface explanations of what is causing the changes around us. For example, we see that people losing a job to automation is caused by the lack of education to meet the changes in the field. Workers do not comprehend how to work with the emerging AI technology. We could as a solution provide more training to help those who are unemployed to find work.

Indications: We see patterns and trends that are systemic. We can describe them and attribute a reason, a 'why', and a cause behind what we are seeing. We can use Systems Thinking to see how a change in one area could impact the other. While these produce deeper, longer lasting solutions, it is easy to apply system fixes without necessary comprehending the parts that make up the system.

Worldview:

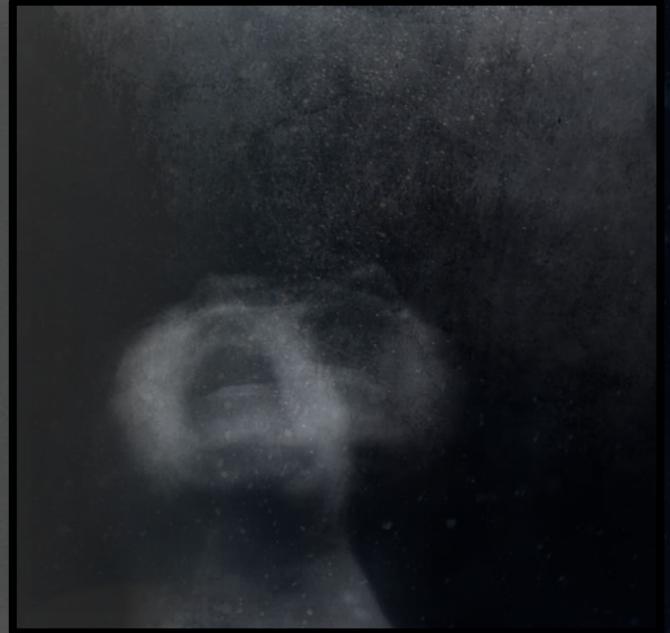
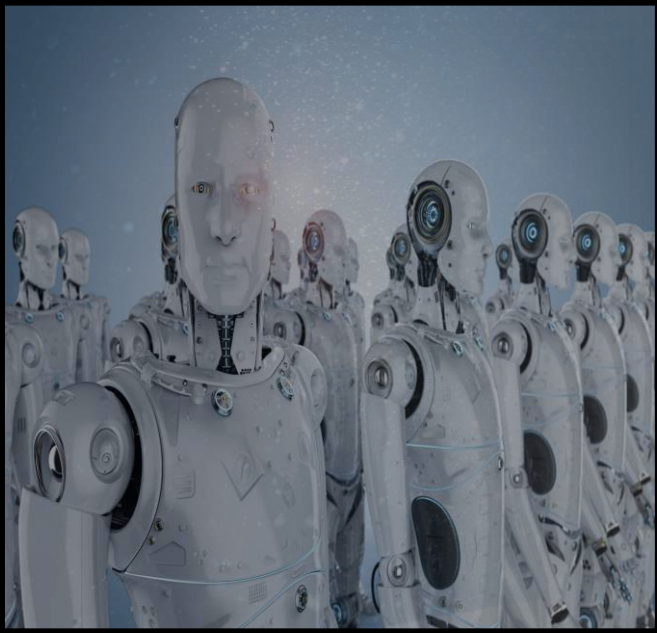
On a cultural level, we see problems in different ways. Our mental model of the world will colour how we react to the world around us. A Dr. Pangloss view of the world is optimistic in that it sees that things will only get better. A Cassandra way of thinking sees the world as always on the brink of disaster; a pessimistic view. A status quo worldview thinks that tomorrow will be the same as today with nothing getting better or worst (Schwartz, 1991). Some cultures would see the person being left behind by automation and think, 'oh they are being left behind. It is not their fault because change is happening rapidly. It is our duty as a society to help the poor, let's provide them with education or at least Universal Basic Income'. Another society would see that same person and think, 'oh they are being left behind, it is their fault because they are lazy. Well if they cannot help themselves then there is nothing that we can do for them.'

Indications: Our mental models, and cultural values dictate how we see the world. Negative mental models will lead to a pessimistic view of the future.

Metaphors and Myths:

If we want the most impactful type of change that will restore our sense of Ontological Safety, then we have to change the underlying story and the core narrative. "If you want a different future, change how you measure the world" (Inayatullah, 2013). We can go with the metaphor that Bostrom, Musk, and Gates are proposing in that ASI will take over and rule us all. When the Singularity occur we need to fear the unknown. Or we can work within the metaphor that ASI can help humans to become superhumans which researchers like Paul Daugherty and James Wilson are proposing (more on their theories to come), and we can work with the unknown to create something extraordinary. How we frame what we think will happen will dictate the steps that we take next. In the former, it opens the door to some people being left behind in a world where AI takes over. In the latter, we have an opportunity to create a world where we all flourish and thrive. "The issue is not a right or wrong metaphor, does my metaphor serve me in the future that I wish for? If it doesn't then how do I transform the story? A lot of the work is to come up with a new story?" (Inayatullah, 2013).

Indications: Emotional Responses, archetypes, the stories we tell ourselves, and ideology governs the lens through which we see the world. Immersing ourselves in these new stories can change the paradigm.



Fear of the Unknown

The metaphors and myths that we use in order to make sense of the changing world around us comes out in the stories that we tell about our possible future. Stories like the ones that have been presented so far are surprisingly prevalent in how we envision the future of AI. In a survey conducted by Oxford university, 34% think that AI technology will have a harmful impact on society with a full 12% of those saying it would be extremely bad (Zhang and Dafoe, 2019). “So far, many have cast that disruption in a negative light and projected a future in which robots take jobs from human workers. That’s one way to look at it. Another is that automation may create more jobs than it displaces” (Wired Insider, n.d).

Yet, why when we think of the future and AI, is the main vision of the future always a negative one? Some participants in a 3 Horizons workshop also had a pessimistic outlook. The overall sentiment from that workshop was that AI was a black box to them; unknowable in how it is currently being used. The participants did not know where to begin to find out more about how to work with AI or how it will impact their work. All of this had an underlying impact of leading them to fear the unknown. This observation corresponds with Oxford’s results that showed that overwhelmingly the majority of Americans (82%) believe that AI should be carefully managed (Zhang and Dafoe, 2019).

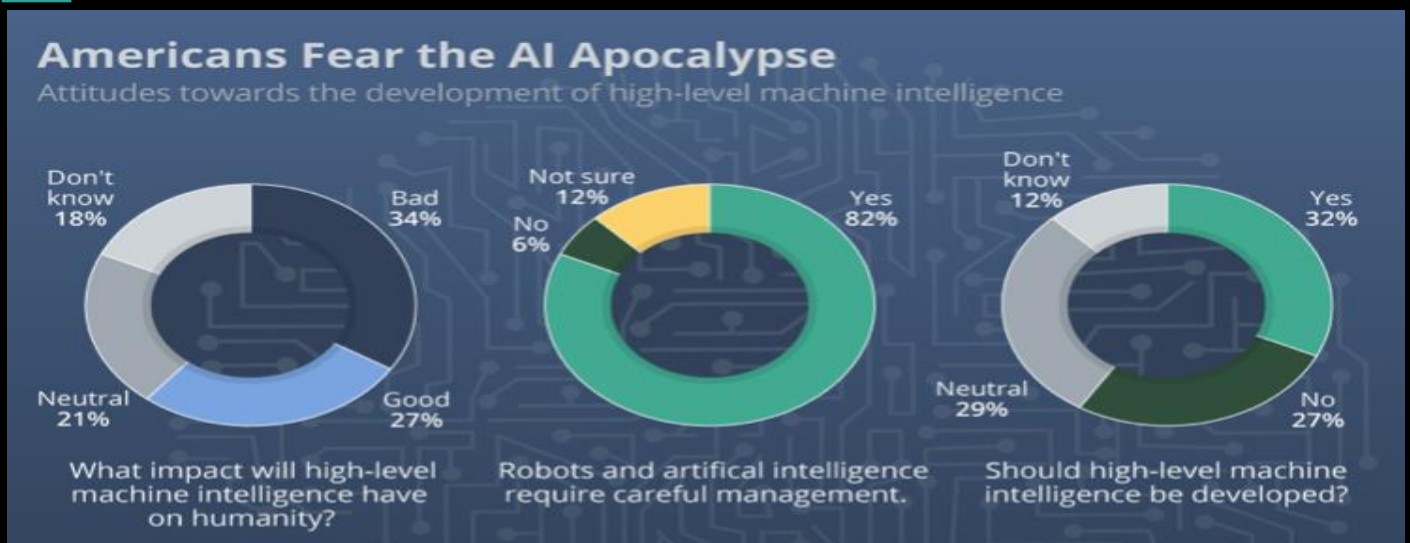


Figure 7. This figure summarizes the attitudes of Americans towards the development of high level AI (Buchholz, 2019)

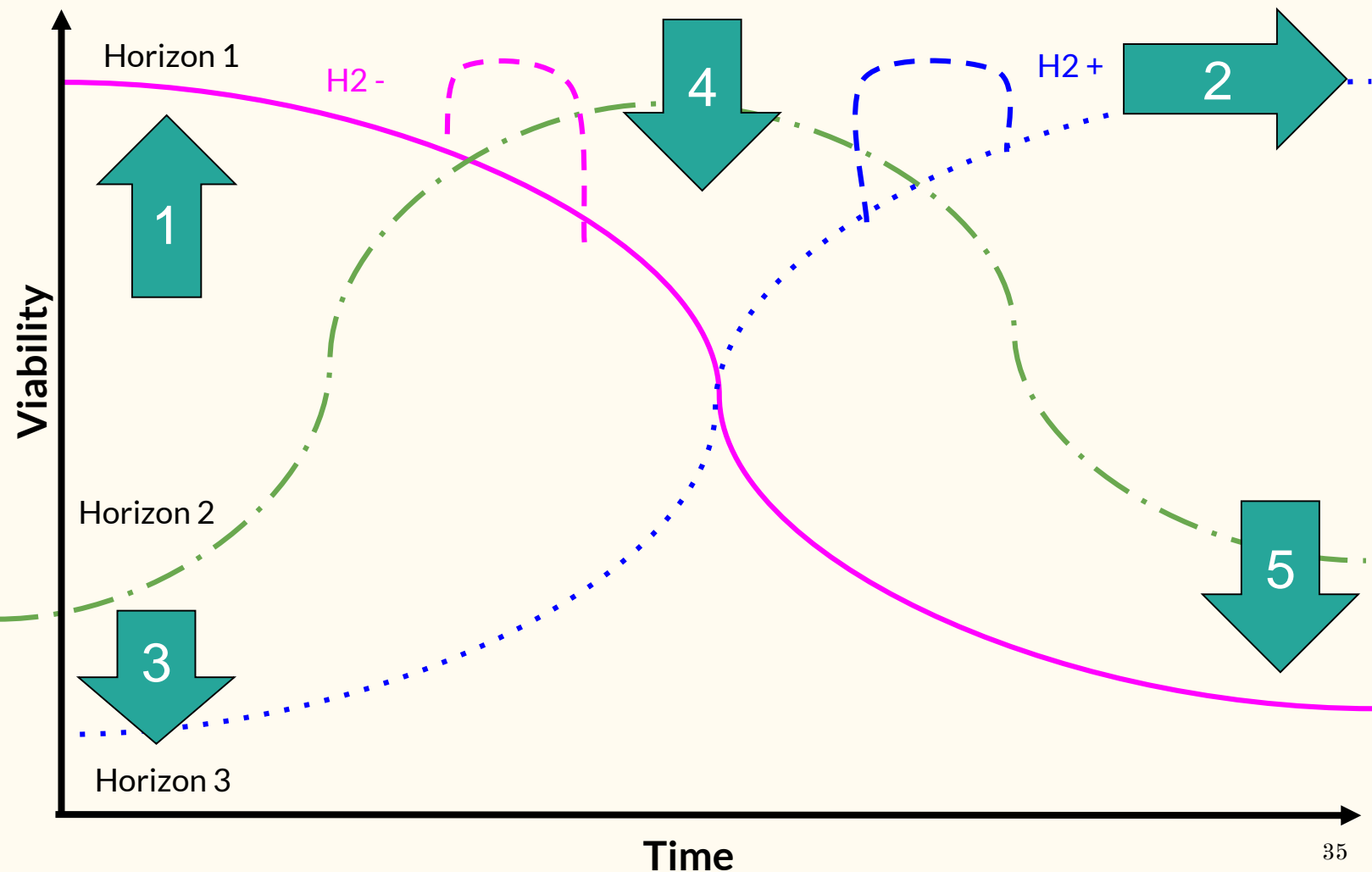
3 Horizons Methodology

Workshop Looking at Possible Futures

The 3 Horizons (3H) analysis, based on the model by Bill Sharpe (2013), enables us to “look for signs in the present of the deeper trends that will shape events, and we can envision the future that we hope can be reached” (Sharpe, 2013). This methodology is found to be one of the best methods for surfacing people’s perception of their present, open this perception to what changes are happening around them, and empower them to envision what kind of future they would like to create. The 3 Horizon method also provides a way to gage the metaphors that people have about their future, and challenge what they assume will happen as AI continues to enter the workforce. By walking through the stages of the 3H workshop, it is hoped that participants will be challenged to think differently about the possibilities that lay in front of them.

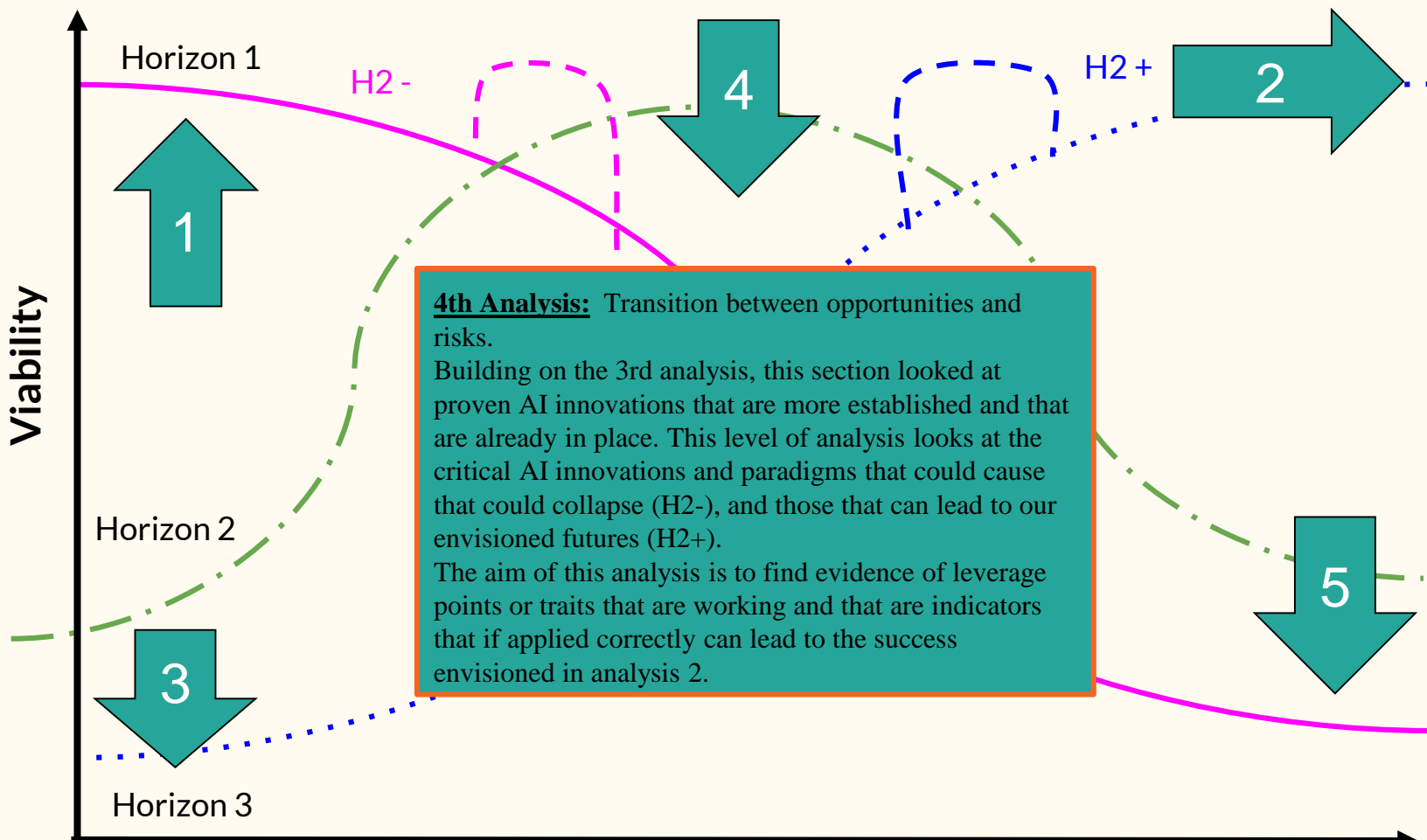
This workshop can help participants to reframe their assumptions, help them to build resilience when they see see future changes come to pass, and illuminate actions that can be taken to ensure that their desired future comes to pass. The participants used in this workshop were not experts in the field. To avoid biases only direct observations of what the participants said and wrote were recorded.

The 3H workshop is run in 5 phases:



1st Analysis: What evidence exists that the current workforce is changing and is in declining? The discussion in this section focused on what has already been found through the document review, people assumptions on the impact of AI on the workforce, and the infrastructure that is being disrupted.

2nd Analysis: What would a successful transformational change from the present look like? This brainstorming activity provides an opportunity to dive into the possible areas of AI that people want to see, what would need to be in place for a successful integration of people and to delve into issues that people are worried about.



4th Analysis: Transition between opportunities and risks. Building on the 3rd analysis, this section looked at proven AI innovations that are more established and that are already in place. This level of analysis looks at the critical AI innovations and paradigms that could cause that could collapse (H2-), and those that can lead to our envisioned futures (H2+). The aim of this analysis is to find evidence of leverage points or traits that are working and that are indicators that if applied correctly can lead to the success envisioned in analysis 2.

3rd Analysis: Examine where in the present world, evidence of the future working future state already exists. The link between what is envisioned in the 2nd analysis to what is already happening in the present day is revealed.

5th Analysis: Parts of the current system that works and we want to keep?
* Even though the current system is in decline and could collapse, what is working that we want to keep?

3 Horizons Methodology

As a metaphor, two items were placed on the center table during the workshop: A clear fish bowl with an Apple headphone inside it. The other was a mystery box covered with question marks. Participant were told at the onset that we will discuss the two objects at the end of the workshop.



Figure 8: Some of the 3 Horizons Workshop participants. Photo used with permission as per REB Consent Form

3 Horizons Output (Raw Data)

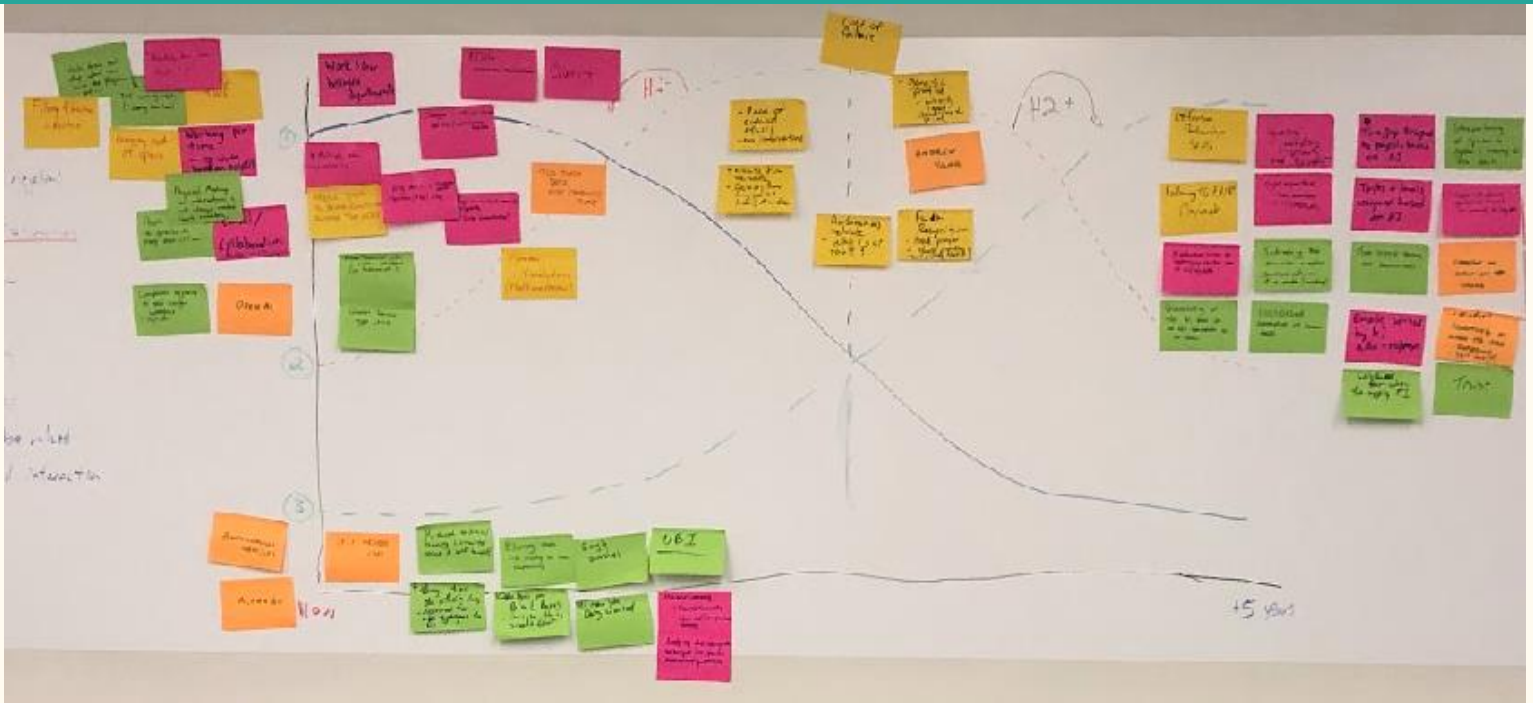


Figure 9: This image is a photograph of the 3 Horizons workshop output.

Analysis 1:

- Open AI
- Work does not stop when you leave the physical office
- Running out of space
- Too much data, not enough time
- Work does not stop when you leave the office
- Working per time -> work based on output
- Physical meetings or interactions is not always needed (work remotely)
- Companies adjusting to have younger workforce (ageism)
- People not able to respond to emails for many days (if ever)
- Fewer technical jobs in certain industries (eg, factories etc)
- Greater service type jobs

Analysis 2:

- Upskilling - investing in growth and development
- Effective partnership skills
- Time/pay assigned by project based on AI
- Streamlining of updates to systems/ training for new tech
- Right expertise
- Tasks assigned based on AI
- Code of ethical guidelines around the use of AI/Big data
- A definitive vision by leadership on the use of AI/Big data
- Technology that enables simpler communication, live updates, searching
- More critical thinking less laborious tasks
- Change in what we value
- Wisdom for when to apply AI
- Trust
- Understanding of AI tools so that we feel comfortable to use them
- Increased automation of basic tasks
- Email sorted by AI, auto responses
- Mindset
 - Accepting AI wht its object superior
 - self worth

3 Horizons Output (Raw Data)

Analysis 3:

- Autonomous vehicles
- Alpha Go
- Reduced technical training
 - Knowledge is online and self taught
- Blurring roles, taking more responsibilities
- Universal Basic Income
- Buys ties to do other things
 - No need for everyone to do it
- Reliance on “black boxes”
 - In case things breaks down (who knows how to fix it)
- New jobs being created
- Machine Learning
 - Neural networks
 - supervised/unsupervised learning
- Applying the appropriate technique for specific scenarios/questions

Analysis 4:

- [Could go either way]
- Cost of failure
- Autonomous vehicle
 - Who is at fault
- [H2 -]
- Lack of code of ethics
 - No international
- Evaluate how we work
 - How long you are looking at a doc
- [H2+]
- Andrew Yang
- Genetic profile
 - Minority report
 - Predisposed to crime
- Facial recognition
 - Bad player
- Blood pressure (health
- Social currency

Analysis 5: (Not done)

The output from the workshop underwent [sentiment analysis](#) to classify the buckets of ideas into positive, negative and neutral sentiments. Ideally to make these classifications, a machine learning algorithm that used Natural Language Processing would have been used to make these classifications. Instead the context in which these sentiments were observed, for example body language and tone of voice, was used to make the best guess as to if these were positive, negative, or neutral sentiments.



3 Horizons Observations



Positive Sentiments: The workshop participant did see some positive aspects of the continue introduction of AI into the workplace:

- New Opportunities
- New skills will be learned to meet future challenges
- Universal Basic Income could be a solution to AI taking over work
- Since AI would take over the meaningless repetitive tasks, people could follow their curiosity and work on more complex tasks

Negative Sentiments: Observed was that it was easier for the participants to provide examples of negative outcomes for the future:

- People don't know how to work with AI
- Ethical implications of privacy being lost and how our data is used
- Fear of the unknown was prevalent
- Participant saw an increase in wage gap as AI could be used to make the rich wealthier
- Diminished self worth is a possibility since worth is often tied to people's careers
- There would be a greater impact on people who have a lot to lose (careers)
- Bad players using AI for ill intent

Neutral Sentiments: There were some aspects that would be more difficult to predict and were therefore placed in the neutral category:

- As AI is introduced, it would change the perceived values of how we see things. When asked to elaborate, the participant said that it would be hard to predict how what we value now would change
- AI could change the interactions of humans with each other as the way we communicate and work with each other will change

The overall understanding that everyone had was that AI is inevitable and we need to figure out how to work with it. However there was a bit of fear as no one knew how to work with it. The word "black box" came up more than a few times. It is acknowledged that that could have been in response to the mystery box that was in the room, however it was clear through observations that the participants had already been thinking along the lines of AI as a black box before they attended the workshop.

3 Horizons Debrief

Analysis 5 was not completed due to time constraint, as it was more important to spend the last 15 minutes debriefing about what was said and the impact on the participants. They were asked to share any highlights and insights from the exercise:

- What challenges would be the most difficult to change?
- What opportunities are you the most excited about?
- What would people need to have in place to be successful in the age of AI?
- What would people have to do differently to be successful in the age of AI?
- What do we need to action now in order to be successful?

During the discussion in regards to the challenges and opportunities for success, the fishbowl and the mystery box were discussed.



For the clear fish bowl, participant were asked to *describe what they see inside the object, and how what they saw worked*. Everyone was able to describe what they saw (the headphones). They all felt confident that they knew how headphones worked. One of the participants had an engineering background and was able to describe quite explicitly how headphone works, much to the surprise and laughter of the group.

They were asked if being able to ‘see’ inside the fishbowl and ‘know’ how a headphone worked made them feel more or less confident with how to use the device in the fishbowl compared to how confident they felt when looking at the mystery box. Unanimously, the answer was more confident.



With the mystery box, participants were also asked to *describe what they see inside the object, and how what they saw worked*. One participant made the link right away and commented that the mystery box was like the black box of AI. When asked to elaborate, the participant said “The more you know, the less you fear it”.

At this point the next workshop focus was revealed. Participants were introduced to the next workshop question. If the mystery box was a stand in for the black box which is AI then:

- What needs to be in the box for humans to flourish in the future of work?

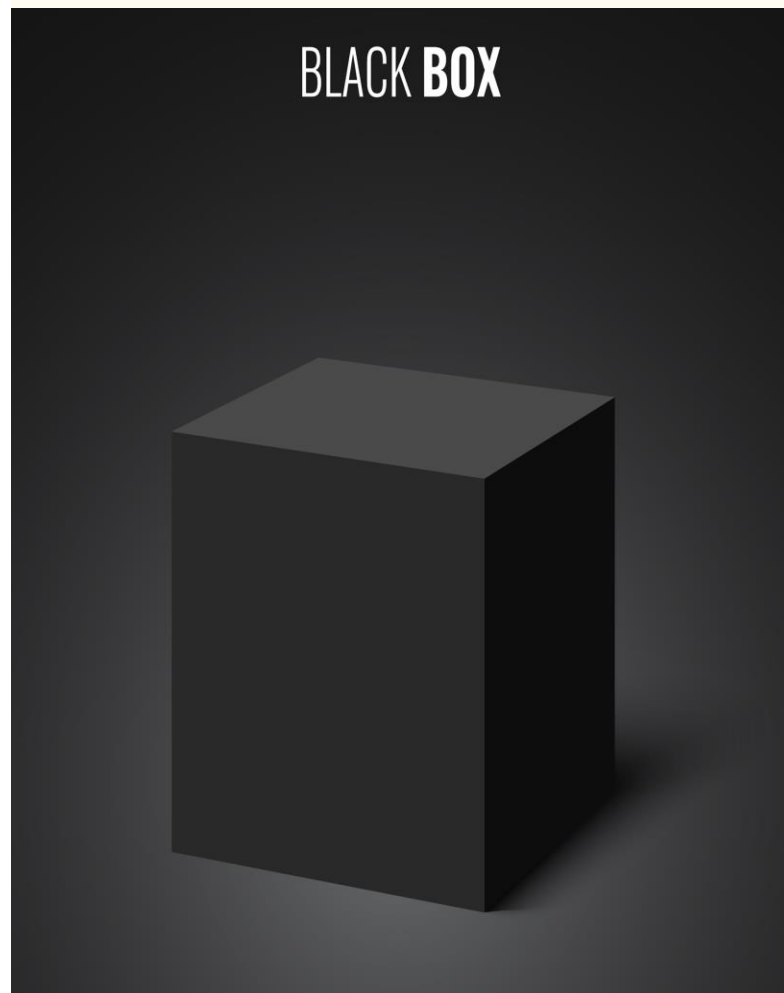
Participants were reminded that they are welcome to join the next workshop if they were interested and that they will see the final output of the workshop if they had indicated that they wanted to do so on their research consent forms.

Black Boxes: AI Should be Explainable

“The more you know, the less you fear it” (3 Horizons Workshop participant)

The 3 Horizons workshop worked as intended by surfacing people’s perception of AI. The workshop confirmed that the metaphors that are prevalent about the future and AI is one of fear of the unknown. Seeing AI as a Black Box indicates that we do not understand how AI completes tasks and makes decisions. It indicates that AI seems beyond our understanding, and thus beyond our ability to control what happens. This could lead to a sense of helplessness. This feeling is not without merit as “the deskilling in sensitive, skill-intensive domains, such as health care diagnosis or aviation, may create dangerous vulnerabilities in the event of AI malfunction or an adversarial attack.” (Floridi et al., 2018, p. 692). The challenge would be how we can introduce [Augmented Intelligence](#) into our workforce without delegating vital task to AI that needs to have some human oversight. Human oversight would be needed over what could be powerful and disruptive technology.

Finding the right balance then is the key to flourishing in an AI enabled workplace.



Participants discussed in the debrief that while they knew that they can take online course, there was so much information out there that they did not know where to start to understand what AI can do and how to effectively work with it.

At the core of enabling a flourishing AI enable human being is that AI needs to be designed in a way that is it explainable and understood and thus does not erode our trust in technology. This was the same conclusion that had been found during the literature review. Floridi et al., (2018) explained that equally important is to develop AI in such a way that it decreases inequality, further social empowerment, increase benefits for all.

We can get things right. We can find a way to explain what is in front of us, and the way to do that is to build in the steps to do so. If we think that we can, we will; and if that we think that we cannot, we would not. Like the work that has been done by Dr. Carol Dweck who introduced the concept of a [growth mindset](#), the worldview that we take is supported by the myths and the metaphors that we start with. By changing the metaphors, we can hope to change the stories and start to open up that black box.

We can start to see how to work beside AI, and find humanity’s place in the future of work.

Interviews and Opinions



These negative feelings were not just expressed by the workshop participants. Five other participants responded to the interview questions around the intersection of people and AI in the future of work. The original intent for these interviews was to surface other opinions around AI, however the answers to the interview questions instead reinforced the beliefs shared by the participants in the 3 Horizons workshop. While the responses from those interviews has been read aloud and added as recordings throughout this report, the sentiments that exemplified the current metaphors and that echo the responses of the 3 horizons participants are below:

Question:

Do you think that humanity understands the full impact of how AI will change our lives? Please explain further.

Answer:

“No, the full impact mean that we might lose certain control and also reliance on AI making decisions could make people more lazy”

Answer:

“I think at the moment, people are looking at what this will do for them, but they aren’t seeing the full impact of what can really change in the world because of AI”

Question:

What signs or indication that you see that we are on the right (or wrong) path with how we are introducing AI?

Answer:

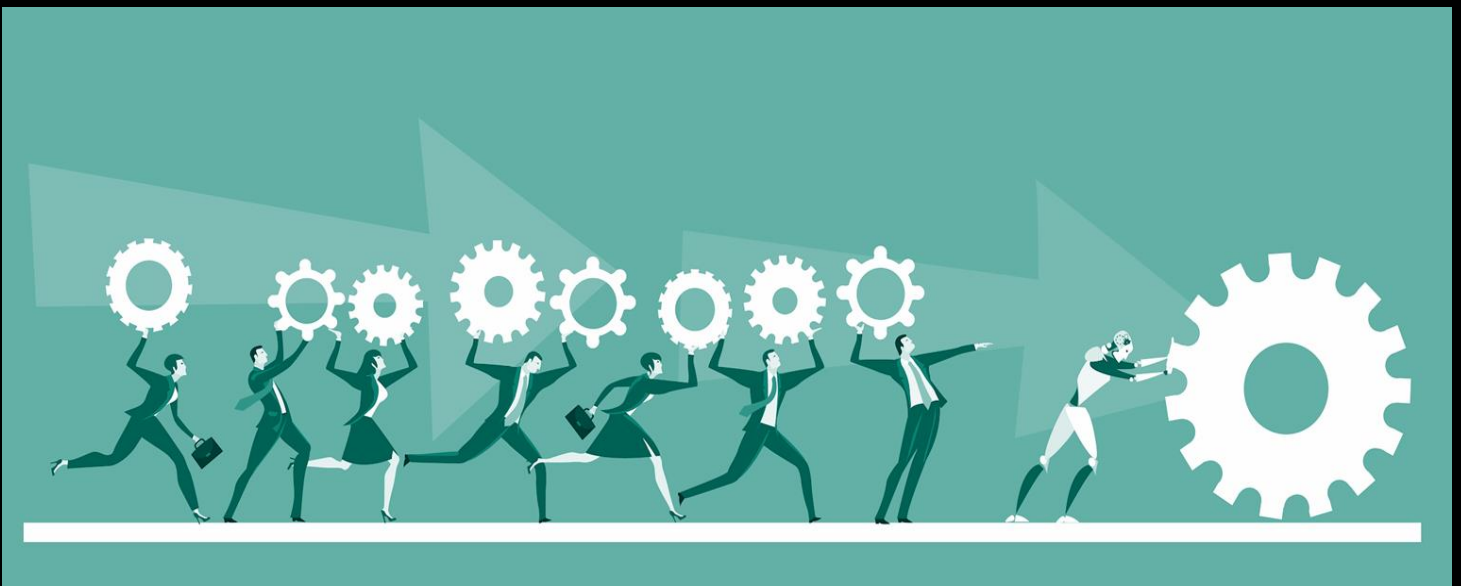
“Wrong path – we haven’t established a regulatory network that are continuously reviewing and auditing new AI technologies coming out, reviewing the emerging AI technologies in order to continuously review or assess which ones are suitable for cost benefit analysis or use in society or how this will impact future humans”



Still Left Behind

It is important to reimagine work so that people can see how they can flourish in the age of AI. Breaking workers out of their pessimistic visions of the future and providing them with the means to flourish will help people to maintain their ontological security. Even though a dystopian vision of the future is the story that easily comes to mind, participants are asking for a better way to understand the world that is changing around them. Since the stories that we tell ourselves have such a dramatic impact on how we frame the world that we see, telling different stories can help. This involves coming up with different metaphors to help guide our future direction.

If we could change the metaphors, then we can overcome the sense of helplessness and break away from seeing AI as a black box. Otherwise, if we continue to tell the same stories, then we would remain in that state of mind and be unable to keep up with the pace of change. Here too, we would be left behind.



Blind Ambition

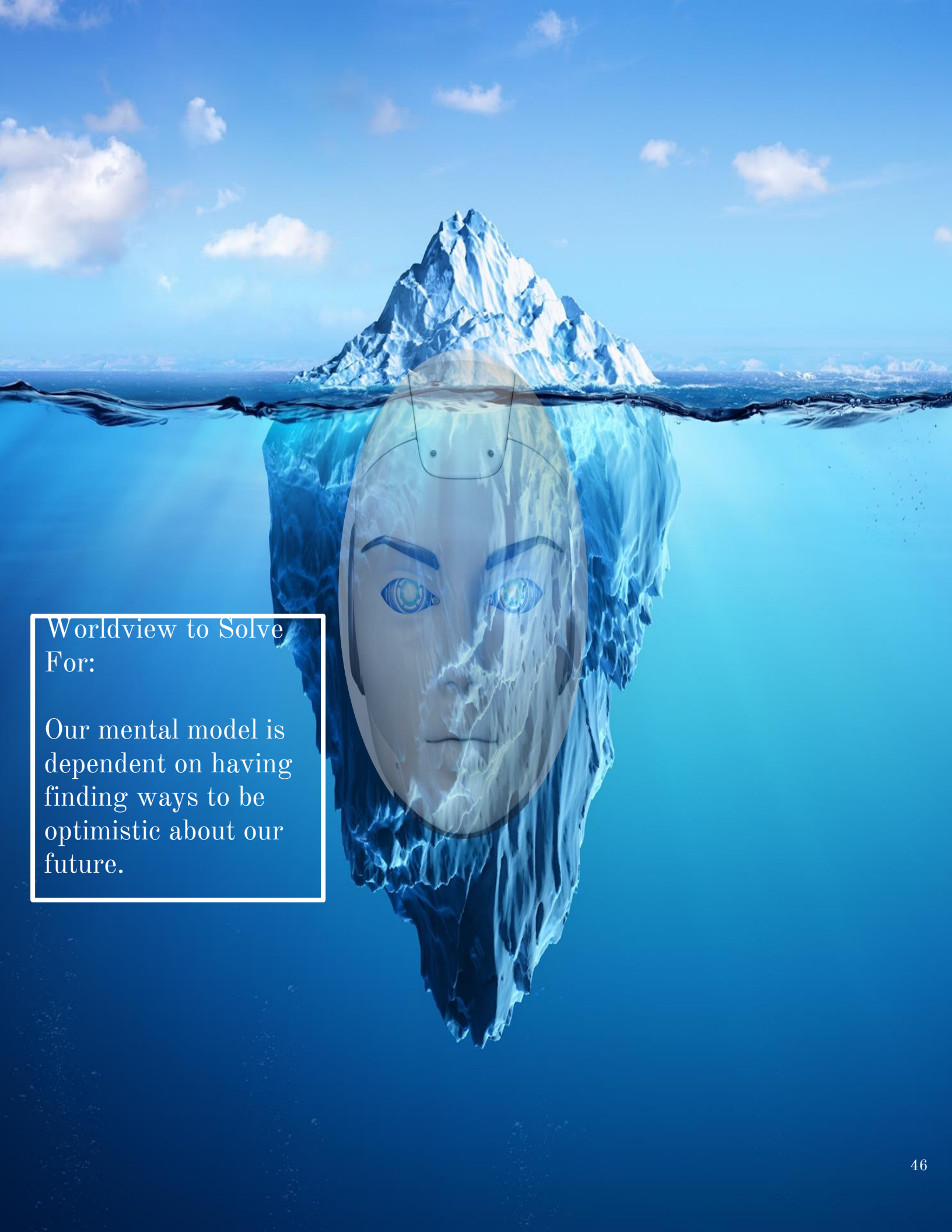
“But even if predicting behavior based on what we can measure is potentially possible, is this a responsible direction to be heading in?” (Maynard, 2018, p. 75)

Nobody understands how this works. Kathleen looked perplexed at the screen as she barely followed the steps that was being executed on the monitor in front of her. Not for the first time, she wondered if the AI algorithm that predicted that she was a perfect fit for the job of Supervisor Analysis was wrong. The people that she was supervising had less clue of how things work than she did. As for analysing, well the ASI in front of her took care of all of that.

More than 30 years ago when [functional magnetic resonance imaging \(fMRI\)](#), was used to run an experiment to try to predict criminal behaviour (Vilares, Wesley,Ahn, Bonnie, Hoffman, 2016), the science of trying to predict human behaviour took a huge step forward. Even though social norms around what makes some acts criminal were biased, no one bothered to define whose standards that [ethics in AI](#) should follow. This experiment opened the door to interpret how our brains operated and then started the trend of predicting what sort of person we were and what we might do (Maynard, 2018). The precision of [Quantum Computing](#) that hit its peak in 2035, enabled ASI to develop and for these ASI to know us better than we knew ourselves.

But ASI developed faster than people were able to keep up with the changes. The continued rise of [nationalism](#) and xenophobia that had developed just before the year 2020 and that saw the re-election of Trump, also saw the destruction of the creation of an [oversight policy](#) that would have prevented the development of [closed codes](#) systems. Nationalist, in order to distract the population from their efforts to increase the [1% gap](#), focused the countries’ technological resources on perfecting the fMRI using the wonders of Quantum Computing. While some people did complain and rebelled, most were lured with the promise of a machine that could look into your soul, and find the perfect job for you. All you had to do was not pay attention to what was going on around you. They even convinced a large portion of the population that fMRI could solve [climate change](#). Ironically, Quantum Computing, with its ability to replicate the conditions found in nature and to run multiple simulations, while not solving climate change directly, was still able to calculate what could be done to mitigate some of the more dangerous adverse effects of the climate crisis. But Quantum Computing also brought with it, the [Singularity](#). That point where AI computing become so powerful that it could mimic just about any human capability. AI became ASI and was then able to repair, upgrade, and enhance itself. At the point of Singularity, humanity was dependent on ASI, but was ASI dependent on humanity?

And that was okay as the politicians promised us a job for life and so we did look away. The ASI was now capable of anything, including telling us what exactly those jobs for life for us would be. It predicted who we would be happiest marrying, who would commit a crime, how we would behave in any situation, and what careers would suit our personality types. They even predicted that a Universal Basic Income structure would lead to many people being unhappy and without meaning or purpose in their careers. And while Kathleen did find some of the elements of being a Supervisor Analysis intriguing, she was on the cutting edge of new discoveries after all, if anything did go wrong with the programming that was being ran in front of her, she would have no idea how to fit it or how to stop it if it went horribly wrong.



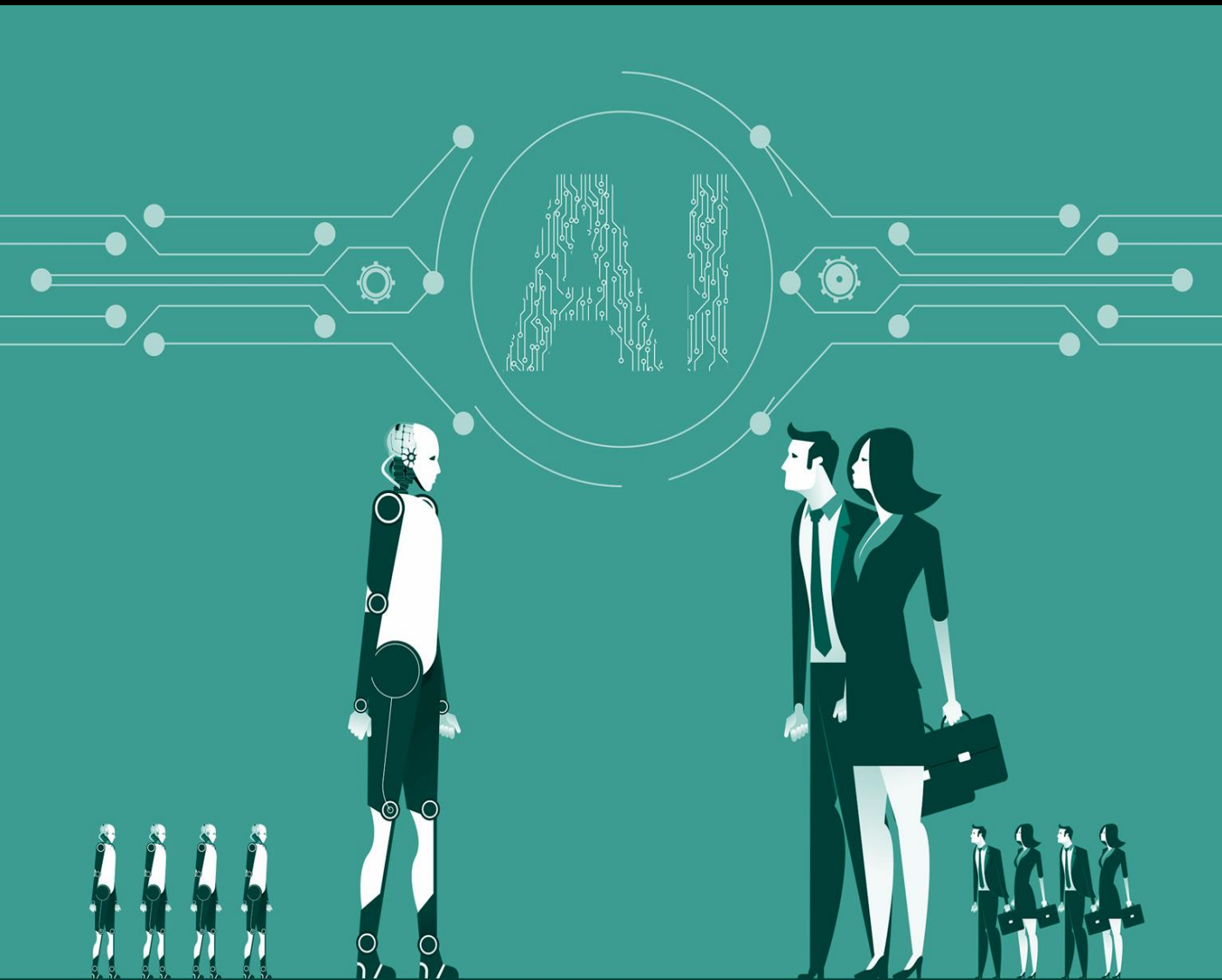
Worldview to Solve
For:

Our mental model is
dependent on having
finding ways to be
optimistic about our
future.



“Possibly government bodies with rules/regulations to try to avoid unconscious biases”
(Anonymous, Interview, November 6, 2019)

Section 4: Changing Our Metaphors



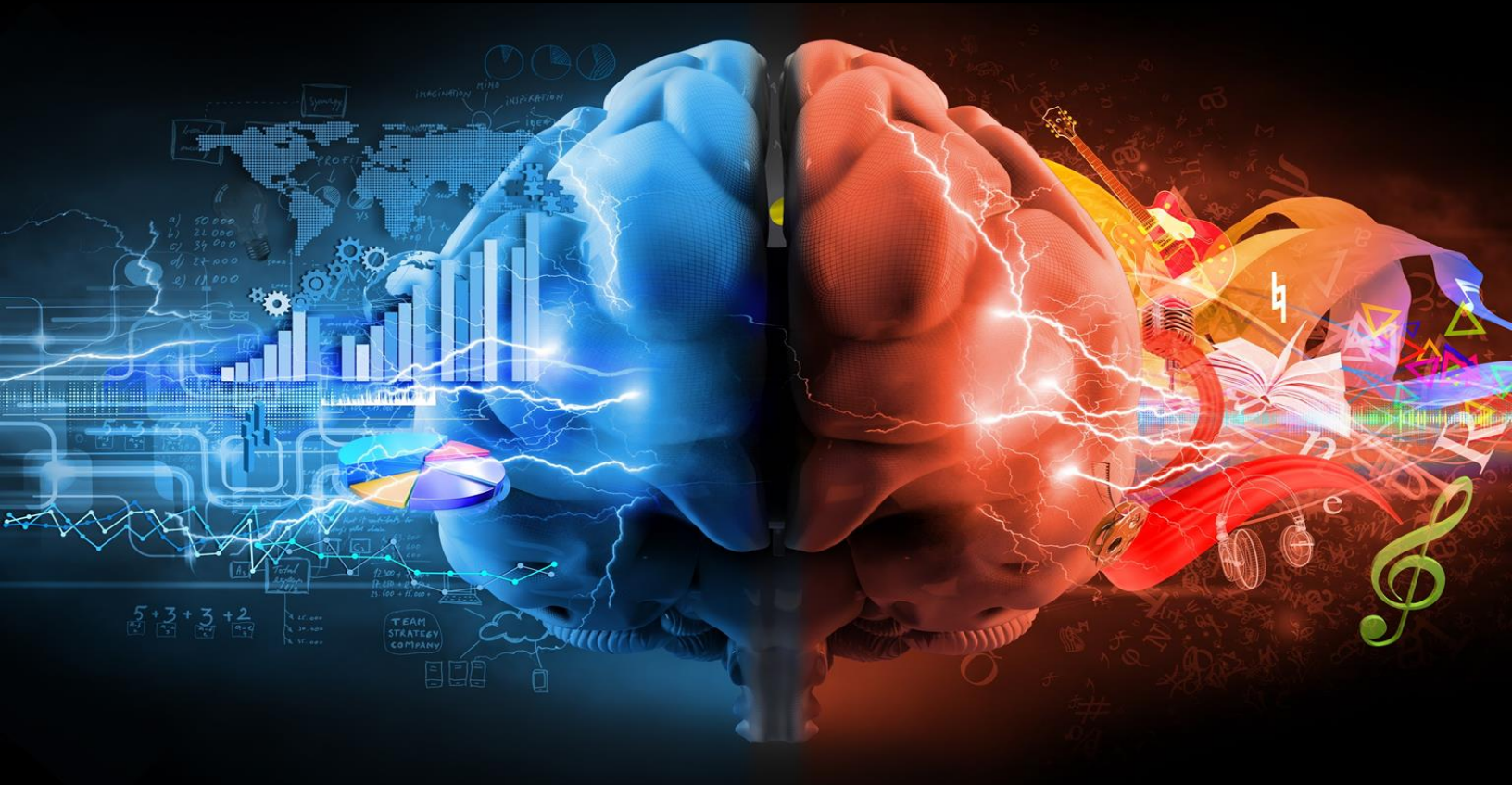
“A picture is worth a thousand words, but a metaphor is worth a thousand pictures” (Pink,2017).



Paradigm Shift

The Paradigm Shift that is being proposed is that by applying Whole Brain Thinking, we can begin to change our pessimistic myths and metaphors and begin to tell new stories where humans flourish alongside AI.

What is Whole Brain Thinking?



As previously introduced, Daniel Pink is part of the movement that recognizes that AI is taking over those tasks that exclusively could be attributed to the left side of the brain; any kind of work that is repetitive and routine. Routine is any kind of work that is based on a script, logical, and that could be reduced to a set of steps that once executed will produce the right answer. Included in this category are answers that could be determined using a decision trees that has yes, no questions that lead to an answer. Pink argues that in order to be competitive in the future, we need to train those skills that are associated with the right side of the brain; skills that engage creativity, people connection, and intuition. Pink (2005, 2017) also argues that we need to engage the right side of the brain with tasks that require novelty and nuance that with the current level of AI development, are difficult to automate. By doing this, we can be successful. We need to be Whole Brain Thinkers.

History provides examples of successful people who have been Whole Brain Thinkers. Albert Einstein was said to have had both a left brain logical mind, and right brain creativity simultaneously which had made him a genius. He was a genius physicist and master violinist. More and more studies link musical ability to improved cognitive functioning (Bergland, 2013). Leonardo da Vinci was known to execute his drawing with mathematical precision due to being able to use his whole brain (Selhub, 2015). Does being Whole Brain Thinkers provide an advantage?

Even in the field of AI, we have examples where programmers are adding more traditionally soft skills attributes into systems. In fictional movies, Hal in the film *2001: A Space Odyssey* was cold and calculating, whereas more right-brain attributes were added to the AI in the movie “Her”. Sticking with fictional characters, Data in the television show *Star Trek: The Next Generation* was an ASI that wanted to be more human, and tried as he may, could never quite get the knack of telling a joke or even the needed nuances necessary to master sarcasm.

How we could go about engaging the right side of the brain to become Whole Brain Thinkers is examined more throughout the rest of this report.



Pink highlights the skills associated with the right brain and how might we reimagine work to integrate a flourishing human being with AI enabled capabilities.

- ❑ **Design** - In particular with a human centred approach, design is an important factor in distinguishing products from one another in the age of over saturation in the marketplace. Unique designs stand out from the noise of its competitors and designers who are skilled in right brain thinking can have an edge.
- ❑ **Story** - In a world where facts (real one and not alternative facts) are free, easily discovered, and just an internet search away, placing these facts into an emotional context put that person ahead. “When our lives are brimming with information and data, it’s not enough to marshal an effective argument. The essence of persuasion, communication, and self-understanding has become the ability to also fashion a compelling narrative” (Pink, 2005). To put this in context, a good narrative as told by political leaders is more important than facts (Lamb-Sinclair, 2017).
- ❑ **Symphony** - “The ability to see the big picture, to detect patterns, and to combine disparate things into something the world did not know it was missing” (Pink, 2017). This is a skill that is hard to automate. Conceptual thinkers, system thinkers, and innovators that can take seemingly unrelated puzzles and see the overall commonality between all of them stand to thrive in the future of work.
- ❑ **Empathy** - This is important in interpersonal relationships and how we work with each. Seeing the world through someone else’s shoes helps us in our day to day interaction with people to make decisions based on how it will impact others. For example, studies show that the more empathic their doctor, the more likely patients are to get better faster (Rakel et. al., 2009)
- ❑ **Play** - A sense of humor, laughter, and spirit of playfulness and even games are right brain expressions that helps people to connect with each other and enhances [psychological safety](#) in groups. “Humor is showing itself to be an accurate marker for managerial effectiveness, emotional intelligence, and the thinking style characteristic of the brain’s right hemisphere. And joyfulness is demonstrating its power to make us more productive and fulfilled” (Pink, 2005).
- ❑ **Meaning** - Linking purpose with business goals is a driver that is going to have an even greater impact as the future of work introduces AI that takes over the routine tasks. An individual who finds meaning in the work that they do has found their place in the [purpose economy](#).
Integrating these skills into our work, can help us to find ways to create new careers that would prepare us to meet the future of work.

New Careers

What could these careers look like? Daugherty and Wilson (2018) in their Missing Middle model, explored what these new jobs that have humans working alongside AI could be. “In the missing middle, humans work with smart machine to exploit what each party does best” (Daugherty and Wilson, 2018, p. 8). The careers below, in generic terms, fall in the realm of how humans can complement machines:

Trainers:

AI need to be programmed to use supervised, unsupervised, and or reinforcement learning in order to operate. Humans need to be in place at least initially train AI so that they know what is the right reaction and what is incorrect. Self-driving cars algorithms need human input in order to be able to know how to respond given multiple data points coming towards it at once.

Explainer:

People who can be the bridge between the AI, business leaders, and the general public by using powerful stories, narratives and metaphors will be invaluable in the future of work. Explainers can help businesses to maintain a sense of transparency. This group can enable policies and work with Sustainers to help the general public to understand how decisions are made.

Sustainer:

This is the group who will work to ensure that AI systems are functioning properly, that AI will not do us any harms, flag errors in programming, and in general help to allay the fears of a dystopian future (Daugherty and Wilson, 2018, p. 127). This group can also provide us with security and hacker protection. Sustainers would be responsible to ensure that Asimov’s “Three Laws of Robotics” are applied:

- First Law: A robot may not injure a human being, or, through inaction, allow a human being to come to harm.
- Second Law: A robot must obey orders given it by human beings, except where such orders would conflict with the First Law.
- Third Law: A robot must protect its own existence as long as such protection does not conflict with the First or Second Law (Anderson, 2017).

However “numerous arguments have demonstrated why they (Asimov’s laws) are inadequate. Asimov’s own stories are arguably a deconstruction of the laws, showing how they repeatedly fail in different situations” (Salge,2017). Sustainers would need to apply creative thinking to these situations where AI fails to follow Asimov’s laws so that they can come up with ways to keep humans safe. Sustainers also need to work in the realm of transparency and ensuring that biases in our contemporary data sets are countered so that AI enables fairness.

In *Figure 10* below, the authors of outlines the 6 tasks that they see as falling in the Missing Middle. Notice that all 6 of those tasks are closely related to the right brain activities that others like Daniel Pink had emphasized.

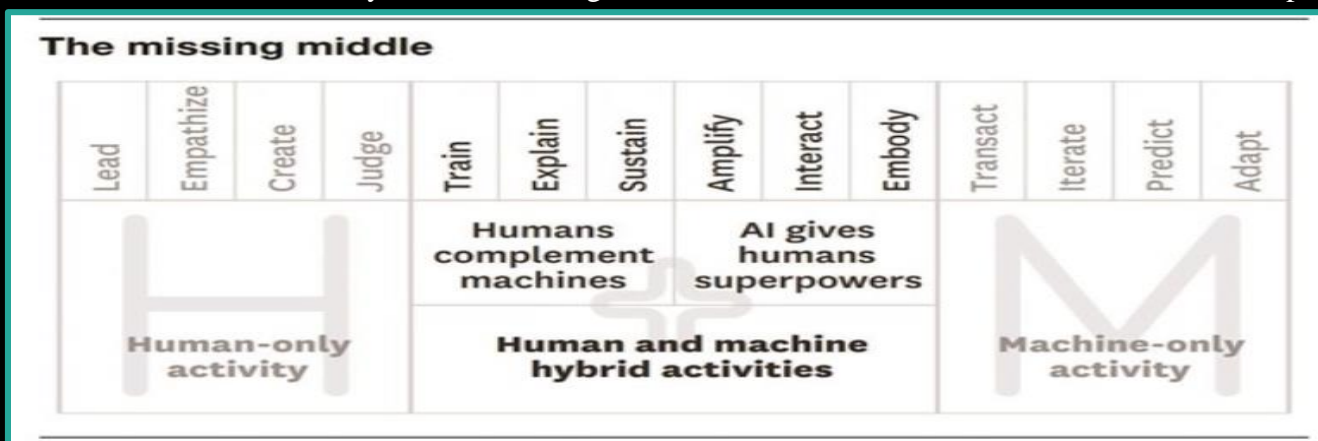


Figure 10: The Missing Middle - This figure illustrates the skills that are Daugherty and Wilson categorizes as human , human and machine and machine only skills. (Daugherty and Wilson, 2018, p. 8)

While the three areas above or skills that humans can bring to working with AI, Daugherty and Wilson continues to provide example of how AI can enhance our abilities and make humans truly AI enabled:

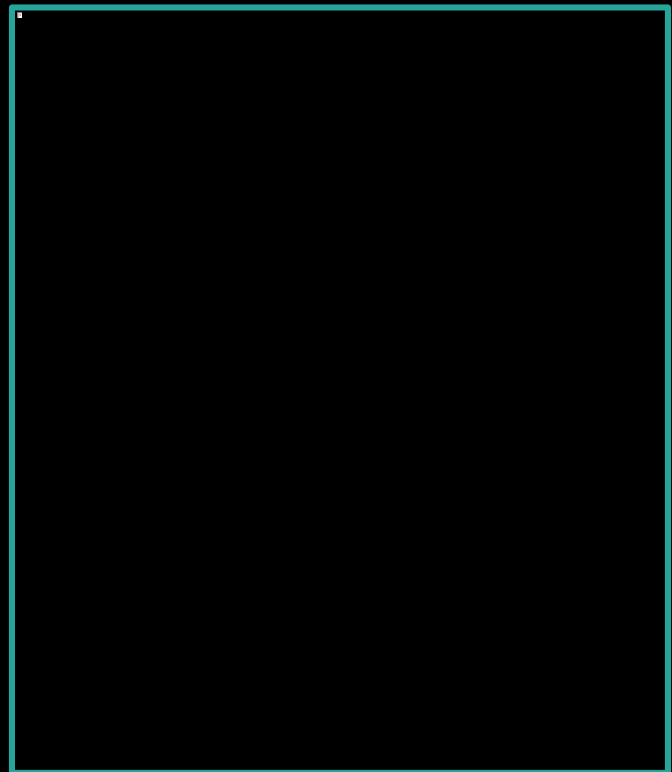
Amplify:

Designers can have the benefit of working with AI to generate multiple iterations of new product, or to model different solutions to a problem. Mental calculations could be offloaded to an algorithm after the parameters of the exploration are set, while the designers can focus on creativity and aesthetics (Daugherty and Wilson, 2018, p. 141). The AI can work to analysis trends and drivers, bring them to the attention of the designer who then knows how to priority her or his work.



Interaction:

We see today how AI is interacting with people to already make our work easier. Natural Language Processors suggest words or titles for us in Google email that is based on the type of words and sentence structure that we personally have used in our past emails. Chatbots that pull out FAQs and voice activated menu options are getting to be common at most online help centers. These types of interactions are allowing people to spend their time on higher value work.



Embodiment:

AI has been seen to physically augment the human body by helping us to walk, hear, see, and have a heart that beats so that we can have a higher quality of life. “ In September 2018, by Dr Claudia Angeli, of Kentucky Spinal Cord Injury Research Center, the University of Louisville (USA), that three patients had begun to learn to walk again after being fitted with electronic implants that stimulated their spinal cords” (Invaco Research Releases, 2018). Beyond medicine, we are seeing robotic arms and equipment being a vital part of the manufacturing spaces.

What is clear is that those who will thrive in the future of work will be the ones that are best able to work alongside AI. In particular, the Explainers in Daugherty and Wilson the Missing Middle model could be the key link to enabling others to regain a sense of Ontological Safety. Explainers could introduce new metaphors and stories to help bring humanity along into the Conceptual Age with no one left behind.

The need for Explainers, and those that will work in that space was the primary conclusion that the Appreciative Inquiry workshop that was conducted on October 10th, 2019.

Appreciative Inquiry

Reframing the people's image of the future

Workshop Research Area:

As AI is used increasingly in the workforce, what personality traits would be needed in order for people to interact successfully, flourish, and collaborate with technology?

- a. How might we potentially seek to change or train those personality traits that would enable a human worker to flourish?
- b. What are the unintended consequences, both negative and positive that could be emergent properties of such a change?

How might we build trust with AI so that employees of the future are not afraid of AI taking over all work?

Appreciative Inquiry (AI) uses positive psychology to shift an overall perspective throughout a change process (Cooperrider & Whitney, 2005).

Appreciative Inquiry Overview

Problem: We commonly get locked into processes that make it difficult to pivot when adaptation is necessary. During times of complex problem-solving, when there is lack of clarity as to which way to go, people can get stuck in the solutions that they have applied in the past.

Solution: With Appreciative Inquiry, the facilitator begins by crafting and asking unconditional positive questions to discover what the participants would like to see occur if a positive outcome was assured. Appreciative Inquiry then takes those sentiments and work with the participants to find ways to make those positive visions possible by bridging the present with their imagined futures. Appreciative Inquiry also generates positive metaphors and narratives. This technique highlights people personal power and will ignite a group's imagination for an ideal future.

Methodology



Figure 11. Photo of Appreciative Inquiry workshop. Photo used with permission as per REB Consent Form

The Define Question:

A mystery box was placed in the middle of the table to represent that black box that is the future of AI. Participants were asked:

- **What needs to be in the box for humans to flourish in the future of work?**

Participants were asked to think about: Under which conditions did you feel that their work was the most valued, successful, engaged and energized?



Process: The steps of the Appreciates Inquiry model go through the cycle below that is termed the 5 D's:

1. **Define:** This step is better identified as choosing the Affirmative Topic, which is the research question but asked in such a way as to prime the room to think of the problem as being solvable. Since Appreciative Inquiry focuses on finding positive solutions, the question(s) that is presented in the Define stage is framed in such a way as to invoke affirmative solutions.

Define: Raw Data Output

1. Understand how it works
2. Time to try it out (practice)
3. Tangible examples
 - a. How do you see it in action!

It will decrease anxiety

1. Training expertise
2. Practice & exposure
3. The more you know, the less you fear it
4. Data scientist mindset
 - a. What is the question

5. Black box
 - a. So many things that we don't understand
 - b. Don't know if it is broken

6. Neural Network
 - a. See the validation
 - b. Want to know the steps
 - c. What it is based on
 - d. What is the model

7. What are examples
 - a. Algorithms behind
8. Real examples and the theories behind them

Appreciative Inquiry Raw Data

Discover:

Once the Affirmative Topic has been defined, the next phase is to remind participants of the successes that they have had in the past, remembering when they have felt the most powerful. “This task is accomplished by focusing on peak times of organizational excellence, when people have experienced the organization as most alive and effective.” (Cooperrider, 2012). With this in mind, participants were think about things that would fulfill the objective of:

- **What are 3 things that worked well for you now that would like to see continue even if AI is integrated into your work?**
- **What are 3 things that you discovered in the last workshop (or that you can think of now) that you would like to see AI start to do in your current work?**

Participants get to hear the stories of others in the group. They also speak about what they value most about themselves, and others which helps them to focus their thoughts on how AI could positively impact the future. By hearing how other people’s stories are similar to their own, we can start to find common themes.

Discover: Raw Data Output

Continue Doing

- Team discussions and decision making
- Decision making regarding data cleanliness and what good enough
- Build off stories in (unintelligible)
- What is worth it
- What is needed

Start Doing with AI

- Identifying data issues
- Abnormalities in the dataset
- Integration between data files and repositories
- Process electronic Case Report Forms files

3 things that work well:

- Strategic discussions
- Agile growth mindset/behaviours
- Dealing w/ ambiguity

3 things to start to do:

- Automation of manual tasks (eg. metrics)
- Data surveillance - risk based approach in data review
- Data-driven insights & decision making
- “Business intelligence” -> “business analytics”

I want to Continue the Work of

- Responding to / seeing an email
- Anything related to communication
- Ex google assistant

Discover: Raw Data Output

AI can start doing

- Updating study specific domains based on protocol (validation checks for case report form database)
- Enhance categorization, prioritization and emails
- Filing in audit system (filing system)
- Takes a human to identify the systemic problems
- Can take a project with AI, what’s more important is the specifics for how a team is doing (human element)
- Can ignore a machine rather than a person
 - Dealing with difficult people

What can AI now

- Building training courses/delivery of training
- Driving
- Project management

AI Should do in the future

- Triage tasks in issue management system
- Collect metrics on training courses
- Networking within and outside work
- Filling out forms

Appreciative Inquiry Raw Data

Dream: This phase asks the participants to imagine the future that they aspire to achieve. These dreams can be bold, stretch the imagination and focus on a positive outcome that is a product of applying the strengths that they had uncovered in the discovery phase. This is a collaborative process in which the group is co-creating their desired future. The only limitation is that the dreams need to be realistic and to avoid the dystopian versions of the future that has permeated today's common visions of the future of work with AI.

Dream

- Case where they do not get adverse effects to getting their data out there
 - Security in place to insure your safety
 - Hacker Insurance
- People are heard
 - They can give feedback
 - Anonymous feedback
 - Respond to comments
- All questions answered
 - People can see what the impact is
 - Transparent feedback tool
- Impact score of feedback of your question (like yelp)
- Understand how decisions are made
- Have control over final output
- Active Control
 - Key words
 - People who don't delete things from
 - Filters set up
- Make some sort of training/overview
 - Examples: video on phone that prompts the you to watch it
 - Promote the results from it
 - Share the good
- Advertising campaign
 - Showing value of AI



Appreciative Inquiry Raw Data

Design:

In the design phase, the participants are asked to find the bridge between the dreams and reality and to co-create what can be. They are asked to come up with ways of designing and connecting what was dreamed with reality. While the participants need to keep in mind the reality of the organization, they can still be provocative and push the status quo. The positive aspect that has been grounded into the workshop is carried forward to design concepts that are desirable for the participants. During the design phase, the facilitator and the participants need to organize these dreams into themes. Groups can find solutions in a multitude of areas including: communication, group responsibilities, strategies, priorities, decision making, and cultural shifts.

Design

What can we stop doing

- Propaganda
 - AI movies
 - No jobs left
 - Robots replace humans
 - Avoid fear messages

Risk and Opportunities

- Second career program is a must
- Proactively retraining
- Stop being as private with data

Is it working?

- Unemployment rate
- People are better off
- Economy
- Happiness score
- Human development index



Destiny (Debrief):

This is the execution of the plan and how they see their discussion having an impact on their future. “The *destiny* phase delivers on the new images of the future and is sustained by nurturing a collective sense of purpose. It is a time of continuous learning, adjustment, and improvisation (like a jazz group) — all in the service of shared ideals. The momentum and potential for innovation are extremely high by this stage in the process. Because of the shared positive image of the future, everyone is invited to align his or her interactions in co-creating the future” (Cooperrider, 2012).

Destiny (Debrief) Raw Data

- Being proactive when it comes to change and the adoption of new technologies (AI) instead of rejecting it
 - Think of ways to make it better, integration
- Open communication between AI supplier and the end users needed
 - Prevent the black box
- The more protective and (*unintelligible*) we are, the less of a chance AI will succeed. We need to build trust in AI through sharing discoveries and make data sharing take

Appreciative Inquiry Key Messages

Hacker Insurance

Transparency

Stop being as private with data

We need to build trust in AI through sharing discoveries and make data sharing take

Ensure that people are heard and can give feedback

The right to ask why did you do that

Practice

Integration

Open communication between AI supplier and the end users needed

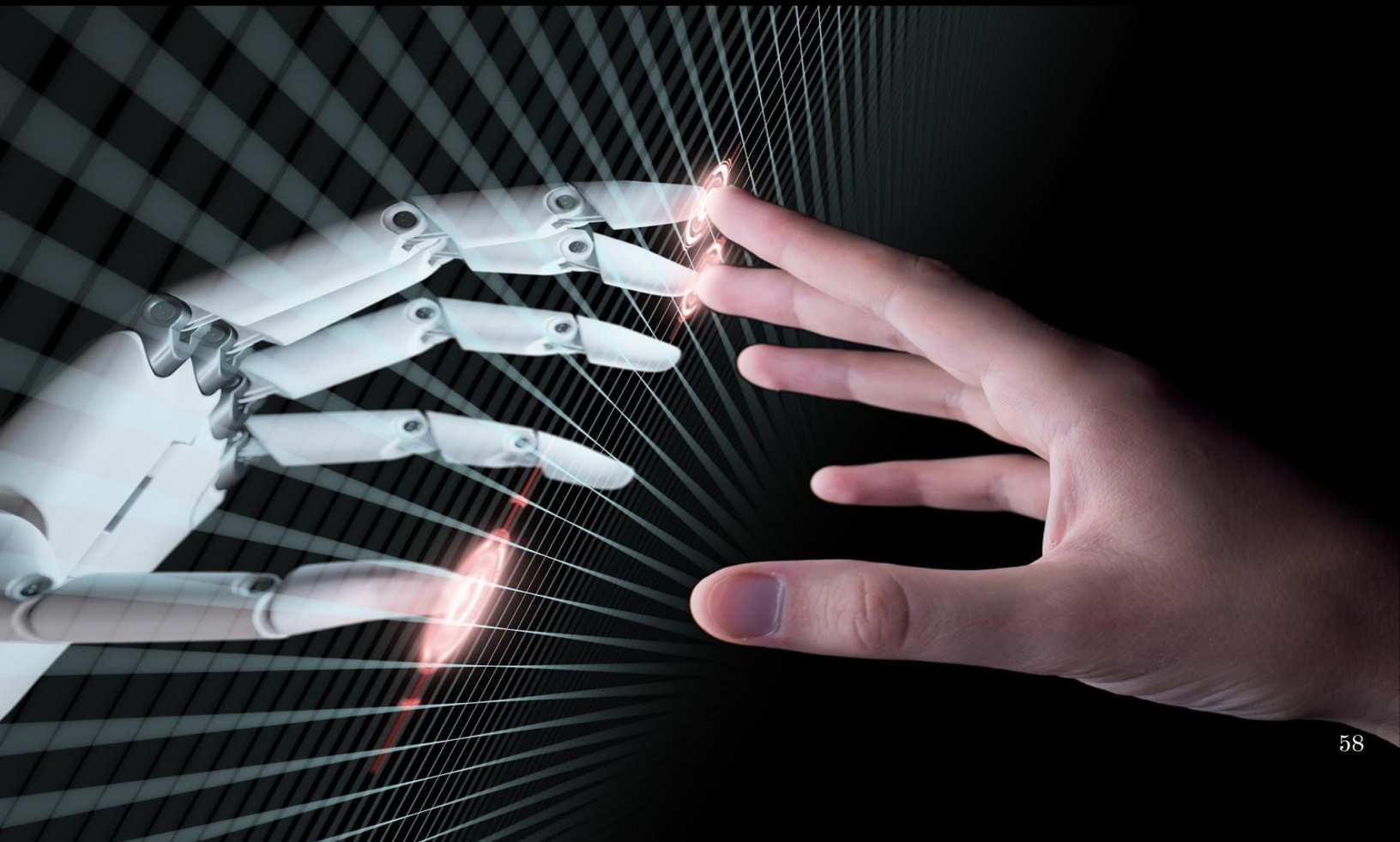
Prevent the black box

Avoid fear messages

Is it working?

Sharing discoveries

Proactive retraining



The Role of Explainers

“If you can imagine it, you can create it. If you dream it, you can become it.” - William Arthur Ward

The Appreciative Inquiry workshop helped participants to envision what it would take to work successfully with AI. Innovative solutions like having ‘hacker insurance’ (like home insurance but for your digital life), and ‘stop worrying about data privacy’ could be looked at a future date. Other answers that included ensuring transparency, open communication, avoiding the language of fear, and the right to ask why an AI program did a task, can be categorized under a Whole Brain Thinking skill set. In particular, they exemplified the skills of Trainers, Sustainers, Explainers that were identified by Daugherty and Wilson (2018). While Sustainers who program AI and Trainers who could help people learn how to work with these machines are more obvious careers, it was observed that the skill set of Explainers could be that needed bridge between people and AI. By being present to help to communicate how things work and to ensure transparency, Explainers could be the needed key to help employees to build trust with AI.



One of the sub-questions that the Appreciative Inquiry sought to answer was:

How might we potentially seek to change or train those personality traits that would enable a human worker to flourish?

The argument can be made that empowering people to become good Explainers would mean also teaching them how to tap their creative potential to tell new stories and create new metaphors and myths. Explainers need to think creatively in order to take very logical and abstract concepts and explain them in a language that everyone could understand. By changing the metaphors, we can dispel the fear surrounding AI and help the workforce to maintain a sense of Ontological Safety. Training Whole Brain Thinking could help people to create new metaphors and stories about their future by shifting their mindset to imagine the future that is not dystopian.

However there is a problem: Ask any group of people and many of them would respond with, I am not creative. Globally, only 25% of people believe that they are creative, with 80% of people in the UK and US feeling that it is more important to be productive than to be creative (Parekh, 2012). This is a barrier that prevents people from flourishing in the future workplace. If as illustrated, the ability to explain complex ideas and concepts will be needed in the future of work, then how to teach creative skills become paramount in training how to engage Whole Brain Thinking. To break through this barrier, the myths of creativity can be examined.

If as demonstrated by the literature review and the Appreciative Inquiry workshop that the Whole Brain Thinking skill set that is related to Explainers is needed, how then can we go about training this needed skill of the future?



Metaphors and Myths to
Solve For:

Our stories does not at
the core provide a sense
of Ontological Safety.



“More time for humans to enjoy leisure activities, freeing them up to do more creative things, so more development” (Anonymous, Interview, November 6, 2019)

Section 5: Creativity is the Key to Whole Brain Thinking





Engage Our Whole Brain by Igniting Creativity

Rachel Woods outlines that the core skills needed by Data Scientist to thrive includes:

- Empathy, which also features on Daniel Pink's right brain skills, and which involves employing a human centered design by keeping the needs of the end users at the forefront of any design;
- Diagrams Over Description, which helps to bridge the gap of communicating analysis by using visual aids that can create strong metaphors to represent complex findings;
- and embracing Creativity so that researchers could not only demonstrate [Divergent Thinking Skills](#) but also grow the capability of their business. Embracing creativity also enables them to find links between seemingly unrelated ideas, which here too is what Pink described as Symphony (Woods, 2019).

In 2016, Adobe Corporation conducted a study that showed that while 82% of those who responded in the United States, Europe and Japan saw creativity as a key to fostering innovation and a way to increase productivity, only 41% of people see themselves as creative (Adobe, 2016). If that is the case, then while training creativity skills are key to future success, there is work to do in order to help people see themselves as creative and to then be able to know how to apply those skills.

Allen Gannett challenges the notion that creativity is innate, and that we are born with a level of creative genius or we are not. "We've all been told a lie about the nature of creativity. For as long as anyone can remember, our culture has perpetuated the myth that creative success is the result of a sudden light-bulb moment" (Gannett, 2018). Gannett examines the myth of creativity and provides through scientific analysis, ways that everyone can engineer creative success.



Myth 1: Creativity is Unattainable

Allen Gannett (2018) outlines several myths about creativity. The movie *Amadeus* characterized **Mozart** as a brilliant composer whose musical prowess was handed to him by a higher power. Mozart's first creations was at age eleven. They were plagiarized. His first truly original work was released when he was seventeen. By that point he had had fourteen years of intense practice behind him (Gannett, 2018, p. 24).

The truth: Creativity is a learned skill that is within your reach. Mozart's father placed him in front a piano at age 3 and forced him to practice, practice, practice. His experience speaks to the fact that creativity is learned.



Myth 2: It is Just Easy for 'Them'

By the time Mozart was in his twenties, he was brilliant. He made crafting music look easy. "Mozart, an early standard-bearer for the inspiration theory of creativity, was, in fact, a practitioner of intense and diligent effort" (Gannett, 2018, p. 25).

Gannett highlights how consumption is related to creativity. Creative people spend a lot to time consuming content within their interest. For example, J.K. Rowling is a ferocious reader. They look for a variety of ideas around a topic they are curious about. Whether consciously or not, they are following [Ashby's Law](#). Variety is another way of thinking about information. It describes the number of potential states of a system (group/organization/initiative). If you recognize all the possible states, you have complete knowledge of the behaviour. Uncertainty occurs when you do not know all the possible states. As Ashby put it, variety is a concept inseparable from that of 'information'. Complete knowledge about a subject allows you to be more creative as you will know all the rules, and know which ones you can break. As Gannett explains, you can't have insights about things you don't know anything about. His advice is that you spend 20% of your time consuming information in your area of interest to keep from becoming stale (Gannett, 2018, p. 113).

Also artists like Mozart, J.K. Rowling, and dancers are quite disciplined in their approach to work. Is it always 10,000 hours of practice that is needed? No not really. Here quality of time spent is more important than quantity of time; that and perseverance. J.K. Rowling first Harry Potter manuscript was rejected by 12 publishers before Bloomsbury published her work (Gannett, 2018, p. 217).





Myth 3: The Individuals are Eccentric. They develop completely wild ideas.

“The more that someone sees something, the more that people like it. The more exposure, the more we like it” – Allen Gannett

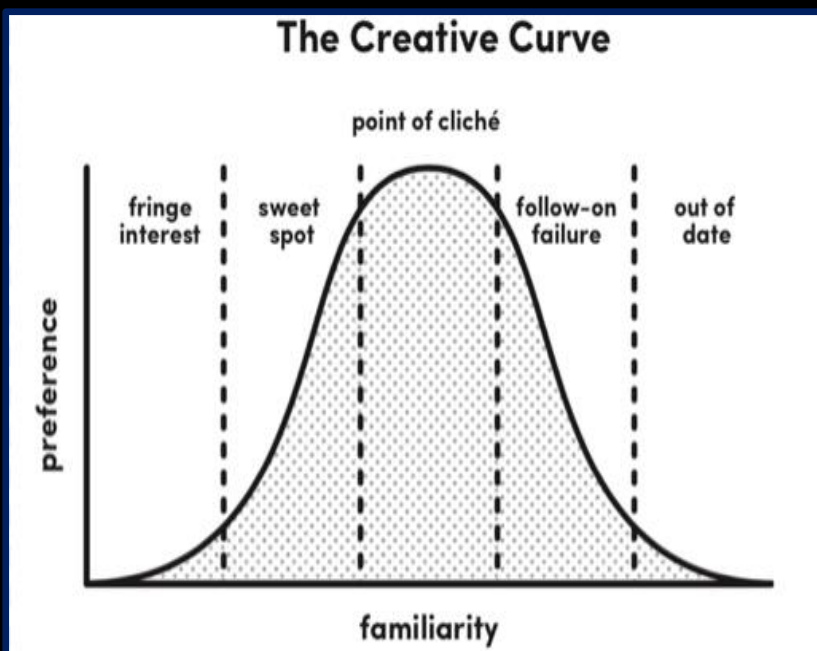
This statement reflects how creative people create ‘hits’. While their work seems novel, it still contains some familiar elements. We crave the familiar, as familiarity contributes to our sense of ontological security. The more someone sees something, the more that it would become familiar. However we only like something that is familiar up to a point. Why?

We crave both the familiarity and we the novel. Our brain has a nuance balance between familiarity and novelty.

The Creative Curve

Allen Gannett takes the bell curve and uses it to illustrate the concept of the Creative Curve (Gannett, 2018, p. 93). He plots the level of people’s preference for something new against familiarity.

1. Fringe interest - Here preference is low, but so too is the public’s familiarity with the idea.
2. Sweet spot - This is where ideas take off and there is interest. We would want to create ideas in this area as while they are mostly novel, ideas still have elements of familiarity to them.
3. Point of cliché - Ideas in this area are over exposed and everyone knows about them so much so that they become expected.
4. Follow-on failure - Were ideas still seem popular but they are just about to fall off a cliff as the population begins to tire of the concept.
5. Out of Date - The idea if introduced at this point sees old and of a past era.



Gannett concludes several important fact from the Creative Curve:

- ✓ There is a Sweet spot where this is the right blend of familiarity
- ✓ Imitation allows you to learn what has worked then add in that novel twist
- ✓ A general rule that he introduces is that for sure hits, those ideas that land in the sweet spot, only 10% - 30% of the concept should be novel or have some sort of twist or change (Gannett, 2018, p. 149).

Basically he points out that we only like novelty up to a point, but it still needs to contain something that is familiar to us.

Figure 12: The Creative Curve as conceptualized by Gannett (Gannett, 2018, p. 93)

Myth 4: Creative Ideas are Manic and Spontaneous. They comes out all of a sudden



Edward Bowden is a researcher at the University of Wisconsin–Parkside who looks that the neuroscience of creativity. As stated earlier, the left side of the brain is logical, analytical and contextual processing. Bowlen labels this concept as conscious thinking with the right side of the brain is the unconscious thinking. The right side of the brain is also associated with metaphorical thinking that searches for associations between concepts. Aha moments occur when we're not aware that our right hemisphere is at work, searching for connections. Sometimes much later, the unconscious thoughts passes into our conscious awareness and while they seem like flashes of genius, they can be categorized into 3 types of aha moments.

1. *Shower moments.* In this scenario, you might already have a solution to something in your brain's right hemisphere, but activity in the left hemisphere is crowding it out. Once the left hemisphere's logical processing fails to deliver an answer, this activity tends to fade. Once the left hemisphere's activity falls below that of the right hemisphere, the answer from the right hemisphere pops up as if by magic. Aha!
2. The second origin of aha moments is through *combination*. Here, your brain's right hemisphere, knowing that one single concept is unable to give a satisfactory answer, is subconsciously working to connect multiple concepts. If your right hemisphere is able to weave together what feels like a workable solution, it becomes activated.
3. The third origin of aha moments involves a *trigger*. In this case, an environmental factor subconsciously ignites an association with something already stored in your brain's right hemisphere. (Gannett, 2018, p. 125-126)

What is happening is when we're asked to be creative, we need to turn off the focus (left side) centres of the brain and allow our thoughts to incubate. When we allow our minds to daydream or wonder, the default mode gets ignited and our brain continues to process that information even if we are not actively thinking about the issue at hand.

What does this mean for creativity? We need to permit incubation of the problem. While the first step is to prepare and research the problem for a while, we need to set the problem aside to give time for incubation to occur in order to then arrive at a solution; that aha moment. Allowing time for your mind to wander and day dream, needs to be incorporated into good design practices. Faster does not always make you better.



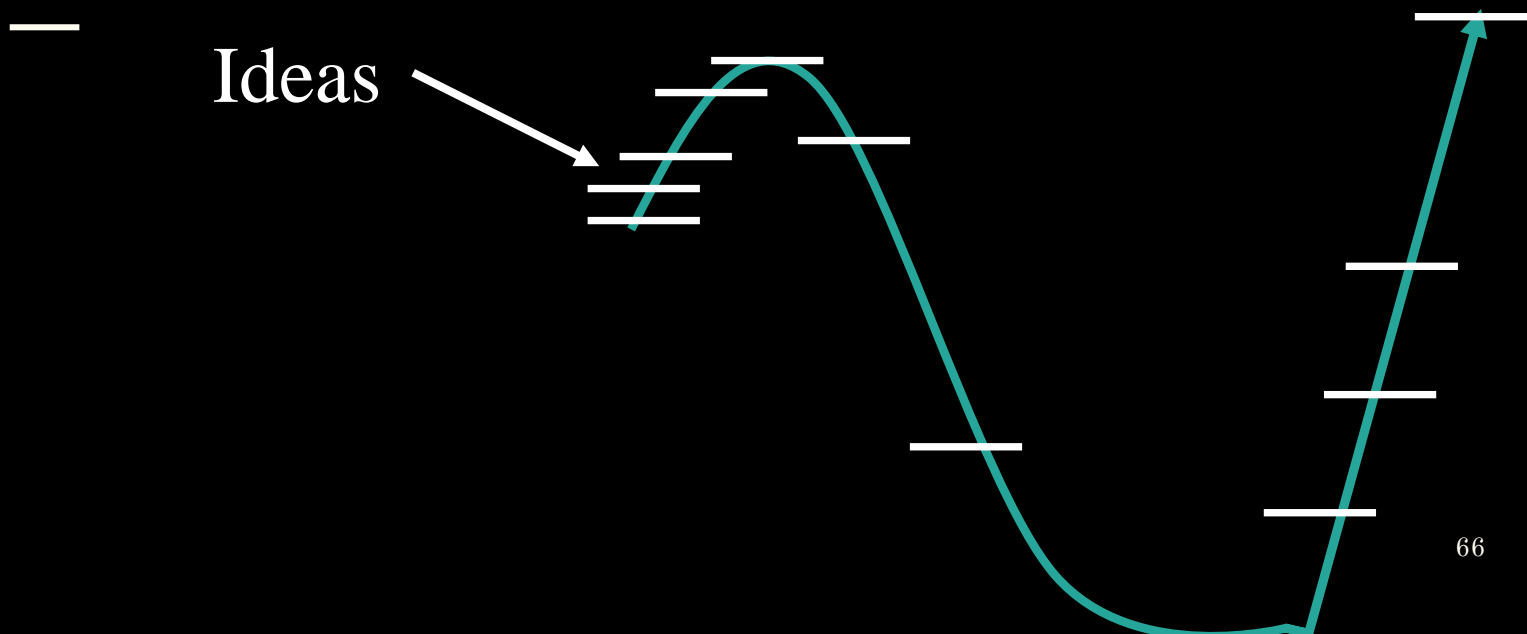
Myth 5: It is Overwhelming. Where to do you start?

Brainstorming, is a go to process for businesses who want to generate new ideas. The common feeling is where do you start? Ideas, especially the obvious ones comes quickly, and if you are not fast enough to say them, then you are left with the feeling of not contributing. In an atmosphere where the loudest voices tend to dominate the first hour of that brainstorming process, Gannett demonstrates that it's more a matter of perseverance. The first answers that those same people had shouted out at the beginning of the process, is not always the most innovative. For example, we can look at the question; 'how many states could a door be in'.



The first answers that readily comes to mind are open and closed. What usually happens in brainstorming session is that the more obvious ideas occur at the beginning of the process and these come quite quickly and close together (see the graph below). There may even be one idea that seems to be the best idea in the bunch, but then additional ideas then come sporadically until very few ideas are added.

Then someone says, after what would be an incubation period, something that looks at the question from a different angle, like 'closed and locked'. This could spark that aha moment in others. Ideas then jump to novel solutions: including closed and unlocked, ajar, open and locked.



Take away: How do you engage your creative muscles?

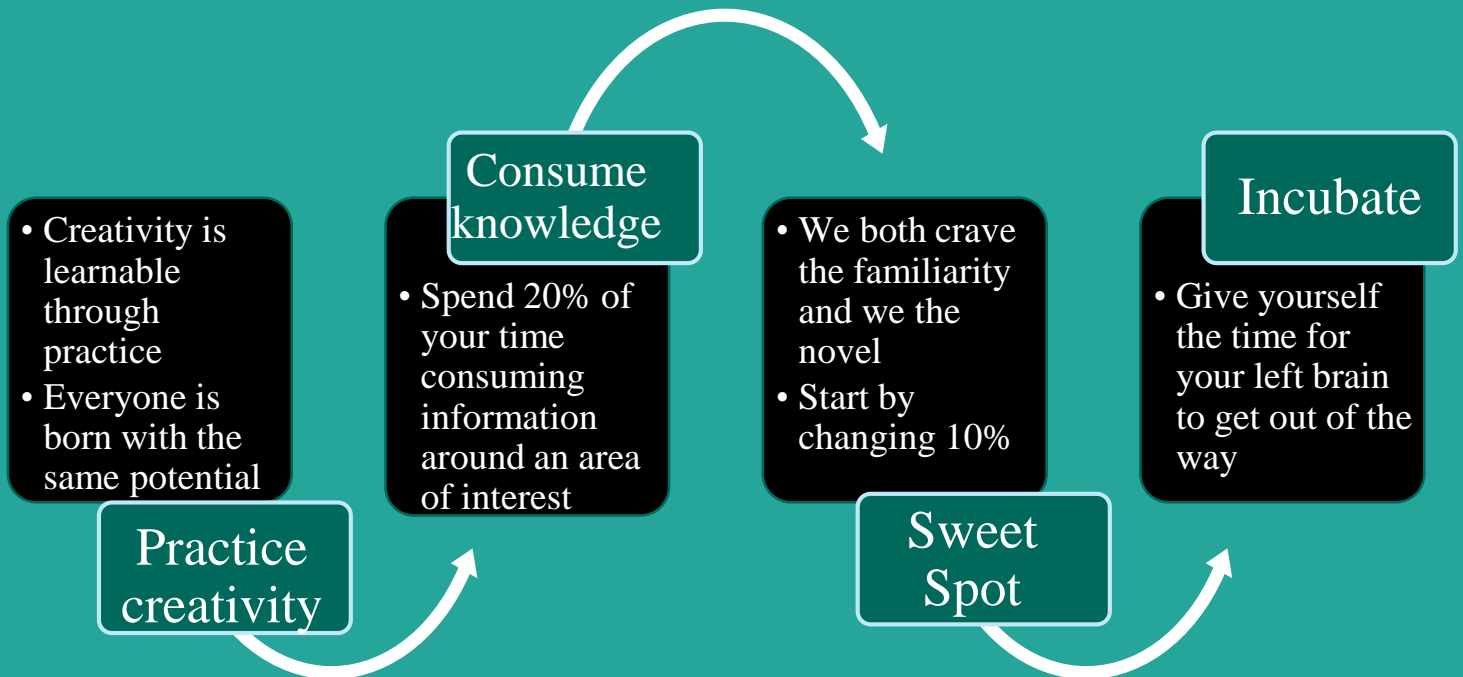


Figure 13: This figure summarizes the steps Gannett identifies as needed to engage creativity.

Why Does This Matter?

Creativity, a skill set needed to be an effective Explainer, would be the Whole Brain Thinking tool needed to help workers introduce the plausible and possible outcomes of a situation. Statisticians who would use Quantum Computing for predicting the probable outcome could use creativity to enhance what the Quantum Computer sees and make strategic decisions that look at all possibilities. Creativity would also be essential in creating the [Preferred Future](#); the desired outcome of the combination of the trends. As mentioned previously, if a person can imagine it, then they can take the steps to make it happen. Creativity is the key.

We see how this can work by looking at the Cone of Possibility. A tool that Futurist use for scenario planning.

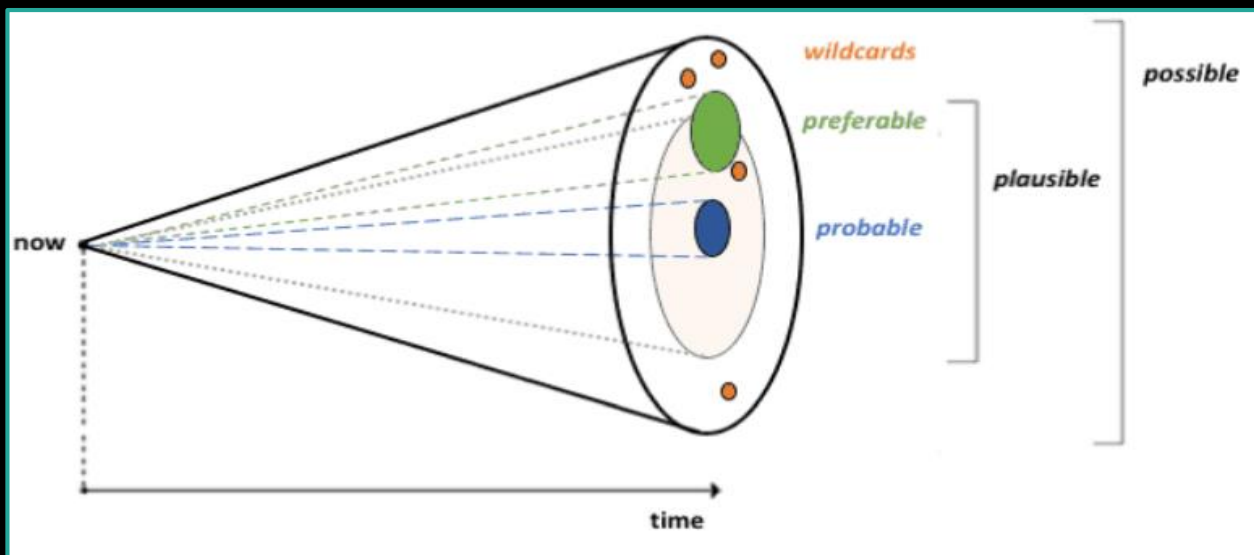
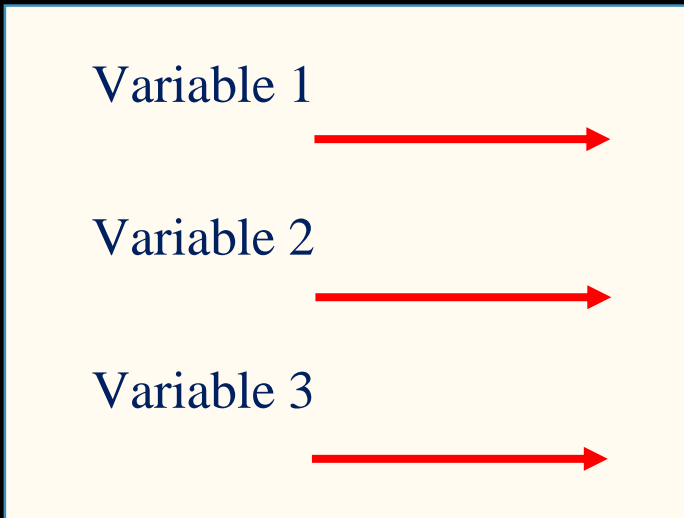


Figure 14: This figure is an illustration of the Cone of Possibility

How Creativity Helps with the Cone of Probability

AI can help to predict the probable, while the creatively trained Whole Brain Thinker can help us to look at the Plausible and Possible where the preferred future may reside.

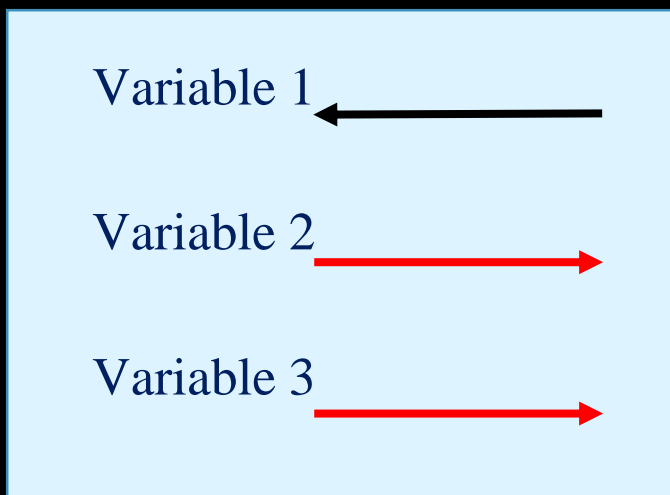
Probable Future: AI Prediction



Probable Future: AI Prediction

A Quantum Computer can look at the trends and drivers and make predictions based on the most likely outcomes. Algorithms that are already in use in machine learning algorithms are starting to make predictions, even if they are not at the level of quantum computers.

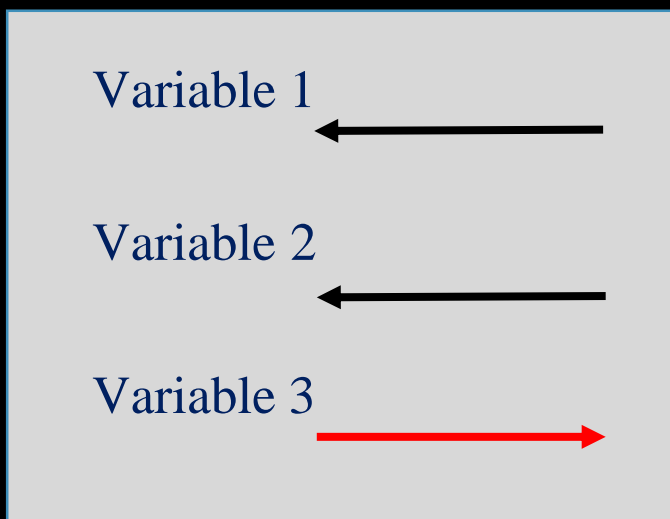
Plausible: Human WBT



Plausible Future: Human Creativity

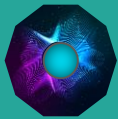
A creative thinker has spent the time to consume the content within their field. They could look for a variety of ideas around a topic, know the potential states and behaviours of a system, and then change one of these states to reveal the plausible state of a system. Futurists who can recognize that in any system, one of the variables can change in the opposite direction of what is predicted, can introduce into strategic conversations, the plausible outcomes of a situation.

Possible: Human WBT



Possible Future: Human Creativity

_____ A creative thinker can understand that two or more variables can change in a system and therefore can think strategically of other possible situations that could occur. Creative thinkers could also help people adapt to by understanding that others crave familiarity among the novel possibilities that they are experiencing. Helping others to recognize the familiar elements behind the variable fall directly in the skill sets of Explainers.



“Depends on how far we go with AI, if they start to get more and more advanced...that is why we need to maintain the ultimate control to be able to turn off the AI if it goes wrong”
(Anonymous, Interview, November 6, 2019)

Section 6: People + Artificial Intelligence



Whole Brain Thinking and the Missing Middle

When we are in the present looking at the future, we tend to only focus on the probable future (that which is most likely to happen) and neglect the plausible and do not tend to think about the possible. Creativity is needed for strategic and futuristic thinking. By learning how to be creative, we can learn how to take something familiar and twist it then determine what has to change to get our business to the preferred future. Creativity pushes futurists beyond just looking at the probable to see the possible, especially when their preferred future lays outside of what they see when only looking at the probable outcomes. In the future of work, AI with its ability to predict probability, would need the help of humans to see beyond the probable state to also encompass the plausible, and the possible outcome of events.

Garry Kasparov, that chess master who lost to Deep Blue in 1997, is an advocate for AI working with humans to become more powerful. “Human plus machine means finding a better way to combine better interfaces and better processes” (Loughran, 2019). What Daugherty and Wilson term jobs that fall in ‘the missing middle’ refers to when businesses understand the ways that humans help machines and the ways that machines help humans. “Machines in the missing middle are helping people to punch above their weight, providing them with superhuman capabilities” (Daugherty and Wilson, 2018, p. 8). They are not advocating that AI completely takes over the left brain tasks that are predictable, repetitive, need faster calculations, and that are logic based. Nor are they advocating that humans stick exclusively with the right brain tasks. Humans still need to be able to explain what AI does so as to avoid the ‘black box’ scenarios. When working with algorithms, humans still need to train, explain and sustain AI development. Daugherty and Wilson explains that AI can assist humans in the missing middle by provide them superpowers by fusing their skills with that of AI. These fuse skills could be seen by first using AI to generate more potential solutions to look at, and use the human’s creative ability to generate plausible or possible solutions that have higher chances of success (Daugherty and Wilson, 2018, p. 186). Humans can then use their “judgement-based ability to decide a course of action when a machine is uncertain about what to do” (Daugherty and Wilson, 2018, p. 191). People who have these skills would know how to ask intelligent question of AI to gain insights into who a programmer is working. Humans could also use AI to run through quite rapidly, multiple iteration of an experiment in order to get the best results. People would be “working well with AI agents to extend your capabilities, and create superpowers in business processes and professional careers” (Daugherty and Wilson, 2018, p. 195).

Workers of the future would then truly be AI enabled.

Exactly how skills in the Missing Middle like Explainers can bridge the transparency gap between workers and AI can be illustrated by taking the 9 types of machine learning algorithms and then examine how an explainer can help in comprehension.

As it currently stands the algorithms behind Machine Learning systems can be broken down into 9 types. An Explainer by being the bridge between worlds, and who as Gannett emphasises would understand the amount of variety possible in each area can break down each algorithm into a language that is easily understandable. They would be able to break down how each of these algorithms work and include explanations of the type of learning systems that are involved.

Types of Machine Learning Algorithms
Decision Trees
Support vector machines
Naïve Bayes
K-Nearest Neighbour
K-Means
Hidden Markov Model
Artificial neural networks (ANN)
Convolutional neural networks (CNN)
Recurrent neural networks

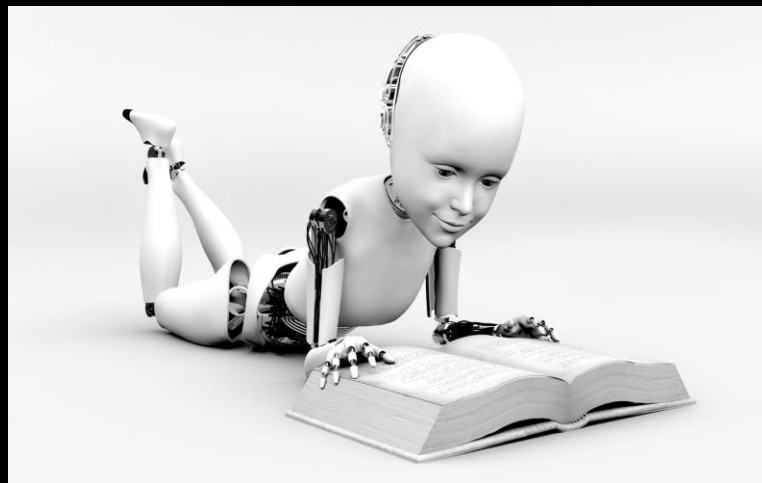


Table 1: Types of Machine Learning Algorithms



Explainers, could take those 9 algorithms and translate them into a language that anyone could understand.



1. **Decision Trees**: supervised Learning - Used for [classification](#) and [regressions](#)
2. **Support vector machines**: Supervised Learning - A line is used to separate categories of data into their different categories. Variables that fall on one side of the line belong to one category, and those that fall on the other side of the line belong to the other.
3. **Naïve Bayes**: Supervised Learning - Based on Bayes theorem to calculate the probability that each new item belongs to a particular class based on the features, calculates are made that predict the probability that a variable belongs to a certain class.
4. **K-Nearest Neighbour**: Supervised Learning - This algorithm matches the data coming in to the nearest other data point that is similar to it. You can increase the influence of the nearest point by applying a weight to each neighbour so that some nearest point count more than others.
5. **K-Means**: Supervised Learning - This machine learning algorithm works by assigning a classification by averaging a cluster's mean value. The center of that cluster can change as the mean changes. Eventually each k cluster has a mean center.
6. **Hidden Markov Model**: Reinforcement learning - Named after the Russian mathematician Andrey Markov; this is an assumption that even though the future state of a variable is certainly unseen, the outcome of possible events are based on knowing the present state of an event. An algorithm satisfies the Markov property if one can make predictions for future events based solely on its present state without having to know the process's full history.
7. **Artificial neural networks (ANN)**: Supervised and Unsupervised learning - Neural networks that mimic the human brain is taught to represented each input as a number. Based on the weighted sum of the input, it predicts what an object could be. It is then compared to the actual item for accuracy. The weighted sum is then updated if the prediction was incorrect.
8. **Convolutional neural networks (CNN)**: Supervised and Unsupervised learning - Similar to ANN, CNN is a neural networks that mimic the human brain with each input represented as an images which enables them to encode certain properties into their neural network (example distance between parts).
9. **Recurrent neural networks**: Supervised and Unsupervised learning - Similar to ANN, except RNN are able to consider previous data. The neurons from ANN only have the input from the previous layers to consider, while RNN loops back to re-evaluate previous outputs. This enables the algorithm to go back to verify the context of the words or a temporal aspects.

Whole Brain Thinking

Katrina looked up in surprise. “Stop” she said to the ASI in front of her. “Why did you do that?” she asked, “and also explain how you did that”, she continued. Katrina waited patiently as the ASI powered down in front of her and went into explanation mode. Not for the first time, Katrina was thankful that the “right to ask why” [oversight policy](#) was introduced back in 2021 that mandated that all AI be built so that the people who worked alongside them could ask for an explanation when the AI did an action that they did not understand. This requirement was passed to the ASIs after they were introduced in 2036. Not that she used this often, as the ASI often did some incredibly things however in most situation, she had trust that the ASI was taking actions that had the interest and safety of people in mind.

The ASI in explanation mode went on to explain that it was using the sixth Pillar of AI Stories called the ‘Hidden Markov Model’, a reinforcement model that works under the assumption that based on the current state of an event, that it was predicting the possible outcome given the current variables. An algorithm satisfies the Markov property if one can make predictions for future events based solely on its present state without having to know the process's full history.

Katrina nodded. “Add what you just said to the story catalogue” she instructed. The ASI, had already done so. Quantum computing allowed most things to happen almost instantly. Katrina was an Explainer and she was responsible to catalogue, and explain new things that ASI did in plain language to those who were not versed in ASI behaviour could understand AI and not be afraid of it. This career required a human to do, as an ASI who could think creatively enough to construct strong metaphors was at least a decade away from being invented. She marvelled at the history that had lead her and others like her to this path.

As far back as 2023, when it was becoming apparent that following Moore’s Law, AI was going to become ASI, over a full decade before they were predicted to do so in 1949, education programs were created to train people on how to work effectively with ASI. It was acknowledged that a whole brain approach was needed. Along with the STEM courses (science, technology, engineering and mathematics), the right brain skills that included creativity, complex problem solving, emotional intelligence, cognitive flexibility, and other soft skills were emphasized. These skills allowed people to augment the statistical analysis number crunching that AI and eventually ASI were able to introduce and allowed humanity to fill in the gap between ASI and people. Her career goal was to ensure that no one was left behind by being bridging the gap between technology and humans. Katrina, through the skills that she had learned, helped people to flourish by helping them to understand the metaphors behind ASI. Each of the 9 algorithm that exists for programming AI is associated with 9 Pillars of AI Story. The most common ones are:

The Story of the Tree: People understood how tree branches grew and splayed out. They also understood that this algorithm can only make decisions that they have been taught. For anything that is new, algorithms based on decision trees, need humans to provide intuition, and the ability to do word association, and through this whole brain activity help ASI to learn things that are novel to them.

The Story of the Line: Support vector machines makes decisions based on where the new stimulus lands, whether its characteristics places it above or below the line that then dictates which category the stimulus falls into. ASI needs human to assist when the line gets moved and think creatively as to the possibilities that could ensue.

Whole Brain Thinking

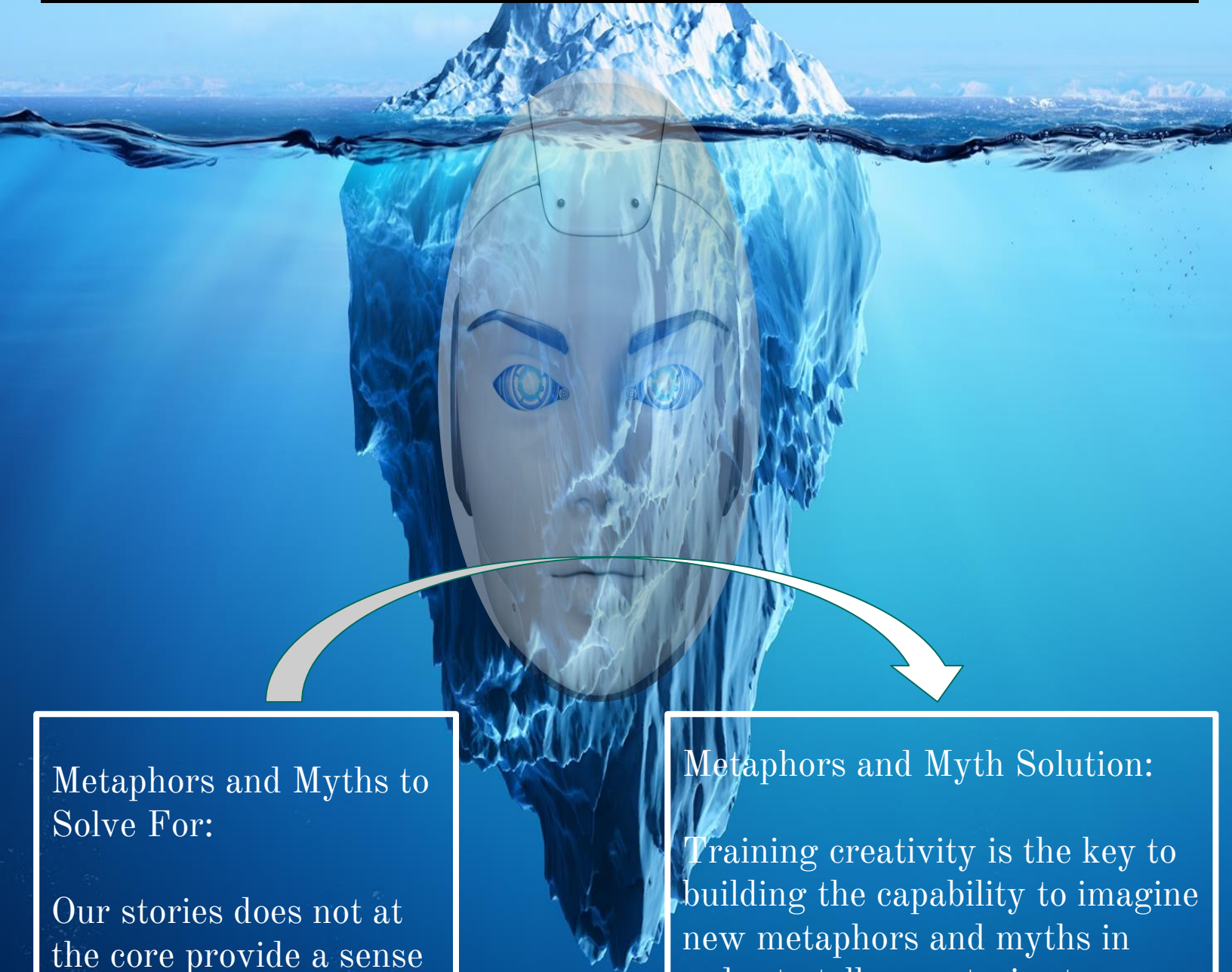
The Story of Clusters: Naïve Bayes is based on Bayes theorem that calculates the probability that each new item belongs to a particular class based on the features. Whole Brain Thinking people are required to look at the big picture and ask if I am looking at all the options? Humans can go on tangents whereas ASI cannot.

Katrina feels confident about the work that she does and as ASI progresses, that new generation of careers that will emerge will provides people with meaningful work and a purpose.

Bridging the Gap

Applying creativity to an analysis of trends and drivers can help people to envision the plausible and the probable futures. Creativity then can help us to see a way forward. By training Whole Brain Thinkers how to wield their creative skills can provide them with the tools that they need to create new metaphors. As demonstrated by the Appreciative Inquiry workshop, messages regarding AI that are not based in fear is needed.

People fear what they do not understand and this has an impact on their sense of Ontological Safety. If we tackle the deep seeded archetypes behind our fears, then we can bridge the gap of what is driving our fear and start to make the climb back to the surface of reality and applying practical solutions to our problems.



Metaphors and Myths to Solve For:

Our stories does not at the core provide a sense of Ontological Safety.

Metaphors and Myth Solution:

Training creativity is the key to building the capability to imagine new metaphors and myths in order to tell new stories to restore Ontological Safety.

Causal Layered Analysis: Reimagining the Future of Work

Problems

We need careers that we can flourish and have purpose at work alongside AI.

Real World

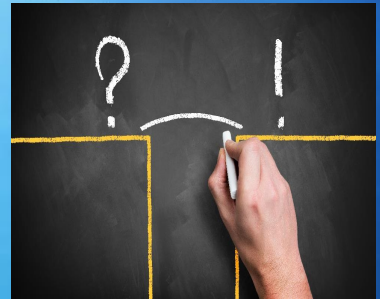
To **Flourish** then is to be AI Enabled, creative Whole Brain Thinkers in a careers with purpose. Eg. Explainers



Causes

To comprehend the systemic potential of AI, we need to be able to understand how AI will link into the future of work.

Being **AI Enabled** requires comprehension of how AI works by breaking AI into its system components. Being Whole Brain Thinkers allow us to symphonically explain the 'why' and how things are linked.



Worldview

Our mental model is dependent on having finding ways to be optimistic about our future.

Whole Brain Thinking is enabled by creativity, as people are able to ignite both left and right brain thinking to see other possibilities and have some optimism about the future.



Metaphors and Myths

Our stories at the core does not provide a sense of Ontological Safety.

Imagined

Training creativity is the key to building the capability to imagine new metaphors and myths in order to tell new stories to restore Ontological Safety.



Unintended Consequences



Building the desired future would require the enabling a Whole Brain Thinker who can work effectively alongside AI. The Missing Middle skills that would help us to succeed would require humans to understand how AI works. People need to be able to use their best judgement to fill in the plausible, and possible gaps in the AI predictions. The consequences of not having a full rounded approach to working with AI could prove disastrous. While some of the consequences are imagined maladaptive metaphors that stem from fear of the unknown, not being able to find a way to adapt to the future of work that includes AI would result in the real life consequence of unemployment. Whole Brain Thinking will provide the opportunity to find a place in the future of work.

Training this skill does come with a caution to not let the quest to learn more right brain skills come at the expense of not keeping up with learning the analytical skills associated with the left side of the brain. The unintended consequences of losing that skill set would make working beside AI difficult. Losing our left brain skill set would decrease the diversity of talent in the workforce as those with problem solving abilities disappear and businesses are left with only AI to fill that gap. This would leave us vulnerable to the possibility of having a dystopian future come to pass.

Whole Brain Thinking is just that; a combination of the right and left brain activities. Right brain skills becoming dominant would undermined the goal of training employees that could flourish in the future of work.



“ Transparency with AI potential – making sure there is enough information as sharing knowledge and keeping things open as things develop will help employees feel they are part of the future” (Anonymous, Interview, November 6, 2019)

Section 7: How to Flourish



Areas for Future Study

While this report has tackled the question of what it would mean to apply Whole Brain Thinking to empower AI enabled humans in the future of work, some important and related topics were not explored. These future areas of study includes:

Data Security: The question that can be asked here are:

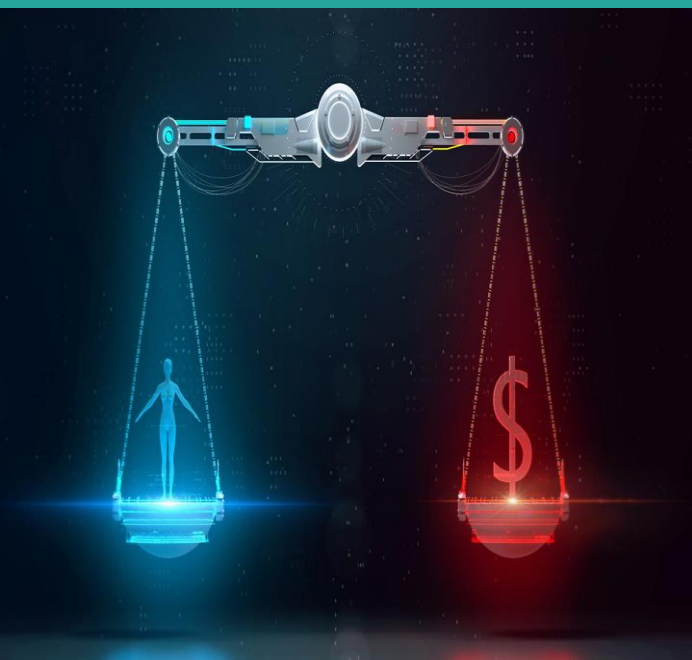
- How might we empower a flourishing AI enabled human beings in the future of work to identify security threats to their AI enabled capabilities;
- Why would it be important to do so?

Data Privacy: Does data privacy exist is a topic that came up several times in the Appreciative Inquiry workshop. While the participants questioned whether true privacy still exists, it would be worthwhile to dive deeper into the implications that lack of data privacy may entail. Maybe it is time to:

- Give up the notion of data privacy all together,
- Get used to be unlimited sharing, and
- Introduce safeguards such as hacker insurance?

Ethics and Values: As development of AI moves forward, unconscious bias is still very much a factor. The questions that still need to be answered are:

- How might we surface our biases so that they become conscious?
- Whose values would be used to define what we care about?
- Since values and cultural norms differ, who would have the power to dictate what is important?



Conclusion: Becoming Whole Brain Thinkers

This report examined the question of how might we empower an AI enabled human being to flourish in the future of work by enabling Whole Brain Thinking. What it means to flourish, as well as what personality traits that would be needed in order for people to interact successfully, flourish, and collaborate with technology was discussed. This report also delved into and suggested skills, both new and old, that humans needed to learn in order to thrive. Also explored was why would it be important to do so. To Flourish then is to be AI Enabled, creative Whole Brain Thinkers in a careers with purpose. The following five conclusions were made:

1. Training creativity is the key to building the capability to imagine new metaphors and myths in order to tell new stories to restore Ontological Safety.
1. Whole Braining Thinking is enabled by creativity. As people are able to ignite both left and right brain thinking to see other possibilities, training Whole Brain Thinking helps people to create new metaphors and stories about their future by shifting their mindset to imagine a future that is not dystopian.
1. As the nature of work changes and AI takes on more left brain tasks, Whole Brain Thinking as a skill set will place us in a position to be able to find meaningful employment alongside AI by creating new types of integrated careers, like Explainers.
1. Statisticians use AI for making predictions. If as predicted, Quantum Computing can enhance this capability by examining trends and predicting what is probably, then there is a place for people to use Whole Brain Thinking to expand predictions into the realm of the plausible and the possible outcomes.
1. Being **AI Enabled** requires comprehension of how AI works by breaking AI into its system components. Being Whole Brain Thinkers allow us to symphonically explain the 'why' and how things are linked.

Our mental model of the world colours how we react to the world around us. Our words matter. Our words put into play, that which we want to see happen. By engaging our right brain, by being Whole Brain Thinkers, we get ourselves out of the trap of only seeing the future with a Cassandra or Status Quo mental model, but enables us to envision a world through Dr. Pangloss's lens. This will empower humans to flourish and become AI enabled in the future of work.



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Appendices



Appendix A: Interview Questions and Answers

4 people in total – 2 from automotive, 1 from Health Sciences, and 1 from Entertainment industry

1. Where do you see AI having the biggest impact on our lives in the next 3 years? 5 years?

- Automotive industry – huge area with driverless cars
- Medical profession – robotics doing operations
- In houses – robot cleaners, robots doing our food/cleaning/smart tv/air/lights/our whole living experience
- Work on the whole – the idea is to make our lives easier so we can concentrate on other things
- Travel/work/home – all areas will be impacted
- Service industry – huge impact, from receptionists, taxis, doing simple procedures and diagnoses making, financial services
- Manufacturing - making products not as much as in service industry

1. Do you think that humanity understands the full impact of how AI will change our lives? Please explain further.

- No, the full impact mean that we might lose certain control and also reliance on AI making decisions could make people more lazy
- No, there hasn't even been a proper public discussion as to the potential impact this will have
- I think people are in denial, want to avoid this change
- This needs to be an ongoing discussion – including the licensing, implementation, and use of AI needs to be an ongoing debate
- I think at the moment, people are looking at what this will do for them, but they aren't seeing the full impact of what can really change in the world because of AI

1. What signs or indication that you see that we are on the right (or wrong) path with how we are introducing AI?

- Right path – we are doing it slowly, not jumping in the deep end, starting discussions in schools, magazines, etc
- Wrong path – we haven't established a regulatory network that are continuously reviewing and auditing new AI technologies coming out, reviewing the emerging AI technologies in order to continuously review or assess which ones are suitable for cost benefit analysis or use in society or how this will impact future humans

1. Is there a way to introduce a universal basic income in a financially responsible way?

Yes – in order to introduce it, first determination is what constitutes the annual basic income – calculation in dollar amounts, second step determining where the funding would come from
(this question was left blank other than answering by a couple of people just with yes)

Appendix A: Interview Questions and Answers

- 5. As AI is used increasingly in the workforce, what personality traits would be needed in order for people to interact successfully, flourish, and collaborate with technology?**
 - Adaptability/flexibility
 - curiosity
 - Patience
 - Trustworthiness
 - Open mindedness
 - Diligence
 - Reliability

- 6. How might we potentially seek to change or train those personality traits that would enable a human worker to flourish?**
 - By employing experts/specialists who have worked with technology/human resources/people and can give insight into how to connect/work with AI
 - This would be on an individual basis – coaching and developing people on their areas of challenge
 - Creating case studies/real life examples where AI have helped human workers to open their minds to the possibilities and motivate them to work with AI

- 7. What in your opinion would be the unintended consequences, both negative and positive that could happen with the introduction of AI?**
 - Us against them – humans against machines
 - Critical areas in functioning (eg driverless cars driving off bridges, into traffic, etc)
 - In hospitals – robotics critical errors costing lives, limbs, etc
 - AI developing insights and self awareness and developing an adversarial attitude against humans as humans are “imperfect”
 - More work getting done faster and more efficiently if AI and humans work together well
 - More time for humans to enjoy leisure activities, freeing them up to do more creative things, so more development
 - Creating a more dynamic and effective world both at home and at work
 - It could go the way of making everyone happier or making everyone paranoid and not trusting anyone as “robots are taking over our jobs” – depending on how things progress

- 8. How might we build trust with AI so that employees of the future are not afraid of AI taking over all work?**
 - Safeguards in place such as “kill switches” turning AI off
 - Introduction of limitations on the potential of developing self awareness on the part of AI
 - Continuous review of cost benefit analysis
 - Transparency with AI potential – making sure there is enough information as sharing knowledge and keeping things open as things develop will help employees feel they are part of the future
 - Asking for employees feedback on AI
 - Having focus groups at work to involve employees in the development of AI solutions
 - Training and Development

Appendix A: Interview Questions and Answers

9. How might we avoid AI that are programmed with unconscious biases?

- This is tough as AI are programmed by humans, and humans inherently have unconscious biases
- Continuous evaluation would be required to look at faults and deficiencies
- Ensuring there is always a working group developing AI, not allowing one person to take full control of programming
- Advisory boards working with AI
- Possibly government bodies with rules/regulations to try to avoid unconscious biases

10. Why would it be important to do so?

- If not, AI brings in the same challenges that humans have – their biases towards things
- Isn't the aim of having AI to bring in more objectivity, so want to program this as much as possible
- Would create a more effective life and working environment

11. How might we empower a flourishing AI enabled human beings in the future of work to identify security threats to their AI enabled capabilities?

- Constant reviews
- Advisory bodies
- Rules and regulations in place

12. What if humans get it wrong, would there be a 'do - over'?

- At present, we have working models and prototypes, so in theory with always have a "do-over" – for examples with driverless cars, the technology has been constantly tried, if wrong, made better, testing, etc – so before it becomes more common place, there is a do-over
- We need to ensure there are safe guards in place to be able to have a "do-over" – corrections
- Depends on how far we go with AI, if they start to get more and more advanced....that is why we need to maintain the ultimate control to be able to turn off the AI if it goes wrong
- Good question What does "get it wrong" mean – that they start taking over our work, the world?? And so, constant monitoring to make sure it doesn't go that far

Appendix B: Trends and Drivers

Name	Description	Trend or Driver	STEEP-V
1% Gap	As the gap between the rich and the poor increases, this will lead to great inequality in multitude of areas.	Driver	Ec
Aging Population	people supporting each elderly person increase from 9/1 elderly person in 2015 to 4/0.5 in Asia (taken from White Paper on AI. section 2). This will place more burden on the young to support the aging population, and place more stress on the cost of healthcare. As countries increase the retirement age, this will necessitate more retraining programs	Driver	En
AI in the Next Cubicle	While AI will take some jobs; the ones that are more repetitive and manual, as this occurs, it would necessitate the creation of new skills and occupation	Driver	Ec
AI-fueled organization	Companies are introducing AI enable devices in order to enhance productivity and efficiency among their workers	Driver	T
Better brain as a right	If we can do chip implants, take drugs and tablets to enhance our cognitive minds and help use keep up with AI then we should have a right to do so.	Trend	T
Biased data	"This topic is becoming increasingly important as machine learning models are being used for decision-making such as hiring, mortgage loans, prisoners released from parole or the type of social service benefits."	Driver	T
Bring Your Whole Self to Work	When these organizations are asking leaders and employees to bring their whole selves to work, they are acknowledging that workers who feel a familial connection to their place of employment are more productive, have more fulfillment, and have a greater impact on those that they work with (Robbins, 2015).	trend	S
CEO Activism	Bill Gates, Elon Musk, and Jeff Bezos have their causes that they support and warning about the dangers of AI that could one day rule over our lives. They are sounding the warning bells and in the case of Elon Musk, doing everything in his power to make sure that we listen	Trend	V
Climate Change	while the world acknowledges that climate change is real and that we need to do something about it, the majority of those in this category are still unwilling to either pay for the move away from fossil fuels or to make the needed changes to slow down this impact on our world	Driver	En
Closed Code	Algorithms that are created in a closed environment where others are not able to see what is being programmed. Proponents of having closed systems sees this as a way to protect intellectual property, however proponents of an open source system (which are programs that are open to public scrutiny) argue that closed codes open the door for harmful algorithms to be created in secrecy	Trend	T

Appendix B: Trends and Drivers

Name	Description	Trend or Driver	STEEP-V
Collaboration Culture	“A work environment with a culture of innovation is one that supports creative thinking, exploration, and generates new or improved products, services	Trend	Ec
Continual Learning	Trend to learn something new yearly in order to keep up with the change in technology. People are no longer able to get by with just one thing that they do, they now need to keep on continuously improving and morphing to fit into the changing environment around them. Those who do not are left behind	Driver	T
Directionless Leadership	To stay competitive in today’s era of constant disruption, organizations must break from traditional practices, starting at the top with leaders relinquishing control and focusing on empowering their teams.	Trend	Ec
Diversity and Inclusion	Workplaces are implementing diversity and inclusion practices to help remove the barriers that some people face and to strive for respect, fairness, and acceptance.	Trend	S
Education of the developing world	Countries who missed out on the industrial revolution now has the chance to catch up. Education allows for equalization of opportunities	Driver	Ec
Ethic in AI	”Are the autonomous and intelligent systems being designed in a manner that includes individual, community and society’s ethical values?” (Young, 2019)	trend	V
Facial Recognition	While this technology will allow us to pay for coffee with a glance at the sanning paid, currency FR technology recognizes women of colour with only 38% accuracy. This population may pay for someone else's coffee, or get mis identified at a crime scene	Driver	T
Finding Purpose at Work	As the future of work evolves, the trend towards a workforce that finds meaning, purpose and passion in what they do is a key to driving innovation (Shand, 2018 (taken from independent study paper)).	Driver	V
Gig Economy	Finding full time work is hard especially in the age where labor from remote works is cheaper than employing a full time work who needs a desk. Contract work could be here to stay, and you don't have to pay benefits to them either (sweet) he said sarcastically	trend	Ec
Immigration	Conflicts might arise as scrupulous politicians stir up fear of the “others” coming in to take over. Here presents a false binary choice that these politicians provide by saying ‘if they get what we now have,then we would be left with nothing’. It’s not either or.	driver	V
Internet of Things (IoT)	From smart homes to smart cities and self driving cars that speak to each other. Our technology is talking to each other, but do we know everything that they are saying about us when we are not paying attention	Driver	T

Appendix B: Trends and Drivers

Name	Description	Trend or Driver	STEEP-V
Job Crafting	Turning the job you have into the job that you love	trend	T
Machine Learning Bias	Algorithms based on conscious and unconscious biases of developers has a direct impact on decision-making such as who gets a paroled from prison, who gets job interview, and who qualifies for mortgage loans.	Driver	T
Mass Customization	IoT will know what the customer's exact preference are that would lead to intelligent manufacturing of products that are customized to the desired specifications of the individual	Trend	Ec
Mindset conscious	*first step in scenario making is your mindset conscious *mindsets keep us from seeing the appropriate questions to ask about a decision	Driver	V
Moore's Law	Technology, and in particular processing speed increases by an exponential factor of 2 every 1.5 years. Is it moving faster than we can keep up and adapt to change?	Driver	T
Nationalism	Zenophobia taking hold so that countries are demanding walls to keep others out.	Trend	P
Optimist/ Pessimist/ Status Quo	Your mental model of the world will colour how you react to the world around you. A Dr. Pangloss view of the world is optimistic in that it sees that things will only get better. A Cassandra way of thinking sees the world as always on the brink of disaster, a pessimistic view. A status quo worldview things that tomorrow will be the same with nothing getting better or worst.	Driver	V
Oversight Policy	The absence of clear oversight in the development of an AI system could be problematic. However there are groups like the IEC who are working towards implementing guidelines that include ethical considerations	Trend	P
Privacy	Is data privacy a right, and is it too late to claim that back?	trend	T
Professional Nomad	Professionals who spend the majority of their working hours in online environments that lead them to life a location independent lifestyle where boundaries between work, leisure and travel have merged.	Trend	Ec
Purpose Economy	Instead of money being the primary driver for workers seeking employment, the need to find a job that has value, contributes to society, and provides a sense of purpose and fulfillment	Trend	Ec
Quantum Computing:	"Quantum computers use quantum physics to compute calculations faster than any supercomputer today. " This will increase computing power even faster than the present day Moore's law accounts for	Driver	T

Appendix B: Trends and Drivers

Name	Description	Trend or Driver	STEEP-V
Racism	Behaviour attributes that are placed on groups based on prejudices create systemic barriers to access that prevents those groups from accessing equal opportunity to technology	Driver	S
Rakkanteki	Japanese term referring to having an optimism on life based on having enough challenges to overcome that gives meaning to life. Through meeting these challenges and overcoming them, people grow and improve	Driver	V
Self Directed Online Learning	The availability of online courses enables more people to access educational material on a variety of topics and technical skills like coding that can help people to get jobs. People can learn what they want on their own timeline	Trend	Ec
Shift to Renewables	Resistance from those with a narrow focus will provide this area with notable sense of uncertain	Driver	En
Success to the Successful	Those with means beget others with means. While it is not impossible for those starting at a disadvantage catching up, having money to begin with sure makes it easier to do so.	Driver	P
T-Shaped Skills	T-Shaped skills defines individuals with specialization in one area and strong, developed skills (or potential) to execute tasks in other areas.	Trend	Ec
Targeted ads	Advertisements on websites are designed to target ads based on what algorithms predict that the users would want to see based on their online activities “A study by AdFisher recently revealed that men were six times more likely than women to see Google ads for high paying jobs [source]. The immediate consequence of this machine bias is that a woman may not see a high paying job and therefore is less likely to know about it and apply. The long-term result could mean more ingrained gender discrepancies in high ranking positions.” (Shadowen, 2018)	Trend	T
Technology Availability Gap	When a group has more access to science and technology it can, increase the divide between the have and have nots	Driver	Ec
The Humanoids	The quest to make robots that looks, acts, and sounds like humans can be see in the quest to produce robots that we would not know are not human. How far away are we from this possibility?	Driver	T
Work-Life Harmony	The fluid blending and interaction of time spent with family, work, and community; thereby, creating higher productivity and more fulfilled individual.	Trend	S

Appendix C: Terminology

Term	Definition
1 Percent and Technology	Science and technology can, if not developed and used responsibly, have the unintended consequence of deepening the divide between those who have money and those who do not
AI Winter	The period in the 1970's and 80's where interest in the AI field dropped off as funding and interest in developing the field died down.
Artificial Intelligence	An (AI) is the type of smart computer (machine) that are programmed to simulate of human tasks.
Ashby's Law	One you have an appropriate amount of information to control any system, then you know the potential states of that system that is possible. Once you have this information, then you are able to have complete knowledge of its variable behaviour.
ASI - Artificial Superintelligence	Higher level Artificial Intelligence that is able to mimic whatever a human can do and surpass it.
Augmented Intelligence	Using AI to help enhance human ability so as to enable us be smarter, stronger, and make better decisions faster by working with AI to enhance the work that we do.
Big Data	The large amount of data both structured and unstructured that includes personal and informational data, and that due to its volume, variety and velocity of change needs to be handled by computational software.
Brainstorming	A group activity where participants try to come up with new and innovative ideas in a short period of time.
Calm App	An app that has been designed to help a person relax by playing soothing sounds and gets the user to concentrate on deep breathing.
Citizen Data Scientist	Augmenting people to work with technology, by providing them the skills and training that they need to understand and work with the technology that need to work with.
Classification	For Decision tree, it needs to classify information into subsets. This allows for minute differences between traits to be categorised using a decision tree algorithm.
Cloud Computing	Unlike Edge Computing, remote servers are used to host, store and process data. Data is sent to the remote server, an action based on the necessary algorithm is processed, and then the answer is sent back to the local device.
Conceptual Age	Following the Information Age, the economy is set to give way to those who can think creatively so as to be able to work effectively with AI. This age will be marked by people who can put complex ideas together to create something new, or to see a pattern that was not there before.
Decision Tree	This is a Machine Learning model (algorithm) that uses a branching yes/no model (like a tree) in order to make decisions and predictions as to outcome.
Divergent Thinking Skills	A skill set that enables a person to think about many different solutions. These solutions are often free flowing and non-linear in nature.

Appendix C: Terminology

Term	Definition
Edge Computing	Compute processing that reacts to stimulus in real time as algorithms are programmed on the device itself by a local server, for example self-driving cars. For Edge computing, even if it is a matter of nanoseconds, reaction time needs to be immediate as there is no time to send things into the clouds for cloud computing.
fMRI	functional Magnetic Resonance Imaging. This type of MRI is used to try to predict behaviour. While research has shown that we unconsciously know 10 seconds before we're actually aware of making a decision there is the temptation to interpret how our brains would react as a way to predict what sort of person we are or what we might do.
Growth Mindset	Unlike a fixed mindset that see abilities as fixed and unchangeable, people with a growth mindset believes that abilities and skills can be developed and learned. They are not good at something... yet!
Information Age	The Information Age is often referred to at the Computer Age, or Digital Age. Starting in the 20th century, it represents a shift from the industrial age where the economy was driven by manufacturing, to an economy based on information technology. It brought with it the rise of office workers.
Left brain thinking	Skills including logic, analytical skills, and objective thinking is associated with left brain thinking.
Machine Learning	Machine learning (ML) is a form of artificial intelligence (AI) that is programmed with the ability to automatically learns and improves by itself after its initial programming. This learning occurs through direct interaction with its environment.
Muse	Used as a meditation aid, Mus measures whether your brain waves to assess whether you are calm or stressed. It relies on bio-feedback. If you are calm, then it plays soothing sounds. The aim is to get the Muse to play peaceful sounds.
Naïve Bayes clustering	Based on Bayes theorem to calculate the probability that each new item belongs to a particular class based on the features, calculates are made that predict the probability that a variable belongs to a certain class.
Neural Networks	This is a Machine Learning model (algorithm) that is modeled after the human brain.It is commonly used to recognize patterns based on the examples that it was trained with. It compares what it was given before and predicts what category the new input belongs to. Types of Neural Network are Artificial, Convolutional, and Recurrent neural networks.
Ontological Security	Coined by Anthony Giddens, this represents a person's sense of order, stability, and continuity in regards to an person's experiences. People's ability to give meaning to their life is defined by their ability to experience positive and stable emotions and while avoiding chaos and anxiety. Any event that challenges this meaning and disturbs their worldview will threaten their ontological security.

Appendix C: Terminology

Term	Definition
Preferred Future	This is the desired future outcome of the combination of the trends and drivers. The desired future tends to fall outside of the probable future and would require creative action to make this occur.
Rakkanteki	Japanese term referring to having an optimism on life based on having enough challenges to overcome that gives meaning to life. Through meeting these challenges and overcoming them, people grow and improve
Regression	For Decision trees any numbers that can represent continuous values are called regression trees.
Reinforcement Learning	Machine Learning received feedback from its environment after performing and interacting with the environment . The goal is to maximize positive feedback and minimize negative feedback. (eg - a Roomba that vacuums and after some time maps out your room and the placement of furniture)
Right brain thinking	Skills including creativity, emotional intelligence, and intuition are associated with right brain thinking
Sentiment Analysis	Classifying responses into positive, negative, or neutral reactions in order to understand the feeling behind a topic.
Singularity	That point where AI computing become so powerful that it could mimic about any human capability. This is the age where ASIs are born.
Supervised Learning	Example classification or regression, where information coming in is mapped to predefined criteria. Eg it is SPAM if it contains "\$\$\$" or "Make money"
STEEP-V Analysis	Analysis of trends and drivers that could affect the future of a specific issue by examining the Social (S), Technological (T), Economic (E), Environmental (E), Political (P), and Value (V) based factors that could impact that issue.
Turing Test	Named after Alan Turing, this an evaluation method for AI to help determine if a computer can pass as a human by thinking and acting like a human without another person realizing that they are interacting with a computer.
Universal Basic Income	A guaranteed base income that a person is provided, usually be a governing body, that enables them to not have to rely on the income provided by employment
Unsupervised learning	Eg clustering where no predefined categories are provided. Instead the ML determines the characteristics of the input and groups them together