What Machines Can't Master

Human Skills to Thrive in the Age of AI

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Rob Garlick
Head of Innovation & the Future of Work
Citi Global Insights

robert.j.garlick@citi.com

Wenyan Fei
Citi Global Insights

wenyan.fei@citi.com

Carol Gibson
Citi Global Insights

carol.gibson@citi.com

Expert Contributors

Alison Tisdall
CEO
Mind3

Amanda Spielman
Served as His Majesty's Chief Inspector
Ofsted

Sir Anthony Seldon
Head
Epsom College

Professor Anton Korinek

University of Virginia and Darden School of Business

Azeem Azhar
Founder
Exponential View

Belinda Sartori
Head of Futures
Charterhouse

Bill Schaninger, PhD
Senior Partner
Modern Executive Solutions

Christie Smith, PhD
Senior Partner
Modern Executive Solutions

Cameron Headrick
Head of Learning
Citi

Carl Benedikt Frey
Dieter Schwarz Associate Professor of AI & Work at the Oxford Internet Institute and a Fellow of Mansfield College,

Chris Butt
Founder
Cognisess and Yondur

Daniel Doll-Steinberg
Cofounder & Partner
EdenBase

David Goodhart
Head of Demography, Immigration & Integration
Policy Exchange

Eleni Nicolaides
Chief Corporate Development Officer
PeopleCert

Isabelle Bichler-Eliasaf
COO & Co-Founder
retrain.ai

Dr. John J. Sviokla
Chairman and Co-Founder
GAI Insights

Lord Mark Price
Founder
WorkL and WorkL for Business

Marshall Goldsmith
The world's leading executive coach and award-winning leadership author

Mike Seaton
Principal
King's College Doha

Nell Montgomery
CEO
Psychiatry UK

Phillip Souta
Global Director of Tech Policy
Clifford Chance

Piers Linney
Executive Chairman & Co-founder
Implement AI

Sharath Jeevan OBE
Executive Chairman, Intrinsic Labs
Author of "Inflection" & "Intrinsic"

Rob Nail
Strategy and Leadership Coach and Advisor

Robert Buckland
Senior Advisor
Engine AI

Roger L Kneebone
Professor of Surgical Education and Engagement Science
Imperial College London

Dr Tracy Rea
Consulting Director
Gobeyond Partners

Ying Zhou
Professor of Human Resource Management, Director, Centre for the Future of Work
Surrey Business School

What Machines Can't Master

Human skills to thrive in the age of AI

Which human skills will come the fore as artificial intelligence advances? It's a question that comes up time and again. This report is designed to answer it. Organized into six chapters, we build on the ten reports Citi has published in the last decade on how technology, including AI, will impact the future of work. Each chapter offers solutions to problems that lie ahead for the Future of Work.

Problem 1 – AI will continue to advance, surpassing humans in many tasks.
Solution – We need greater emphasis on the areas in which humans will maintain competitive advantage versus AI. If you already know how AI will surpass us, save yourself some time and skip Chapter 1.

Problem 2 – Most people don't know what the Durable Human Skills of the future will be.
Solution – We ask 28 experts about future skills. Their thoughts, with thanks to our interviewees, are presented in Chapter 2. A summary is also included in Chapter 3.

Problem 3 – How do we prepare for these essential human skills?
Solution – We summarize the expert views on how companies, education and policy can help in Chapter 3, concluding change is needed now.

Problem 4 – How do we better measure the Durable Human Skills that will increasingly be important?
Solution – We are over-emphasizing the measurement of areas in which AI will surpass us and Chapter 4 concludes that we need to get better at credentialing Durable Human Skills.

Problem 5 – How do we then better share Durable Human Skill credentials?
Solution – Chapter 5 highlights that verified and interoperable Skill Wallets will grow to save time and money for individuals and companies. They are likely to become a new norm.

Problem 6 – Everyone knows that upskilling and reskilling are a big part of the answer to how humans adapt to AI, but so far this is rhetoric and is not happening.
Solution – We see a trend change in Learning & Development driven by AI training, investment in Durable Human Skill training, coaching and psychological testing.

Links to previous related reports are included on page 103. The last of these concluded that a jobs boom, rather than a Doomsday scenario, is possible IF upskilling and reskilling can keep pace.

We believe this report will be of interest to employers, educationalists, policy makers, employees, students and parents. Increased awareness and debate is however only part of the story. As many experts in Chapter 2 note, we need action and execution.

AI is not waiting for anyone. The race between AI's progress and human's ability to adapt has already started.

What Machines Can’t Master

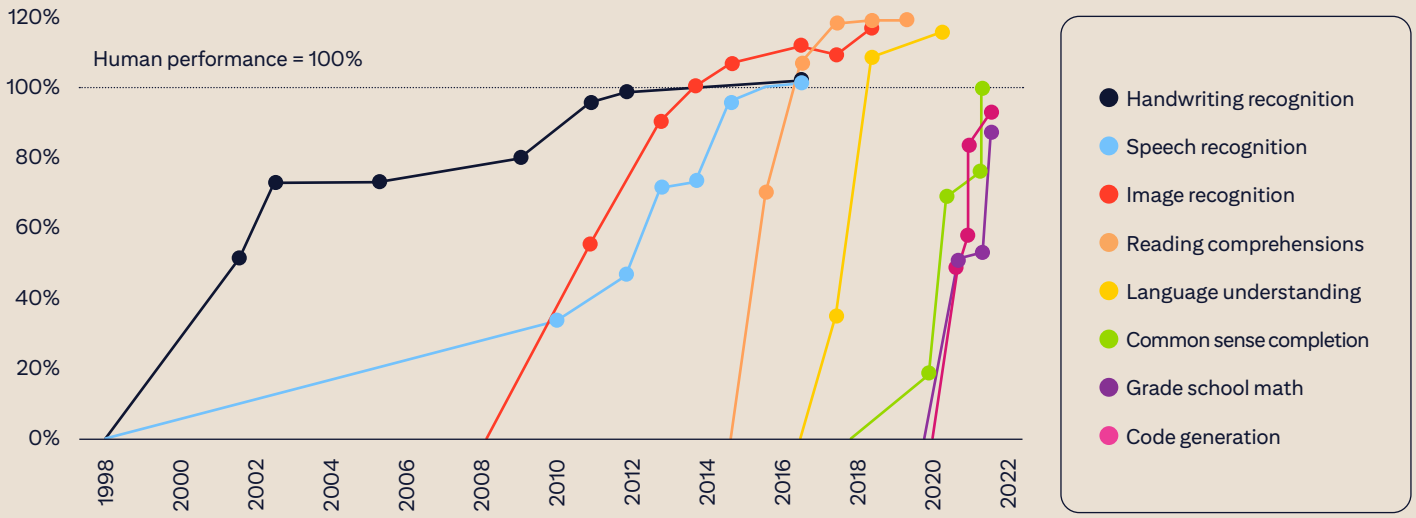
Heart skills such as communication, emotional intelligence, empathy are mentioned much more than other skills.

Source: Citi Global Insights

Mentions of Different Skills (as % of total interviewees)

- 64% Communication
- 57% Emotional Intelligence
- 54% Literacy
- 54% Empathy
- 46% Critical Thinking
- 43% H2H Collaboration
- 43% Problem Solving
- 39% Creativity
- 32% Adaptability
- 32% Leadership
- 25% Dexterity
- 25% Learning Ability
- 21% Resilience
- 21% Perspection
- 11% H2M Collaboration
- 11% Ethics
- 7% Entrepreneurship
- 7% Self-Awareness
- 4% Organisation

AI has surpassed humans at a number of tasks



Source: Contextual AI, Will Henshall for TIME

Durable Human Skills by category

Source: Citi Global Insights

Hand

Dexterity

Heart

Emotional Intelligence

Communication

H2H Collaboration

Leadership

Head

Cognitive

- Critical Thinking
- Problem Solving
- Organisation
- Self-awareness
- Ethics

Digital

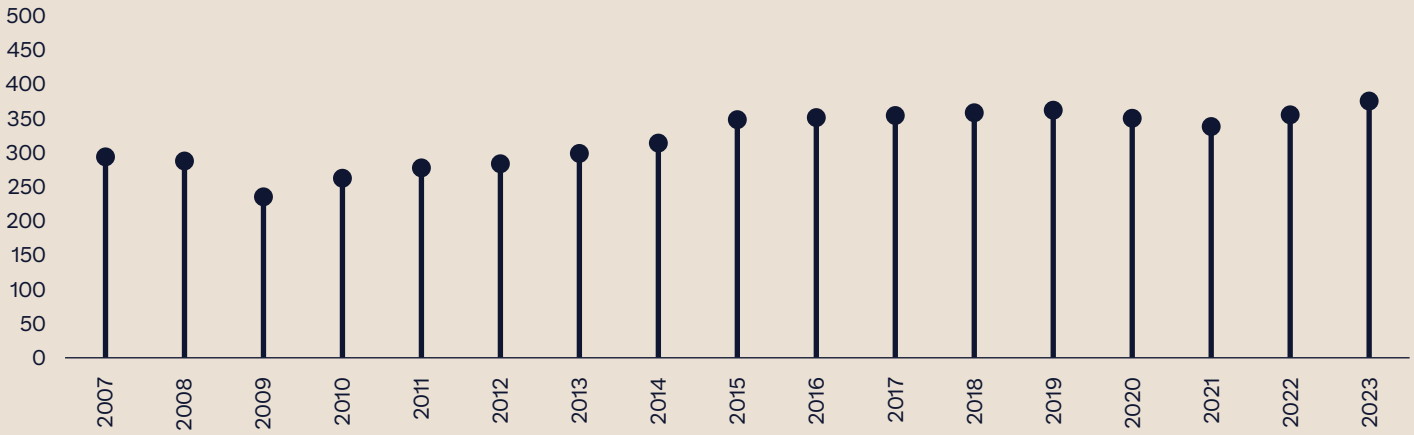
- Literacy
- H2M collaboration

Change

- Creativity
- Perspection
- Adaptability
- Learning Ability
- Resilience
- Entrepreneurship

The global corporate training market needs to grow much more to deal with AI disruption

Historical Global Spending on Corporate Spending (in $bn)



Source: Statista

Contents

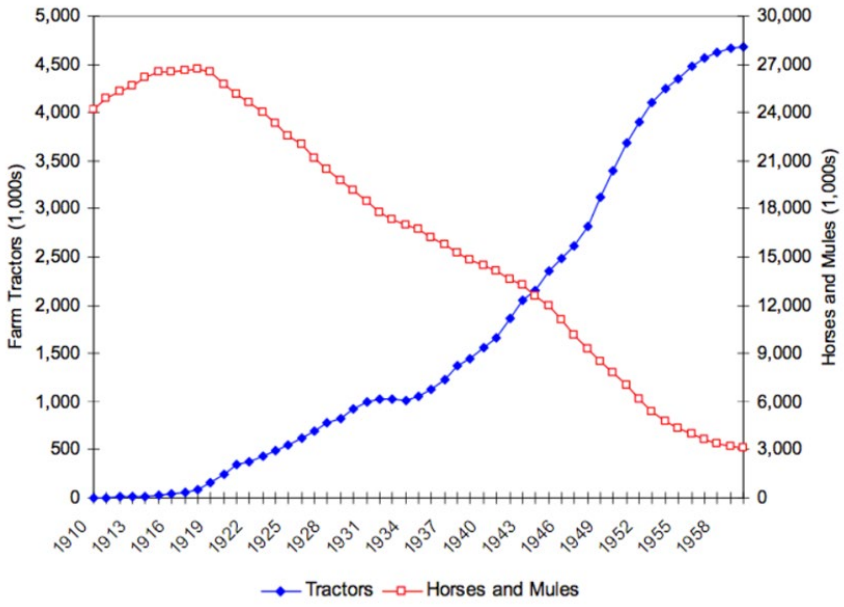
Machines Marching Forward

If you already take it for granted that computers will surpass humans in many ways or skills, you can save yourself some time, skip this chapter and move on to chapters 2 and 3 exploring where humans can still retain durable competitive advantage versus computers and Artificial Intelligence (AI).

If you are uncertain and want more on the revolution taking place in AI now, read on. Don't be like Charles Duell. In 1899 Duell, the US commissioner of the Office for Patents purportedly said that "everything than can be invented has been invented."[1]

How things have changed since 1900, from mass migration into cities full of skyscrapers (built with machines), to cars and planes that transport us, to robots that make many of our products, the way we shop, entertainment via TVs or gaming, or the way we communicate via phones and computers. Over this time employment has changed dramatically, from 38% in agriculture in 1900 to less than 3% today.[2] Clearly the skills needed by workers have also changed dramatically. Even in 1950 the second most demanded work skill in the US was 'strong hands, arms, back.'[3]

Figure 1. Replacement of Horses by Tractors on US Farms 1910 - 1960



Source: US Dept of Commerce

[1] https://medium.com/swlh/everything-that-can-be-invented-has-been-invented-49c4376f548b

[2] https://www.statista.com/statistics/1072843/employment-structure-western-europe-by-sector-1900-2000/

[3] https://medium.com/marshall-street/at-the-intersection-teach-universal-skills-that-prepare-kids-for-any-future-1bfd38989f01

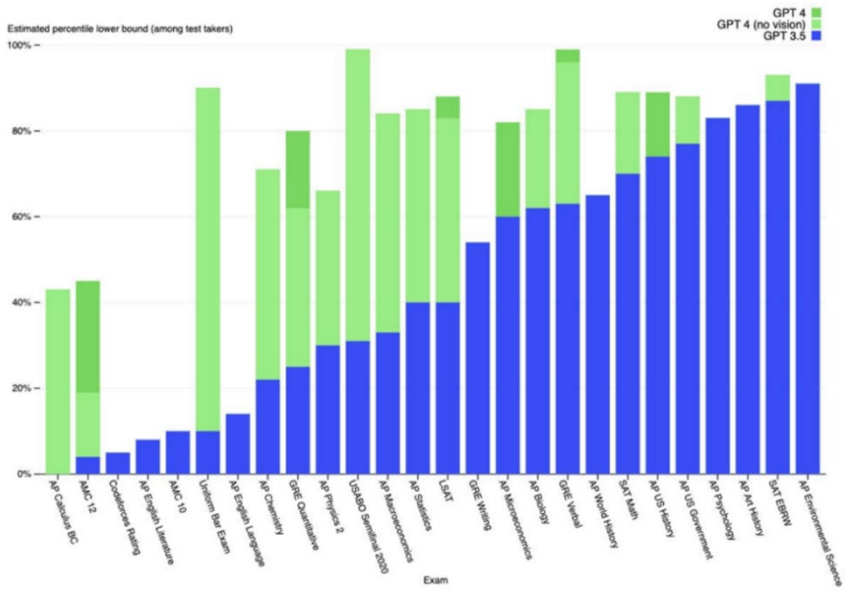
If you think human work has changed significantly, take a moment to reflect on the work of horses. In 1900 horses still pulled farm equipment and transported people and goods. In 1900 warfare included horses used by cavalry to transport equipment. Today wars are fought with missiles and drones. Technological change has spared horses of this work and danger, but it also made most of them unemployed, or used only for leisure activities. The horse population declined almost 90% between 1910 and 1960, as shown above.

Humans were better at adapting than horses, migrating from farm work to manufacturing and then, with the advance of automation, into knowledge work. The term knowledge work was only born in 1959. Fast forward to today and we have both an over-supply of graduates (see David Goodhart's comments on page 31) and looming substitution for some knowledge tasks by AI.

AI's recent advance has been extraordinary. Now almost anyone can interact with AI bots such as ChatGPT. You don't now need to be a computer scientist to work with AI. Nor do you need to be a computer scientist or a rocket scientist to see that AI is going to impact work and skills. The question is, how?

ChatGPT 3 was born on 30 November 2022. Soon after it passed an array of knowledge tests or exams, as shown in Figure 2. ChatGPT 4 arrived just 4 months later to raise the bar even higher – for example scoring 90% in the US Bar exam. I doubt there is a person reading this report, or any person you know who could pass all the tests ChatGPT has. The value of some knowledge areas is heading to zero.

Figure 2. LLMs Change Communication & Intelligence

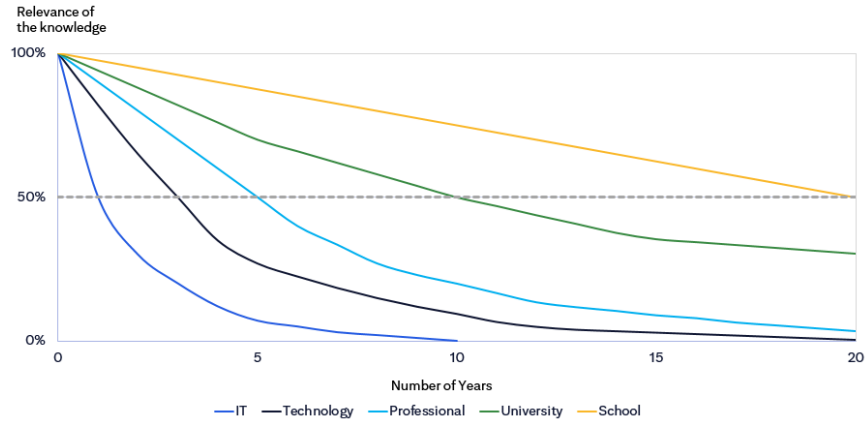


Source: OpenAI

ChatGPT is said to be performing at an IQ level of 155.[4] Einstein had an IQ of 160. More human Einstein's are welcome, but in the meantime, we are getting bigger computers and will continue to do so. As smart as AI is today, it is as dumb as it is ever going to be and will continue to improve at a pace that far exceeds the ability of humans.

Worse still, it turns out humans are not great at retaining knowledge or keeping up with new knowledge. Some of our brightest young minds go into medicine but keeping up with 5000 medical papers published per day is impossible for any (even super-smart) human.[5] As shown in Figure 3 the rate of change has meant the half-life of knowledge – the time it takes before knowledge is superseded – has continued to fall over time.

Figure 3. The half-life of knowledge



Source: Citi Global Insights

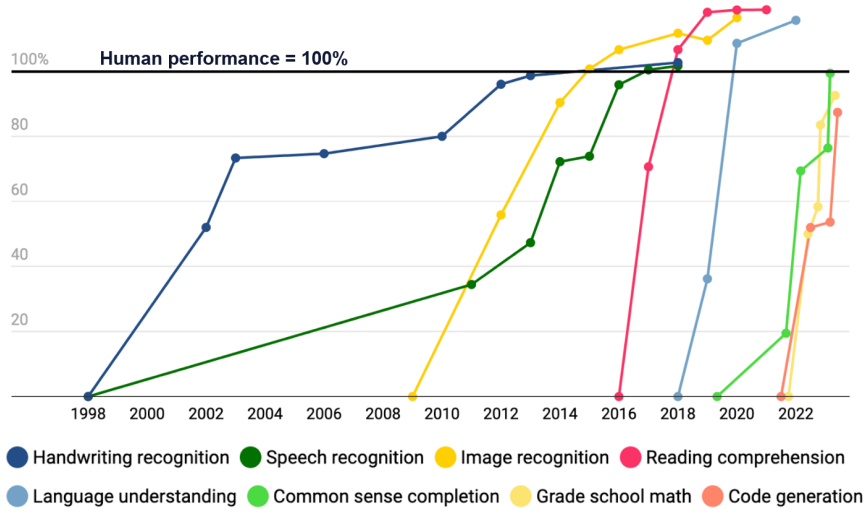
There are of course valid arguments against the advance of AI, such as Large Language Models being probabilistic machines or stochastic parrots that do not understand context. Or that passing exams is not the same as understanding and enacting real world applications. However, Figure 4 shows that computers are already surpassing us in many useful cognitive areas and progressing at an accelerating pace.

[4] https://www.scientificamerican.com/article/i-gave-chatgpt-an-iq-test-heres-what-i-discovered/

[5] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3191655/

Figure 4. AI has surpassed humans at a number of tasks and the rate at which humans are being surpassed at new tasks is increasing

State-of-the-art AI performance on benchmarks, relative to human performance



For each benchmark, the maximally performing baseline reported in the benchmark paper is taken as the "starting point", which is set at 0%. Human performance number is set at 100%. Handwriting recognition = MNIST, Language understanding = GLUE, Image recognition = ImageNet, Reading comprehension = SQuAD 1.1, Reading comprehension = SQuAD 2.0, Speech recognition = Switchboard, Grade school math = GSK8k, Common sense completion = HellaSwag, Code generation = HumanEval.

Source: ContextualAI, Chart: Will Henshall for TIME

An additional problem with the pace of progression is computers can often do things instantaneously and at near zero cost. Take translations of words from one language to multiple others. The latest software updates on your iPhone or on Outlook on your laptops make this possible at the click of a button. Competing against 'free and always available' is not great for humans that major in language skills.

Coming Next

The focus of this report is not to highlight where AI is moving to next, but a quick summary includes:

- **Domain LLMs** (Large Language Models) built on proprietary company data that improve functionality and reduce errors (e.g., hallucinations).
- **LLM error rates** will also fall due to: fine-tuning, in which humans rank outputs: RLHF (Reinforcement Learning with Human Feedback), in which models learn to reward human preferences; SAFE (Search Augmented Factuality Evaluator) where LLM responses are checked for factual correctness against Google searches; layer wise scaling of LLMs to improve accuracy; conditional training, where models are trained on augmented datasets with undesirable content reduced; constitutional AI in which models generate revisions in line with a set of principles; and scalable supervision, in which AI agents evaluate other AI agents.
- **Small LMs** will arrive on your phones and laptops, with NPUs (Neural Processing Units) to add useful AI functionality without latency.

- **Large Action Models**, also known as AI agents or assistants, will execute useful tasks for you, with your human instructions automatically translated into computer code to complete tasks.
- As well as linking with other computers or APIs, AI will increasingly link with robots and become **embodied AI**.
- Useful **co-pilots** will become normal for most knowledge workers, but will learn from us and increasingly do more and more.
- Work is going on in areas such as **Causal AI, Explainable AI**, Swarm AI to improve the output and functionality of AI, as detailed in our previous report.
- Some leading AI technologists, such as OpenAI's Sam Altman, believe cost of intelligence will trend towards zero[6]. The growth in a new '**Intelligence-as-a-Service**' (IaaS or IntaaS) market suggest it will become more accessible and cheaper. Deloitte for example collects 4m articles every 15 minutes to offer intelligence on areas such as compliance checks or geopolitical threat monitoring[7]. The Total Addressable Market for AI-as-a-Service is forecast to grow from $10bn in 2023, to $112bn in 2030, a 41% CAGR. One estimate forecasts AIaaS reaching $278bn by 2031.[8]
- **Quantum Computing** is coming next to allow the processing of even bigger data sets at higher speeds and lower costs. One of quantum's use cases is to accelerate machine learning and AI further, as detailed in our Quantum Computing report. Change is unlikely to slow.

There are many opportunities to use AI to solve problems across multiple domains (eg health, education, finance, science) but the point here is AI innovation will continue to advance and impact human skillsets.

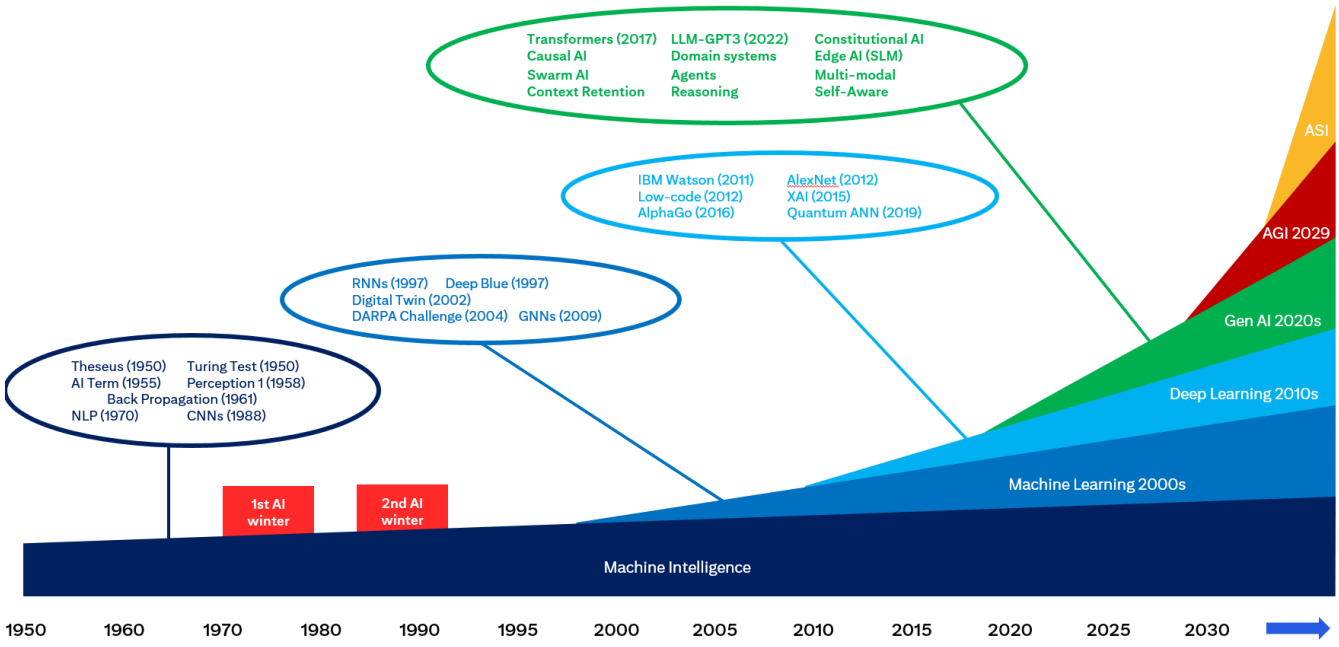
This innovation wave is taking us towards AGI (Artificial General Intelligence – the point at which AI exceeds humans across a wide range of cognitive tasks) and ASI (Artificial Super Intelligence). We can debate the cross-over points, but they are coming. Even before ChatGPT, VC capital into AI was up 100-fold in the decade to 2011. Now AI is the top category for VC investment with new innovations coming in multi-modality (ie being able to use AI across multiple areas at the same time, such as language, vision and movement needed in autonomous cars), reasoning and memory.

[6] https://www.mi-3.com.au/19-11-2023/sam-altman-openai-ceo-fired-lying-his-board-and-who-may-soon-return-says-ai-will-reduce#:~:text=%22My%20whole%20view%20of%20the,else%20we%20want%20to%20do.

[77] https://www2.deloitte.com/uk/en/pages/risk/solutions/intelligence-services-centre.html

[8] https://www.skyquestt.com/report/artificial-intelligence-as-a-service-market

Figure 5. Innovation towards AGI



Source: Citi Global Insights

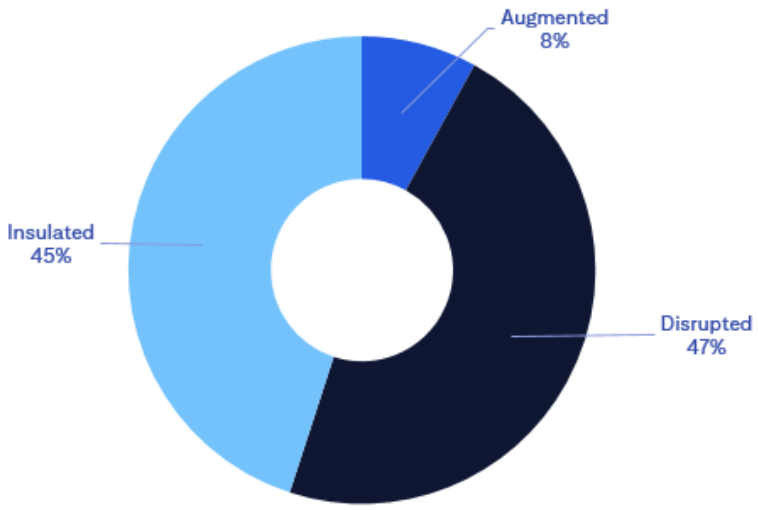
Figure 5 highlights that AI is not new, and has had a slow build, including two AI winters. Amara's law is often used for technology innovations. In the 1960's Stanford computer scientist Roy Amara commented that "we overestimate the impact of technology in the short-term and underestimate the effect in the long run."[9] AI has been building and layering towards the sharp acceleration in capability we are seeing today. It appears we are already in Amara's long run period.

One certainty is AI will cause a lot of disruption to the world or work and skills. We detailed this in our Boom vs Doom report, including our work with the Oxford Martin School in this area over the last decade. Figure 6 provides an additional view of the extent of skills disruption predicted due to GenAI. Note, this follows LinkedIn's estimates that 25% of skills requirements have already changed since 2015.[10] If human skills take time to build and disruption is coming, knowing where the skill puck is heading is vital.

[9] https://deviq.com/laws/amaras-law#what-is-amaras-law

[10] https://news.linkedin.com/2022/march/our-skills-first-vision-for-the-future#:~:text=The%20skill%20sets%20for%20jobs,development%20is%20becoming%20increasingly%20clear.

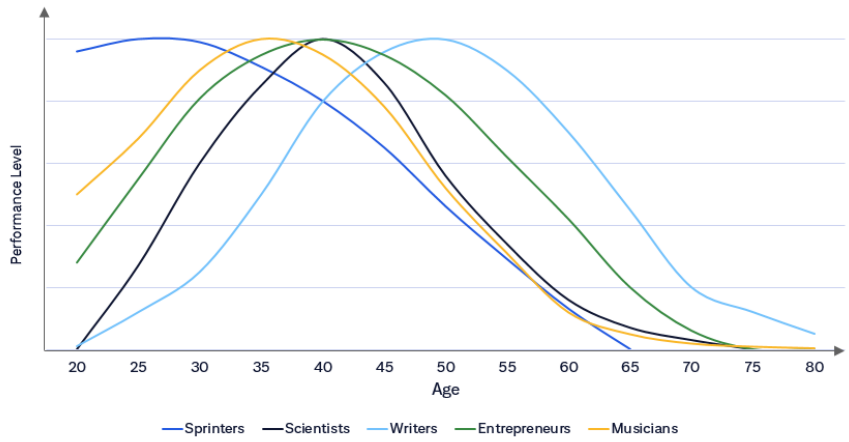
Figure 6. GAI's expected effect on LinkedIn members' skills, globally



Source: LinkedIn Economic Graph Research Institute

A final thought on change and the long run, or at least your long run. Figure 4 & 5 above on the continued progress being made by computers contrasts with a reality of life for humans – acquiring new skills takes time, but they also degrade. If your chosen career is to be a sprinter, your peak performance is aged 20-27. Statistically speaking its downhill after that. Scientists and writers (both in the knowledge worker category) peak in their 30's and 40-55 respectively.[11] Recognizing the risk of decline, the mandatory retirement age for air traffic controllers in the US is 56. Given the decline curves illustrated in Figure 7, one should be aware of both the skills where humans will continue to exceed computers (ie DHS) and the skills that are more durable over one's life.

Figure 7. Skills Performance Levels



Source: Citi Global Insights

[11] Sedmak, S., 2023. Arthur Brooks (2022). From Strength to Strength. Nueva York: Penguin Books. *Nuevas Tendencias*, (109), pp.39-39.

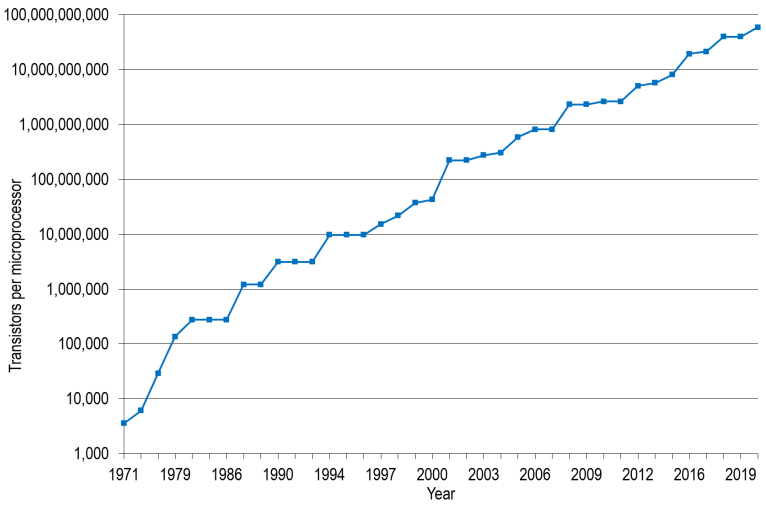
Competitive Advantage – Computer vs Humans

The focus of this report is on Durable Human Skills, as discussed in the next 5 Chapters. However, below are examples of areas (attributes / skills / functions) in which computers (including AI) are already, or will eventually, exceed humans.

Processing Power – Computers Win

- The world's most advanced computers are already on par with human brains and are only going to get better. As amazing as the human brain is, brain sizes have reduced over the last 3000 years[12]. Computers on the other hand have been following an extraordinary rate of progression, driven by Moore's law. Apple's iPhone 12, for example. is estimated to be 5,000 times faster than the most powerful computer from 1985 (CRAY-2, built by the US Defense and Energy Departments) and 900 million times faster than the Apollo 11 guidance computer.[13]
- The progress in AI is even faster than Moore's law. Elon Musk recently noted "I've never seen any technology advance faster than this, the AI compute coming online appears to be increasing by a factor of 10x every 6 months."[14] The exponential growth in machine intelligence means it will far surpass human processing power.

Figure 8. Moore's law: The number of transistors per microprocessor



Source: Karl Rupp, Microprocessor Trend Data (2022)

[12] https://www.bbc.com/future/article/20220503-why-human-brains-were-bigger-3000-years-ago

[13] https://blog.adobe.com/en/publish/2022/11/08/fast-forward-comparing-1980s-supercomputer-to-modern-smartphone.

[14] https://www.iotworldtoday.com/transportation-logistics/elon-musk-on-the-future-of-ai-self-driving-cars-at-bosch-connected-world-

Data – Computers Win

- Computers already have superhuman powers of dealing with data. LLM's are trained on trillions of parameters.
- AI has historically excelled at quantifiable, structured, repetitive tasks, such as dealing with large data sets and mathematics. Now this has moved to unstructured data (such as language) and to self-learning. For example, computers now win every game they have played.

Speed – Computers Win

- Human brains can run 1 mathematical operation per second versus the fastest computers, which can do one quintillion calculations at the same time (that's 1,000,000,000,000,000,000).[15] No contest. Humans also cannot compete with the speed of information retrieval and our storage process is slower than our experience of the real world.

Endurance – Computers Win

- Almost every company will tell you that their human capital is their most important resource, but humans do come with endurance issues: they need breaks, sleep and holidays. Sometimes they arrive late, are sick, join collective bargaining unions, have issues sustaining performance, or cause reputational harm. At some point, humans quit. Unless the plug is pulled, computers are on 24/7/365.
- A derivative of endurance is AI bots will have unlimited patience and attention spans when interacting with humans.

Access – Computers Win

- In addition to access to all the information available on the internet, AI now does not need pre-labelled data to feed and train LLMs. The next areas for training include all video content available, simulated data, synthetic data, robot data, and new forms of data coming from better sensors (see our recent Quantum Sensing report). There is a difference between access to information and useful knowledge or actionable insights, but AI is also increasingly capable at using this information.

Memory – Computers Win

- Databases have superhuman memory. One of the most cited papers on human memory is by Miller (1956) who found humans can repeat back a list of no more than 7 randomly ordered items, such as digits or words[16]. Another paper finds a young adult's working memory store is just 3-5 meaningful items.[17]
- While there is not agreement on the limits of human long-term memory, distortions happen, we forget things to free up memory capacity and our memory declines with age.

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[15] https://www.scientificamerican.com/article/new-exascale-supercomputer-can-do-a-quintillion-calculations-a-second/

[16] Miller, G.A., 1956. The magical number seven, plus or minus two: Some limits on our capacity for processing information. *Psychological review*, *63*(2), p.81.

[17] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2864034/

Knowledge Sharing – Computers Win

- One of the most challenging issues for humans is how long it takes us to assimilate new knowledge and skills. The 10,000 hours thesis is often used on the path to mastery in a subject. Computers on the other hand can learn from each other and benefit from the cumulative knowledge of previous computers. Take autonomous vehicles for example. One self-driving company drove its first 1m miles in AVs in 12 months, the next million in 3 months, the next 1m in 1 month.[18] Humans on average may drive a million miles in a lifetime. But in addition, new AV's get born with the accumulated knowledge of all the cars that have gone before them.

- Cloud computing has helped this networked effect for computers, so information can be multiplied many times and is not lost. Metcalf's law is apt here, with the value of a network multiplying as the network grows.

- The ability to share information across computers also allows them to stay up to date with new information at the same time. Using the AV example, if traffic rules change (such as speed limits) all AVs can know this simultaneously.

- The number of connected devices in the world already exceeded the number of people in the world by 2019. Many of these are in constant communication, and given the addition of AI, M2M (Machine-to-Machine) communication will exceed H2H (Human-to-Human) communication. It is estimated by 2023 there will be c.30bn connected devices[19].

- Computers can already deal with the tsunami of content and information overload better than humans. A next stage is they will also be better at evaluating what is AI generated content, via watermark that will not be seen by the human eye.

Upgradable – Computers Win

- We have become used to software being updated to add new features or improvements, such as automatic updates to iPhone Operating Systems. This is a change versus old hardware systems that had to be replaced. Unfortunately, humans don't have this ability to upgrade (yet).

Bias – Computers Could Win

- Understandably there is significant concern currently that computers / AI can be biased. However often this is due to the datasets which it ingests. These datasets have usually come from human content, which is biased, and AI can amplify this bias. The Nobel prize winning Daniel Kahneman highlighted that humans are biased and make systemic errors. His 'Thinking Fast' work highlights people use mental shortcuts to make decisions, often based on preconceived ideas.

- While there is much work to be done to make computer decisions as robust as possible, computers process data more reliably and objectively than humans. Human-in-the-loop judgement and accountability will remain, but AI will be used to identify human bias in decision making. Regulators will likely mandate transparency and explicability for machines at a higher level than we do for

[1818] WATCH: Is This a Watershed Moment for Driverless Cars? : Is This a Watershed Moment for Driverless Cars?

[19] Number of Internet of Things (IoT) connected devices worldwide from 2019 to 2023, with forecasts from 2022 to 2030 (in billions)

human decision makers. Via an iterative process on this important subject, it is possible we think more deeply about and correct algorithmic bias to improve outcomes.

Multi-tasking – Computers Will Win

- Today humans win at several simple muti-tasking areas. Human drivers for example take 67 hours on average to pass a driving test.[20] However, computers are catching up fast and will likely exceed us. Their ability to do so in data domains is obvious and they can also now do so in vision tasks. GenAI has extended this into language. The next phase of AI is Large Action Models to carry out tasks via APIs. Embodied AI, in which AI will link to robots to carry out tasks, is also gaining traction. Autonomous Vehicles (AVs) can already do this, combining moving, vision, real time navigation, language, safety and maintenance checks.

- Part of the reason AVs will grow is to reduce human error. One of the causes of human error while driving is being distracted by doing other things, such as the use of mobile phones. Research has shown that human error rates rise when multi-tasking, for example in healthcare, aviation or business.[21] Now that multi-modal AI is growing, the ability of computers to multi-task will likely exceed that of humans.

Cost – Computers Win

- Due to Moore's law, the price performance of computation has fallen significantly. According to Ray Kurzweil, the power of computers per dollar spent has increased 20-quadrillion fold since 1939, as shown in Figure 9 below.[22]

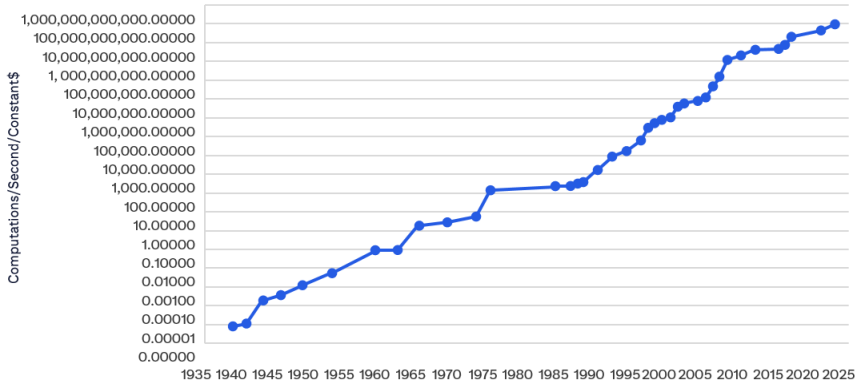
- While there is some concern over the sustainability of Moore's law going forward, Quantum Computing is coming next to continue the capability of computing at lower costs.

- In contrast to rapid cost reductions (versus capability) in computer software and hardware, human wages tend to rise in line with inflation.

- In addition, the cost of distributing digital products across the internet (such as music, film or software) is almost zero. The cost and time taken to move people is much higher.

[20] https://www.directline.com/car-cover/magazine/how-long-does-it-take-to-learn-to-drive
[21] https://www.wisconsinacep.org/resources/LLSA%20Articles/2018
[22] https://www.bvp.com/atlas/ai-escape-velocity-a-conversation-with-ray-kurzweil

Figure 9. Best achieved price-performance in computations per second per constant 2023 dollar



Source: Ray Kurzweil

Weak Competition and Comparative Advantage

Clearly there are many offsets to a Panglossian view of AI and many reasons why technological advances could slow. These include the capital taps helping fuel innovation being turned off if the economics of AI prove elusive or underwhelming, similar to the TMT boom and bust seen around 2000. And AI implementation and integration challenges within firms are likely; as highlighted in our Unleashing AI report last year. We already have an AI talent shortage; regulations, governance requirements and liabilities will rise; and worker resistance and backlash could occur if AI does include significant job substitution.

AI also cannot replicate many areas humans value. There is a poignant moment in the Oscar winning film *Good Will Hunting* where the psychologist, played by Robin Williams, is sitting with the young math genius, played by Matt Damon. Williams tells Damon that he knows everything and nothing. He knows the theory and appearance of many things he has read in books, but they are not born out of his own experiences. He has not felt what it is to see amazing places, or listen to live music, or fall in love. The film first aired in 1997, but this distinction may be apt between AI and Humans ahead. Real human connections and experiences matter.

1997 is more famous for the historic moment when a computer called Big Blue beat the world chess champion Garry Kasparov. Kasparov noted afterwards that human chess players had entered an era of 'weak competition' in which computers were only going to get better and better. Since then, the highest human chess rating stands at 2882 versus the highest computer rating, Stockfish, at 3634.[23] Stockfish is also free and open source.

We are currently in a period of weak competition for Generative AI in particular, and AI in general. AI's capabilities will continue to advance and take on more tasks currently carried about by humans. These phases include: human-first, assisted by machines; AI-assisted in which humans are augmented; and AI-first with rising autonomy and reduced human oversight. AI is often likened today to having a smart intern or assistant. Each year that passes the AI intern is going to get smarter and do more.

[23] https://en.wikipedia.org/wiki/Stockfish_(chess)

The 'Father of Economics' Adam Smith long ago highlighted the advantages of the 'division of labour' in which people specialized in certain occupations and skills.

The same has been true since the industrial revolution between human capital versus physical capital. The same will be true of human capital versus AI in this current cognitive industrial revolution.

Understanding the areas humans will hold a comparative advantage versus AI is vital for people, companies, educational institutions, policy makers and societies. To aid our understanding we turn to informed experts for their views on Durable Human Skills.

Expert Views on the Skills of the Future

In this chapter we asked informed experts for their thoughts on the skills of the future.

One aim was diversity of thought and, as such, we pool expertise from a huge variety of perspectives. These include Talent Management; Education (School, University, Corporate L&D), Government, Consulting, Economics, Finance, Healthcare, Journalism, Law, Technology, and Sport. The majority of contributors are also authors. While several are now working in AI related areas, often they also have had non-AI backgrounds to help provide informed perspective.

We thank them for their contributions and hope readers will benefit from their insights.

Alison Tisdall
CEO
Mind[3]

Ali Tisdall is CEO at Mind[3], where she co-creates custom leadership development experiences for senior executive leaders and teams. She has run leadership and coaching programs in over 65 countries worldwide, with thousands of senior leaders over her career.

Ali formerly co-led Europe for Pivot Leadership, and prior worked in Strategy consulting and in a global operational role at Korn Ferry. Ali is a published thinker and frequent speaker on applied neuroscience to high performance and, is a Fellow at the Institute of Coaching at McLean hospital, Harvard Medical School.

What work skills do you think will be most important or valuable as Artificial Intelligence continues to advance?

The AI/talent contract 2025 across industries is for this human-machine collaboration to enhance productivity in which AI compliments (rather than replaces) humans. AI represents the digital talent assistant of our dreams, taking on the dull repetitive tasks and promising us better - if different - jobs. Today, that means skills that are additive to the current capabilities of AI are adaptability, critical thinking, EQ, cultural sensitivity, bias mitigation, ethics, digital literacy, and creativity.

But that's today. Skip forward 5 years and all teams have embedded AI as colleagues. Human-AI collaboration is the norm. In this scenario, we can predict that EQ, creativity and ethics will have a premium. But the watch out is that these are not uniquely human skills. And while evolutionary shifts in our brain biology takes thousands of years, AI innovation works at warp speed.

Skip forward 10 years and we should assume AI's creativity, ethics and strategic skill set will be well beyond our imagination today. So what skills might be critical as we look to our AI infused future?

Firstly, agile talent that can do the things that AI and APIs cannot do will be most in demand: such as the ability to collaborate across silos, think creatively about how to combine technologies and navigate the social dynamics at pace.

Secondly, everyone will need to master the art of reinvention: becoming learning ninjas able to pivot from skill to skill in response to changing industry demands. Learning to learn will be your competitive edge in a skills market where machines just do everything better.

Thirdly, the idea of 'digital' as a thing will seem archaic. As the futurist and entrepreneur Peter Hinssen says, "Your kids don't talk about a digital camera, it's just a camera". In turn in 5 years we will not live in a *digital* world, it's just how the world is. Only in a zombie universe would digital literacy not be viewed as the most basic cost of entry. We will also see an upsurge in the value placed on the unconventional mind: people who generate novel ideas, see around corners, and challenge orthodoxies. No more talk of culture fit.

How can we best prepare for the skills you describe above?

Demand that your board and executive team are AI literate, operate hyper-sonically fast, challenge every analogue norm about your organizational and business model, are not Western-first in their thinking, and have a mix of minds under 40.

Move quickly – adopt an experimentation culture as fast as you can. Normalize fail, learn, test and iterate even in regulated industries. You'll need to be thinking about your next operating model even as you bring new products and services to market. Get great at leading transformation as just the new every day.

Change your mind about what talent looks like. Leading talent will not just be about leading other human beings very soon, but about sourcing the right embedded AI talents and making the hybrid work.

The brain treats certainty, autonomy, relationships, equity and status as powerful drivers of reward and threat, while AI does not. So we must change the story of AI from one of threat to opportunity. Leaders that help others thrive, be resilient, and gain energy in this world of constant change, will be prized. This includes creating more certainty for people, greater agency over our lives, more time for people and relationships, meritocracy in the system and better, more interesting work for all.

Amanda Spielman
Served as His Majesty's Chief Inspector, Ofsted

Amanda Spielman was Ofsted Chief Inspector of Education, Children's Services and Skills from 2017 to 2023, where she introduced the first fully evidence-based education inspection framework. She was previously chair of the exam regulator Ofqual from 2011 to 2016, and part of the founding management team at the multi-academy trust Ark Schools.

In an earlier life she worked in mergers and acquisitions at Kleinwort Benson, strategy consulting (Mercer Management Consulting) and private equity (Nomura Principal Finance). She is now a Visiting Professor in Practice at the London School of Economics in its Centre for Analysis of Risk and Regulation, and a trustee of the Victoria & Albert Museum.

What work skills do you think will be most important or valuable as Artificial Intelligence continues to advance?

How can we best prepare for the skills you describe above?

Using new technologies well in education is hard: indeed there is a long sad history of failed education innovations over many decades, many of which tried to short-circuit the long slow process of making young humans acquire knowledge. Understanding this is crucial to thinking sensibly about AI and the future of education.

The key relevant insight from cognitive science is that there is no meaningful human thought without knowledge: we can only think with what we know. This is because the working memory that holds novel information and unfamiliar ideas is severely limited. To think critically we must draw on knowledge we hold in long-term memory. The shiny tinsel lure of jumping to 'teaching critical thinking' is attractive but inherently flawed. Experts often fall for this idea because they have deeply internalized all their accumulated knowledge and draw on it so effortlessly that it feels like applying common sense, or generic 'critical thinking'. Saying that 'we should be teaching kids to write AI prompts' is uncomfortably close to saying 'the kids can google it so they don't need to learn all that boring stuff'.

To make the most of future human potential, including making young people the best users and stewards of AI and its attendant risks, educating them well matters as much or more than ever. Young people should continue to build a rich and extensive body of knowledge, starting from first principles. High levels of literacy, mathematics and broad general knowledge will still matter, although of course the areas of emphasis will continue to evolve. Current school curricula are different from those of 150 years ago: children learn less botany, less geometry, less arithmetic but more 'hard' science, more statistics and coding. The best educated young people will make the best prompt engineers.

The study of human psychology also shows us that that achievement contributes to building self-esteem (more than the other way around); humans are generally happier in well-developed social structures with plenty of interaction with family, friends and co-workers; the young (and the burgeoning numbers of old people) need lots of good human care; and direct instruction by adult humans is the most powerful mechanism yet discovered both to build children's knowledge and to motivate them to learn the things they are not intrinsically motivated to learn (such as mathematics, which hardly any children will induce without formal teaching). Actual schools and colleges will continue to have an important place in society.

Building on children's creative potential will also continue to be important: not just for human advancement but also for individual fulfilment: creating, making and mending can be satisfying activities that fulfil a deep human need in a highly automated world. In England it is unfortunate that the practical strands of school education (other than the visual arts) have been in steady decline for more than 25 years.

Post-compulsory education will also evolve but will still need to balance immediate utility with broader knowledge-building. Those who are trained too narrowly in specific domains or tools can be left high and dry when those narrow specialisms are superseded. Those who have built wider expertise are more creative and better able to adapt to future evolutions of technology and society. Caring occupations and teaching will also evolve, ideally to maximize high-quality human interaction, using advancing technology to streamline the other activities that absorb much time in healthcare, education and social care.

Sir Anthony Seldon
Head of Epsom College

Sir Anthony Seldon is one of Britain's leading contemporary historians, educationalists, commentators and political authors. He has been a transformative Head of Brighton College, Wellington College and Epsom College, as well as Vice-Chancellor of the University of Buckingham.

Anthony is author or editor of over 45 books, has been Director of the Institute for Contemporary British History, honorary historical adviser to 10 Downing Street for ten years, the UK's Special Representative for Education to Saudi Arabia, Deputy Chair of The Times Education Commission, is a director of the Royal Shakespeare Company, and is the President of IPEN, (International Positive Education Network). He is patron or on the board of several charities.

What work skills do you think will be most important or valuable as Artificial Intelligence continues to advance?

We are too busy, too distracted and too complacent to be taking AI seriously.

I have worked much of my life in schools, and that is where we must start to address the problem.

But we are still educating our young people for the twentieth century. This needs urgently to change. At present our schools:

- Focus too much on passive learning and encouraging students to give the right answer at the right time and in the right way. The system wants young people to behave in a predictable manner, more like machines than humans. We need to be placing far greater stress upon independence and originality of thought and action.
- Schools often do not have much space, opportunity, or time for students to develop their own opinions and ideas. What schools want is for students to do what they're told and to and behave in the approved manner. There is very little stress on agency, or the need for agency and creativity.
- Exams dominate schools in Britain (and abroad) totally. They are responsible for the way the school calendar, curriculum and culture is rolled out. But exams test only a very narrow range of cognitive skills. They allow little space for the four types of character virtues they will need in the world of AI- the intellectual, performance, moral and civic- as championed by the world-leading Jubilee Centre for Character and Virtues at the University of Birmingham.
- Schools as currently formatted, together with unlimited social media, are actively contributing to the mental health epidemic among young people. The best schools teach the skills of well-being and resilience which will be needed more than ever in the world of AI.
- Finally, schools have very little space for the nurturing of young people's heart and hands. Their focus is almost entirely on the head, to the detriment of the other two. In the world of AI, we need people to be more fully human, which means nurturing and valuing the heart, which machines will never possess, and developing skills with the hand, which are increasingly seen by researchers as integral to rounded human beings.

What action is required?

This is the easier part. What we need to do is for those with influence across technology, business, politics, the media, finance, law and education to help government smell the silicon. Stop promulgating 19th century education. Raise the eyes to what is happening in Britain and abroad.

21st century schools are popping up all over the world, as our “AI in Education" website and initiative describes. They are focused on developing agency, creativity, resilience, empathy, entrepreneurship, wellbeing and the four-character strengths.

There is no time to lose.

Professor Anton Korinek, University of Virginia and Darden School of Business

Anton is a David M. Rubenstein Fellow at the Brookings Institution, a Professor at the University of Virginia, Department of Economics and Darden School of Business as well as a Research Associate at the National Bureau of Economic Research (NBER), a Research Fellow at the CEPR and the Economics of AI Lead at the Centre for the Governance of AI.

Anton is also an editor of the Oxford Handbook of AI Governance. He received his PhD from Columbia University in 2007 after several years of work experience in the IT and financial sectors. He has also worked at Johns Hopkins and at the University of Maryland and has been a visiting scholar at Harvard University, the World Bank, the IMF, the BIS and numerous central banks.

What work skills do you think will be most important or valuable as Artificial Intelligence continues to advance?

In the short term (ie the next few years), the most important skill for white collar workers will be versatility with Generative AI. The AI systems we currently have and that we will have in the near future are making workers far more productive. The flipside is that these technologies are deskilling – they reduce the market value of human capital.

In the medium to long term, I expect that AI systems will outperform human workers in all cognitive functions, including jobs that require creativity and emotional skills. There is quite a bit of uncertainty about the timing. The leaders of frontier AI labs expect this to happen within the next 2 to 5 years, but it could take a couple of years longer. Robotics won't be far behind in automating the physical functions performed by workers. Ultimately, I am afraid that human capital will become the greatest legacy asset in history. This will be most painful for those who have taken out loans to pay for the acquisition of human capital.

How can we best prepare for the skills you describe above?

For the next few years, make sure to keep up to date on advances in AI so that you can "ride the wave." But the wave is cresting and will eventually break. At that point, the market value of education may decline significantly. The period of "skill-biased technological change" that we have experienced over the past half-century may be over, and the associated mantra that everyone needs more education may be a dead end.

The following analogy might be useful: if you were born 200 years ago, acquiring physical strength made you a more valuable worker. Since then, mechanization has greatly diminished the value of physical strength in the workplace. Just like the legendary John Henry succumbed to the relentless efficiency of the steam-powered drill, white-collar workers will find their value in the workplace diminished, except it will happen much faster.

People, companies, and policymakers are woefully unprepared for the coming transformation. If we want humanity and democracy to continue to thrive in a world in which AI and robots can perform cognitive and physical work more efficiently than humans, we must fundamentally rethink the role of work and the structure of our economic system.

Rather than engaging in a pointless zero-sum game of trying to "outrun" the machines by acquiring greater skills, we need to invest in research and governance efforts to align our ever more skilled AI systems with human values. Simultaneously, we must update our economic system to ensure the benefits of AI are widely shared – and we must act now.

Azeem Azhar
Founder
Exponential View

Azeem Azhar, founder of *Exponential View,* executive fellow at Harvard Business School, Co-Chair of the WEF's Global Futures Council on Complex Risk.
www.azeemazhar.com

What work skills do you think will be most important or valuable as Artificial Intelligence continues to advance?

As AI advances, we should assume that humans will have access to increasingly capable cognitive assistants that can undertake tasks for us. These agents may be more or less reliable, accurate and comprehensive. And like humans, they will not be free of bias, distortions, errors, etc. Given that any task a human gives them will be bound by that person's personal capabilities and subjective experience, results from such systems will reflect that coloring.

We need to be able to frame our needs in ways that can be delegated to such systems. We need to evaluate the results of that delegation. There is a portfolio of skills that need to be developed to do that:

- **Problem-solving:** The portfolio of skills required to identify, understand, and frame a range of different problems and critically evaluate the results
  - **Analysis and logical thinking** How to frame a problem and break it into component parts and suitable outcomes? This includes logic, computational thinking and other problem-solving approaches.
  - **Critical thinking and textual analysis** Can you critically evaluate an output for logical inconsistencies, bad claims to factual inaccuracies?
  - **Quantitative and statistical skills** Are you able to address quantitative questions as well as qualitative ones?
  - **Creative thinking** Are you able to think creatively to expand the range of possibilities the AI tools you use might explore?
- **Communication, collaboration, and judgement skills:** Are you able to work with AI systems and engage in human-machine collaboration?
  - **Machine understanding** Do you understand the capabilities, limitations, and mechanisms of the AI tools you are using?
  - **Collaboration** Can you productively collaborate across human and human-machine teams?
  - **Judgement** Do you exercise good judgement in your use of the tools, including considering ethical implications?
- **Metacognition and learning-to-learn:** Are you able to evaluate your thinking style and the cognitive style of the systems you are using to adjust your behavior? Can you develop new skills to work with more capable systems? Are you able to identify gaps in your knowledge, either skills or domain expertise, that you need to fill to use these tools well?

How should these be taught?
There is no rulebook for using AI tools right now. No manual, no best practice. The best approach is one of praxis, which is the practical application of your skills in a reflective manner. Use the tools. Reflect on how well they worked. Change you approach. Share your knowledge. Ask your peers to do the same.

A similar methodology could be used for our education systems. But in parallel, the system should be designed so that the subset of skills related to problem-solving, communication and collaboration, and metacognition are specific learning outcomes for school curricula and the exams that evaluate them.

Belinda Sartori, Head of Futures, Charterhouse

Head of the Futures department at Charterhouse school, responsible for our Higher Education, Careers and FutureU programmes. Joined Charterhouse in 2018 as Head of Careers, winning the 2022 Independent School of the Year award for Best Student Careers Programme.

Prior to this, Belinda spent 15 years in Investment Banking for NatWest Markets, Deutsche Bank and then Goldman Sachs, working as an Executive Director in the European Equity Telecoms team.

What work skills do you think will be most important or valuable as Artificial Intelligence continues to advance?

As Artificial Intelligence (AI) progresses, certain human skills that AI cannot easily replicate will become crucial. These include:

Critical Thinking: Ability to tackle complex and ambiguous problems that AI cannot.

Creativity: Human creativity remains vital in innovation, design, and content creation.

Emotional Intelligence: Understanding emotions and social nuances, crucial for roles that require human interaction.

Adaptability: A continuous willingness to learn and evolve will keep individuals competitive.

Data Literacy: Essential for data-driven decision-making in an increasingly data-centric world.

Cybersecurity: With growing reliance on AI, protecting AI systems and data becomes critical.

Leadership and Management: Effective leadership is required to inspire teams, set strategies, and motivate.

How can we best prepare for the skills you describe above?

Traditional educational systems often emphasize memorization and fact regurgitation to measure academic achievement which falls short in preparing individuals for modern demands. To better prepare for the workforce:

Revise Testing Methods: Shift towards exams that prioritize critical thinking, analysis, and problem-solving. Implementing open-book exams can mirror real-world conditions where information is readily available, and the focus is on effective resource utilization.

Enhance Soft Skills Training: Build essential soft skills through classroom and extracurricular activities. Project-based assessments and presentations that require research, planning, collaboration, and solution presentation can foster these skills.

Follow Global Best Practices: Emulate successful strategies from countries like Singapore, the UAE, and Finland, which have implemented initiatives to equip their populations with the skills needed to thrive in an AI-driven world, which emphasizes lifelong learning and collaboration between government, academia, and industry.

Charterhouse's award-winning FutureU programme exemplifies these principles by integrating a focus on transferable skills and personal branding into the curriculum.

This approach prepares students for an AI-driven world through dynamic and interactive activities, equipping them with the tools needed to thrive in a technologically advanced society.

Bill Schaninger, PhD
Modern Executive Solutions

Bill specializes in advising senior executives on how to strengthen their business performance through enhanced culture, values, and talent. Previously, Bill spent 23 years at McKinsey & Company where he was a Senior Partner Emeritus, led the Global Talent Practice and was the Global Knowledge Leader of the Org Practice.

Bill is an international speaker, author, and thought leader on the future of work including contributions to Forbes, Fortune, Economist, BBC, Harvard Business Review, and Axios. His book, Power to the Middle, provides actionable insights for leaders to empower and develop their most valuable asset. Bill holds a BA, MBA, MS and PHD.

Christie Smith, PhD
Modern Executive Solutions

Christie leads Modern's Integrated Solutions Business. Previously Christie was a member of the Global Management Team at Accenture where she was the Global Leader of the Talent & Organization Practice that focused on serving clients on issues of leadership & culture. Before joining Accenture, Christie was the Chief Diversity Officer at Apple and prior to Apple, she was a Managing Principal at Deloitte, LLP.

Christie is a frequently speaker on leadership and talent and has been covered by The NY Times, WS Journal, Harvard Business Review, Fortune, Forbes, and CNN. Christie has a PhD in Industrial Organizational Psychology.

Below is an edited version of a conversation between Bill, Christie and Citi in May 2024. The full video can be found here.

What work skills do you think will be most important or valuable as Artificial Intelligence continues to advance?

There's not a single answer to the question because it depends on the business context, but the skills gap and skill scarcity is costing the global economy $85 billion a year. Three out of four employers say they don't have the right skills to execute on their business strategy.

AI competency obviously is a significant skill need – knowledge of AI, how to use it and in what context to use it. A key AI skill will be defining and structuring a problem, as consultants do. That does not just mean using tools or a playbook, but problem solving and critical thinking. Leaders also need to be insatiably curious and have contextual knowledge in the age of AI.

Leadership increasingly is managing a distributed workforce. There are four expectations of employees today of leaders around power skills: 1. making sure that they are creating and living to the purpose and values that they espouse in the marketplace; 2. agency, giving employees the ability to work when and where they want to on their own terms; 3. wellness, including mental health; 4. connection. People skills and emotionally intelligent leadership has never been more important.

How can we best prepare for the skills you describe above?

We need to reskill at a faster pace than has been taking place. This means companies stepping back and examining what skills they have today, what skills they need in the future and how do they fill the gaps. This is not as pervasive in companies today as it needs to be. AI based tools can help with this process as we move to a skills-based economy. Redeployment of existing employees rather than bringing new employees requires organisations to know what your employees can do and upskilling them. But this has to be cost effective for organisations and wanted by employees.

Related, the structure of work today includes more pressures to get work done. People are ripping through a to do list at pace which leaves them less time to actually spend on developing and teaching their people. We need to create time.

In our pursuit of self-paced learning we are in danger of making people more like machines and we have lost part of our thinking skills. There is also a concern that we ask machines to do lower end work tasks that make up parts of apprenticeship. It is a necessity that people have gone through the ability to think critically about issues to solve problems and take on leadership roles.

The role of leaders and CEOs has shifted dramatically since the pandemic and AI may extend this. In addition to more employee choice, we have seen a massive erosion in trust in the institutions, as shown by both Gallop and Edelman.

More distributed work includes less in person time together, less formal structured time together, and more quasi vendor like relationships. It is easy to go to an economic exchange at work, not a social exchange. However, the very thing that was supposed to give us meaning outside of our core relationships of home and family has eroded. We must repair the social fabric at work.

Cameron Hedrick
Head of Learning
Citi

Cameron serves as the Head of Learning & Culture for Citi, based in New York City. His current responsibilities include enterprise learning programming and technology, and culture philosophy, strategy, and measurement. Cameron also sits on Citi's HR Operating Committee.

Prior roles include Citi's Head of Performance Management, and Sr Human Resource Officer roles for Citi's Global Commercial, and US Consumer Banks. Prior to his twenty-year Citi tenure, he held various leadership positions at Fidelity Investments in Boston, Massachusetts

What work skills do you think will be most important or valuable as Artificial Intelligence continues to advance?

Let's break 'skills' into three broad categories – a) foundational, b) leadership and managerial skills/attributes, and c) role-specific/technical.

Looking forward, a strong foundation in philosophy, history, literature, critical and systems thinking, and the natural sciences will lay the groundwork for success in many future endeavors. This has always been the case but will become more important as our lives become increasingly intertwined with AI. These areas of knowledge help us to synthesize and contextualize the output of AI.

As it relates to core leadership/managerial skills/attributes, these tend to be durable across a range of professional roles and tend to be better indicators of future success than 'head knowledge' alone. Given this one might consider hiring for and cultivating these types of skills/attributes more prominently in the future.

As it relates to role-based technical skills, the impact of Generative AI will vary. Fields such as writing, research, data analysis, or programming are being dramatically impacted, which change the types of skills needed for these roles.

For example, if one begins to write code via natural language, you may not need as much technical/programming skills, however you'll still be required to understand the accuracy and utility of the code you write.

One must consider all three types of skills/attributes in the context of the role for which you are hiring.

How can we best prepare for the skills you describe above?

I am surprised by how leadership/managerial skills are either categorized as 'soft' and/or are thought to magically manifest in an individual as they progress through their career. "Soft" still denotes less important, not directly correlated to customer delight and bottom-line results. It's a very old way of thinking.

Leadership/managerial skills and attributes must be cultivated deliberately. They are hard to acquire and maintain. We should treat these skills accordingly, approaching them with the same level of reverence and rigor as any 'hard' skill.

Acquiring the core liberal arts skills mentioned previously is also a lifelong pursuit – there is no quick path to acquiring these perspectives.

My general advice is zoom out, introduce new learning methods and topics into your repertoire, and be suspicious of what you deem 'conventional wisdom'.

Carl Benedikt Frey
Dieter Schwarz Associate Professor of AI & Work at the Oxford Internet Institute and a Fellow of Mansfield College, University of Oxford

Carl-Benedikt Frey is the Dieter Schwarz Associate Professor of AI & Work at the Oxford Internet Institute and a Fellow of Mansfield College, University of Oxford. He is also Director of the Future of Work Programme and Oxford Martin Citi Fellow at the Oxford Martin School.

In 2013, Frey co-authored The Future of Employment: How Susceptible Are Jobs to Computerization. With over 12,000 citations, the study's methodology has been used by President Barack Obama's Council of Economic Advisors, the Bank of England, the World Bank, as well as the popular automation risk-prediction tool of the BBC.

What work skills do you think will be most important or valuable as Artificial Intelligence continues to advance?

The short answer is the things that AI is not very good at.

One such domain is in-person communication. As chatbots continue to improve, the ability to communicate effectively face-to-face will emerge as a highly prized skill in numerous roles, including management, professional services, and customer engagement. Individuals who excel at creating a compelling physical presence and building personal connections, thereby inspiring and persuading others, will thrive in the AI era.

Another domain is creativity. While AI systems are adept at remixing and reassembling music or text based on given prompts, their capacity for creativity has limits. For example, blending the styles of Mozart and Schubert through AI doesn't yield compositions that echo the distinctiveness of Arvo Pärt. Similarly, training an algorithm on a database of impressionist art doesn't result in the creation of conceptual art.

Consider Marcel Duchamp's "Fountain"—a urinal from a plumbing supply store turned art object—as a case in point. The genesis of Duchamp's revolutionary idea didn't come from an analysis of impressionist art; it was sparked by his observations of the real world.

Moreover, the 'reward functions' driving such breakthroughs remain elusive. AI shines in contexts with clear goals, like games where success metrics are easily defined. But when it comes to doing something genuinely new, what do you maximize for? AI's ability to generate Shakespeare-like texts relies on Shakespeare's pre-existing works. Impressive as it may look, it is not very novel.

Finally, as Hans Moravec observed in 1988, computers can easily match or surpass adults in intelligence tests or games like checkers but endowing them with the perceptual or mobility abilities of a one-year-old proves to be much more challenging. This is still true today, meaning that humans still hold the comparative advantage in many manual tasks done in unstructured environment. Cleaners and plumbers, for example, will still be needed in the future.

How can we best prepare for the skills you describe above?

I think we need to change the ways in which we teach. The best way of fostering social and creative skills, for example, is through tutorial-style teaching where students write essays and discuss them. Classes can be watched online, at least when it comes to teaching older students.

In addition, we should think more about incentives for learning. Roland Fryer's work, for example, focusing on schools, shows that financial rewards for students can lead to improved test scores, particularly when incentives are tied directly to specific actions or behaviors that contribute to learning, such as reading books or attending class. But the design of such incentives is always highly context specific.

Chris Butt,
Founder
Cognisess and Yondur

Chris Butt is the founder behind Cognisess and Yondur, leading companies at the intersection of HR technology and education, powered by the proprietary AI engine, Deep Learn™. Chris has dedicated his career to how we understand and optimize human potential in both the workplace and educational environments.

Through the application of Deep Learn™, Cognisess offers unbiased, data-driven insights into cognitive abilities and behaviors, enabling more equitable talent assessment and management practices. This innovative approach ensures that talent is recognized and nurtured based on true potential, making strides toward a more inclusive and fair job market.

What work skills do you think will be most important or valuable as Artificial Intelligence continues to advance?

Unlike tasks that can be automated or performed by AI, human skills involve a depth of understanding, intuition, emotional nuance, and adaptability that are currently beyond the reach of machines. These human skills include:

1. Emotional Intelligence: fundamental for building relationships, resolving conflicts, and fostering an inclusive work environment.
2. Creativity: this skill includes innovative solutions, the unique ability to think abstractly and envision what does not yet exist.
3. Critical Thinking: this skill is crucial for strategic decision-making, problem-solving, and navigating ethical dilemmas.
4. Adaptability: the skill that enables humans to adjust to new conditions, learn from experiences, and apply knowledge flexibly across different contexts.
5. Interpersonal Skills: the ability to communicate, collaborate, and build relationships with others is a core human skill.

How can we best prepare for the skills you describe above?

The foundation for human skill is 'lifelong learning.' This is not just a 'concept'; it's a necessity for staying relevant and fulfilled in a rapidly changing world. From the moment we start our education to the various stages of our careers, continuous learning helps us adapt, grow, and thrive. It includes adopting a proactive approach to personal development. It's about seeking out opportunities to learn new things, via both formal education and everyday experiences. It's about embracing change and viewing challenges as opportunities to learn and grow. This mindset enhances our career prospects and also enriches our personal lives, helping us navigate the complexities of modern living with resilience and empathy.

Companies play a crucial role in fostering lifelong learning. By investing in training programs that enhance human skills, organizations not only boost their competitiveness but also contribute to a more dynamic, innovative, and cohesive workplace culture. Encouraging a culture where learning and personal growth are valued makes employees feel supported and valued, leading to better performance and job satisfaction.

Educators, too, have a critical role in laying the groundwork for lifelong learning. Integrating human skills development into the curriculum from the early years ensures that students not only excel academically but also develop the soft skills essential for success in life and work. Teaching methods that encourage collaboration, creativity, and critical thinking prepare students for the realities of the future job market and foster a love for learning that will stay with them for life.

Policymakers can support lifelong learning by creating educational policies and frameworks that prioritize human skills development, ensuring that individuals are equipped to succeed in an AI-augmented world.

Lifelong learning is a continuous form of personal 'upskilling' and will be the key to harnessing our human potential in the age of AI. By continually developing our human skills, we not only enhance our employability and productivity but also deepen our understanding of ourselves and others, leading to more fulfilling lives and a more settled society.

Daniel Doll-Steinberg
Cofounder & Partner
EdenBase

Daniel invests in the convergence of AI, Quantum Computing, Blockchain and Immersive Tech that are rapidly becoming general purpose. He has specialized in disruptive technologies and change agency for 30 years.

He has built disruptive tech startups, managed large-scale corporate change and advised governments and supranational organizations on policy and regula9on.

His book, Unsupervised (Wiley, 13 September 2023), a Bloomberg Book of the Year focusses on the Cognitive Revolution that AI, Quantum Computing and other frontier technologies are triggering, their impacts on society and everything we know, and the need for everyone to act now.

What work skills do you think will be most important or valuable as Artificial Intelligence continues to advance?

Several emerging technologies are becoming general purpose at the same time. We can call these frontier technologies. These include AI, quantum computing, immersive technologies / metaverse, additive manufacturing, and the merging of computers and biological material. Alone each one represents a powerful force to transform many of our roles and functions. In combination, however, frontier technologies have the power to completely transform our industries and our foundational layers such as governance, health, economics and society. This makes it extremely difficult to forecast with any accuracy the skills that we will require for such a technology-first world.

What we can be more sure of is that the education systems and skills that we have created and learnt for an industrialized world, coming out of the Industrial Revolution, are unlikely to be suitable in this new world.

Roles that are heavily process-oriented, data driven or dependent on base level analytics are likely to be quickly surpassed by technology. Many creative roles, such as in the entertainment industries, are also highly susceptible. However, roles that require a combination of skills especially soft skills and those with a physical, relationship or trust element are likely to be more secure. But in an uncertain future, the most important skills will be adaptability and flexibility, at which fortunately human history has shown us to be adept.

How can we best prepare for the skills you describe above?

As these technologies become “smarter” and integrated into ever more aspects of our world and functions, there will likely be two overlapping trends. The first is transformation, already underway, where our industries, companies, educational requirements and skills, will be transformed to hopefully better versions. The second will be disruption where the underlying foundations of our world and our functions are completely rewritten to be managed in a technology-first manner.

Preparing for transformation is easier for us. Our education systems will need to instill in us greater flexibility and adaptability to be ready for an ever-changing world, and also the skills to operate with these new technologies. Our companies will need to work heavily on retaining their culture, increasing employee trust, promoting flexibility, and rapid training and retraining skills for roles that may disappear and appear.

And our policymakers need to learn the new skill of resisting the temptation to rush in with regulations that attempt to preserve the present or direct a future, causing unintended consequences and more likely disruptions, rather than transforming and safeguarding it.

Predicting and planning for the disruption process is much harder for us. However, the same skills of adaptability and flexibility coupled with the knowledge that many things are likely to change, alongside actions to promote opportunities and mitigate threats, will give us the best chance for a sustainable, responsible, and better future world.

David Goodhart, Head of Demography, Immigration & Integration, Policy Exchange

David is a journalist, writer and thinker. He worked for the Financial Times for 12 years before setting up Prospect magazine in 1995. He has been involved with issues relating to equality and discrimination for 20 years. In his current role as Head of the Demography Unit at the Policy Exchange think tank he has contributed to most of the policy debates on race including cowriting a report 'Bittersweet Success', on ethnic minority people in elite jobs.

In 2013 he published a book on race and immigration, 'The British Dream' (runner up for the Orwell prize). His two most recent books are 'The Road to Somewhere: The New Tribes Shaping British Politics' (2017) and 'Head, Hands, Heart: The Struggle for Dignity and Stats in the 21st Century' (2020).

What work skills do you think will be most important or valuable as Artificial Intelligence continues to advance?

Even before the recent wave of Generative AI, the conclusion from my book 'Head, Hand, Heart' was that we may have already reached 'peak head.'

Over the last 40 years we have become a kind of monoculture that has accentuated one form of human aptitude – cognitive ability. As a result, we may already be processing too many people through higher education. In the UK a third of graduates working 5 years after graduating are in non-grad jobs. Graduate pay premium is dwindling to almost nothing for non-elite universities.

In the 1970's 9% of school leavers went to university. Now nearly half go on to some form of higher education. The surge in supply of students is also coming from other countries. For example, China is graduating three times more students per year than the US.

Add in the rise of Artificial Intelligence and thinking jobs will increasingly be taken over by machines. AI will cut many white-collar jobs in the same way automation substituted for blue collar jobs. The areas of human comparative advantage will increasingly be in heart, or caring, roles where humans will prefer dealing with humans. These involve social skills, empathizing or managing people in the same room. The skill shift for several decades has been one way into head, over hand and heart, but this maybe about to go in reverse. In addition, a lot of hand and heart jobs cannot be exported.

How can we best prepare for the skills you describe above?

There are several implications if we are at 'peak head.'

We should improve alternative paths to tertiary education, such as apprenticeships, technical skills, or vocation courses. Accountants are now doing this. We also need to credentialise in other ways. The sorting hat of higher education has created a treadmill and credential inflation. We don't need janitors with PHDs, or a quarter of higher education students to get a first, or 40% of jobs to be just for graduates. We do need more ways to assess people's strengths and skills that don't require doing a 3–4-year degree that is neither used nor retained much.

We need to teach and recognize a diversity of aptitudes, to allow many little ladders up into success, not a single ladder based on passing cognitive tests. For example, a lot of people who have high IQ scores do not also have high social intelligence scores. Schools should make sure heart and hand skills are taught alongside head, including arts, sports, creativity, and practical life skills such as emotional stability and wellbeing.

Universities need to shift to be multi-versities that cater for lifelong learning, not for a fixed period of education then work. This will include multi-entry points along both age and skill spectrums, with more flexible, agile, short courses that business needs.

Lastly but most importantly, we all need to better recognize and value heart and hand roles that computers cannot do. Recognition includes pay, conditions, training and autonomy, but also in prestige and respect. So much of our politics, education policy, social policy, and economic policies have been based on the idea of this ever-expanding cognitive professional class. Change is coming and we need to recognize and value hand and heart roles more going forward.

Eleni Nicolaides
Chief Corporate Development Officer, PeopleCert

Eleni leads Product Development (Business & IT Qualifications) and PeopleCert Education. She is also involved in M&As and is responsible for ESG and CSR activities.

Eleni also serves as Director of the Hellenic ICT Professionals Society (HePIS), the Greek Member Society of the European ICT Professionals Society (CEPIS). HePIS represents over 3,500 ICT professionals while over 25,000 candidates have participated in education activities organized by HePIS aiming to enhance their digital skills. Eleni started her career in London, working in the investment banking and venture capital industries, with focus on the Technology, Media and Telecommunications sector. She still remains passionate and actively involved in the tech startup ecosystem.

What work skills do you think will be most important or valuable as Artificial Intelligence continues to advance?

AI is a real disruptor and will continue to shape our future. As Stanford adjunct professor and former Baidu scientist Andrew Ng said, “AI is the new electricity, expected to transform everything, just as electricity did 100 years ago.” While it is challenging to predict the future accurately, AI will likely revolutionize every sector, transforming the work environment, the skills required, and organizations.

At the foundation of globally successful professionals will remain core skills, including English and computer skills proficiency, project management, data and analytics, solid IT and digital skills, as well as AI literacy. As the pace of technological advancement accelerates, the ability to learn and pivot will be critical, with adaptability, continuous skilling-reskilling-upskilling at the epicenter of personal and professional development.

Further, for any professional to excel, the need to balance soft and hard skills will remain. Soft skills including communication, a customer-centric mentality, teamwork, problem-solving, critical thinking, and emotional intelligence will remain vital. For hard skills, in addition to the technical expertise that will continue to be required per job, quickly and effectively adopting cutting-edge AI tools will itself be a game changer.

To remain competitive, professionals will need to invest in continuous learning and obtain certifications to substantiate their skills. Likewise, organizations that invest in the right talent and embrace global best practice frameworks for efficiency and growth will thrive. Professionals and organizations that leverage AI more effectively, innovatively, and swiftly will emerge as leaders.

How can we best prepare for the skills you describe above?

To effectively navigate the transformative impact of AI, stakeholders across various sectors must adopt specific, proactive strategies. The imperative for all is clear: remain vigilant and continuously adapt.

Professionals need to embrace a mindset of flexibility and perpetual learning. They should focus on continuously developing and certifying their skills, improving their performance using all available tools including AI, and staying well-connected to secure early insights into emerging trends and technologies.

Organizations must rigorously assess their current states and plan their digital transformation journeys. This involves sourcing the right talent, investing significantly in learning and development, embracing innovation, and adopting global best practice frameworks to align with proven standards and enhance global competitiveness. Selecting the right AI tools, investing in appropriate technologies and methodologies, and continuously optimizing their processes are also critical steps.

Academic institutions need to revolutionize both how and what they teach. Recent surveys indicate that approximately 50% of university graduates feel unprepared for the workplace, a sentiment echoed by approximately 50% of hiring managers regarding graduate readiness. Academic institutions should frequently update their courses to match the job market needs, help students develop both hard and soft skills, recommend certifications that can serve as job openers, and more importantly, help students cultivate the mentality that will ignite their future success.

Isabelle Bichler-Eliasaf
COO & Co-Founder retrain.ai

Isabelle Bichler-Eliasaf is the Co-founder and COO of retrain.ai. Prior to launching retrain.ai in 2020, Isabelle was the co-founder & CEO of Tohar, an Israeli placement company that pioneered how to leverage technology to source, screen, and find the best fit candidates. After its successful acquisition, Isabelle served as a wealth management executive, overseeing investments in multiple tech companies, focusing on early stage startups.

Isabelle holds an LLB from the Hebrew University of Jerusalem, an MBA specializing in Taxation from the College Of Management in Israel, and a MSc in Risk Management from the NYU Stern School of Business, where her research focus was DEI risk and Responsible AI.

What work skills do you think will be most important or valuable as Artificial Intelligence continues to advance?

The shift to skills-first hiring is forcing companies to change the way they think about onboarding and cultivating their talent. Cognitive skills will become increasingly critical in this new labor landscape, particularly creative thinking and analytical thinking. In fact, the World Economic Forum's latest Future of Jobs report lists these as the two leading emerging skills. Technological literacy will also be a key skill as AI becomes more integrated into every facet of our work lives.

A working understanding of Generative AI will give any employee an advantage in the coming years. This can include knowledge of Gen AI models, AI engineering tools, enablement techniques and infrastructure, and AI risk and security management.

How can we best prepare for the skills you describe above?

The labor market is tightening across the board as the focus on skills sharpens. As it stands now, 1 in every 2 employees is either watching for or actively seeking a new job. Compounding this problem, only 28% of employees would recommend their current employer as a great place to work.

However, there is an emerging answer to this retention crisis. 94% of workers would choose to stay longer with companies that actively invest in their career development. This places the impetus on organizations to properly cultivate their employees and give them ample reason to continue their career development.

Rather than using archaic job descriptions or rigid qualifications, employers need a holistic understanding of skills to map the right candidates to the right open roles, and then cultivate them once on board. AI enables companies to analyze the skills they have, the skills they need to have, and the skill gaps they should bridge. With this actionable data on hand, employers can then properly upskill and reskill their employees.

Dr. John J. Sviokla
Chairman and Co-Founder, GAI Insights

Dr. John J. Sviokla is co-founder of GAI Insights a firm dedicated to helping organizations, communities, and individuals understand the power of GenAI/AI and ethically create value with it.

John started his professional career at Harvard Business School where he did his doctoral thesis on the economic impact of AI. Dr. Sviokla then co-taught the first AI course at HBS, worked at Diamond Technology Partners, a leading digital consultancy, and led The Exchange, a world class think tank aimed at understanding the digital and AI revolutions. He continued that work at PwC as a senior partner before starting GAI Insights. He has worked as a consultant, board member, senior executive coach and investor with hundreds of companies public and private across the globe and has over 90 publications in the Harvard Business Review alone including Where Should Your Company Start With GenAI, and Your Organization is Not Designed to Work with GenAI.

What work skills do you think will be most important or valuable as Artificial Intelligence continues to advance?

How can we best prepare for the skills you describe above?

To understand which skills will be valuable in the GenAI/AI age, it is vital to comprehend where GenAI/AI will hit first. Many studies have talked about knowledge work changing, but we need a more precise definition. My lawyer and my carpenter are both knowledge workers – yet the lawyer will be much more impacted by GenAI/AI. At GAI Insights we created a new category of work we call WINS work – that is work that is made up of the creation and improvement of words, images, numbers, and sounds (WINS) (See our September HBR article for more details on WINS work). Lawyers, educators, consultants, customer service agents, software programmers are all WINS workers. There are many others. All these jobs will be utterly transformed in the next 12-36 months.

This transformation is occurring because GenAI/AI provides power tools for knowledge work. Imagine hiring an electrician who uses a hand drill to make holes needed for new outlets. You'd be outraged. If you are a marketing professional, a pharmaceutical R&D scientist, or an HR professional and you're not using GenAI/AI, you're like a carpenter using a hand saw instead of a skill saw.

The most critical skill for every employee is to understand and learn to use the major categories of GenAI/AI models for personal productivity – especially if you are a WINS worker. Just as everyone had to learn to use Excel, PowerPoint and Word processors, every person will need to learn to use GenAI/AI. This skill is foundational.

The next and perhaps more important foundational skill is to learn to use these models to make you smarter. The original education system was based on tutoring, the way Aristotle tutored Alexander the Great. Tutoring is the very best way to learn. With the industrial revolution we scaled the model with large classrooms, a teacher in front, and tests at the end – to provide the needed volume of educated workers. With GenAI/AI everyone can return to the tutorial model. Tell the model to teach you the matrix mathematics that underlies these models. Command it to tutor you in negotiation techniques to help you get a better salary. Beg it to do mock interviews for that great new job you want. Play with it to simulate that next big presentation. Cajole it to help you close a big sale with that difficult customer.

As many pundits have said, you won't lose your job to GenAI/AI, you'll lose your job to someone who knows how to use GenAI/AI. In this new world, you must learn the tools and task them to teach you. These are foundational skills for all workers and if you are a WINS worker the race began six months ago – so get moving!

Lord Mark Price
Founder of WorkL and WorkL for Business

Mark Price is a businessman, writer and former government Minister of Trade. A former Managing Director of Waitrose, Deputy Chairman of the John Lewis Partnership and Chairman of Business in the Community, Mark has spent over forty years unlocking the power of people in organizations.

Mark is the president of the CMI (Chartered Management Institute) and a board member of Coca Cola European Partners. He is passionate about creating engaged and happy workforces who in turn create longer-term sustainable success for organizations.

What work skills do you think will be most important or valuable as Artificial Intelligence continues to advance?

Artificial Intelligence (AI) is described as a field of computer science focused on the theory and development of tools that automate tasks that require simulating human behavior and decision-making. And that's exactly how AI is helping workers reduce the time tasks take, such as using ChatGPT for research and writing copy.

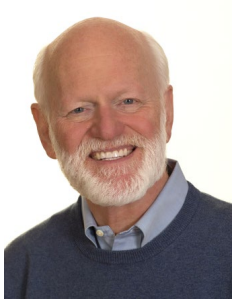
The human skills that AI is currently unable to replicate are Soft skills- these skills will continue to be in demand as the use of AI in our day-to-day work life increases. Skills such as management of teams, strong communication, leadership as well as teamwork, are all skills that are valuable to an organization and will continue to be so.

How can we best prepare for the skills you describe above?

Learning and Development should be at the heart of an organization's employee development plan, ensuring that employees are up to speed with the latest AI advances that they will no doubt use in the near future. New programmes mean new training, so investing knowledge and time in employees will best prepare them.

Management training will continue to be important as organizations look to train the next generation of managers who work with AI on a day-to-day basis. This is where Soft skills come into play, so leadership training is key, along with developing managers to have strong communication skills. However, employers must remember that these Soft skills need to be nurtured from the beginning, so all employees need to be developed in this area, regularly.

Employers must embrace AI to help employees develop the right skills to thrive alongside AI. The employee experience platform that I founded, WorkL, has 'Instant Action Software™ which instantly analyses large complex data sets to pinpoint development areas for employees. We then provide action plans with uniquely tailored resources for managers at all levels as well as team members, if required, to improve performance. Results are personalized with AI Technology giving us the ability to analyze millions of data points in seconds. The software delivers clear actions and insights immediately, recommending steps, measures and processes to improve employee retention and minimize Wellbeing Risk.



Marshall Goldsmith
The world's leading executive coach and award-winning leadership author

Dr. Marshall Goldsmith has been recognized as one of the Top Ten Business Thinkers in the World and the top-rated executive coach at the Thinkers50 ceremony in London since 2011. Published in 2015, his book Triggers is a Wall Street Journal and New York Times #1 Bestseller! He's also the author of New York Times best seller and #1 Wall Street Journal Business Book What Got You Here Won't Get You There, winner of the Harold Longman Award as Best Business Book of the Year.

With a PhD from UCLA, Marshall is a pioneer 360-degree feedback as a leadership development tool. His early efforts in providing feedback and then following-up with executives to measure changes in behavior were precursors to what eventually evolved as the field of executive coaching.

Below is an edited version of a conversation between Marshall Goldsmith and Citi in March 2024. The full video can be found here.

What work skills do you think will be most important or valuable as Artificial Intelligence continues to advance?

Firstly, recognize the value of providing advice to people could be heading towards zero.

My legacy project gift is an AI coaching bot – MarshallGoldsmith.ai. My goal was for this bot to answer any question you asked me as well or better than I could have 75% of the time, but it has way surpassed my expectations. It can now answer 100 times as many questions you might ask me and generally much better than I can. Right now, it's very good on text, next is audio and by the end of the year you are going to be able to talk to an avatar that looks like me and sounds like me, which can answer in virtually any language around the world, instantaneously, for free. The capability is already way above anything I ever dreamed of. I cannot compete with this tool now and use it with my own coaching clients. And it's only going to get better and faster from here.

If your role as a coach is to provide information, you are done. The same is probably true for advice giving such as lawyers if they spend a lot of time reviewing legal journals and looking stuff up. Yes, this will create anxiety, but the AI train has left the station and whether you like it or not, it's going to keep going.

In terms of what skills will be more valuable, a lot of coaching is about follow up. Research has shown the same is true of doctor's compliance in taking medicine themselves. Often the problem is not lack of information or knowledge. Also an AI bot cannot make you take medicine or eat healthily. A key skill is execution for oneself or for others. This is even harder when behavior change is needed. Strong follow up and accountability matters to bridge the gap between knowing and doing to make change happen.

Another key skill is acting as a facilitator to ask the right questions, both of AI bots and of people. The leader of the future is going to be a facilitator of continuous learning of themselves and their teams.

Allen Mullaly, the CEO of Boeing (1998-2006) and Ford (2006-14) was a good example of these skills. He did not pretend to know the answers to many questions and would seek those out who could do so better than him. He was also great at accountability and follow up.

EQ is probably more important than IQ for people at the top of organizations. Going forward AI is going to get better and better at IQ. I am not a stupid guy, but already I cannot compete on answers with my own AI bot. So increasingly important attributes or skills include: EQ, including inspiration and motivation; follow up, including accountability, execution and behavioral change; and facilitation to ask the right questions and foster continuous learning.

How can we best prepare for the skills you describe above?

Change is hard, so we need to get better at it. We are also going to have to get better at measuring non-IQ skills. This may not be easy, but as Peter Drucker said, 'if you can't measure it, you can't manage it.'

Mike Seaton
Principal King's College Doha

Mike is a senior principal at EduReach Education. EduReach is a global school operator whose team have opened and operated schools across three continents. Mike has been a school Principal for over 10 years including positions in the United Kingdom, China and The Middle East.

What work skills do you think will be most important or valuable as Artificial Intelligence continues to advance?

In the swift march of Artificial Intelligence, the debate surrounding the future of education is undergoing a profound transformation. While the development of knowledge, skills and understanding remains pivotal, the limelight is increasingly falling upon the importance of school children cultivating that character traits that will continue to distinguish them as uniquely human in an era dominated by automation.

How can we best prepare for the skills you describe above?

The EduReach family of schools is thus embracing a range of initiatives that go well beyond traditional academic pursuits to nurture the holistic development of our pupils.

For instance, the participation of many of our pupils in the Model United Nations initiative is not only sharpening their oracy skills but is also fostering their geopolitical empathy. By engaging in debates on global issues and negotiating solutions, our young people are learning to articulate their perspectives cogently while appreciating diverse viewpoints - a testament to the enduring importance of human diplomacy in an age of technological advancement.

We have also implemented a Kindness Pledge across our schools to inform the manner in which our children interact with one another, as well as stressing the importance of each pupil being kind to himself or herself.

This clear emphasis on the value of compassion is designed to instill in our students a deep-seated understanding of the interconnectedness of humanity. Daily acts of kindness are rewarded in our schools, whether it be lending a helping hand to a peer or practicing self-care, encouraging our pupils to embody the essence of what it means to be human - a quality that transcends the algorithms and data sets of AI.

Critical thinking is another cornerstone of our educational ethos, exemplified in initiatives such as interdisciplinary projects and problem-based learning. Through programmes like Destination Imagination, where our pupils work collaboratively in teams to solve open-ended STEAM challenges, they are not only engaging in the creative process but also learning to navigate ambiguity and persevere in the face of setbacks.

By grappling with real-world problems and exploring multiple avenues of solution, they hone their ability to ask better questions, devise innovative strategies, and embrace failure as a steppingstone to success. As they celebrate their achievements, whether in the form of a breakthrough solution or a valuable lesson learned, they cultivate a resilience and tenacity that will serve them well in an ever-changing landscape in which adaptability will remain 'front and center'.

In short, EduReach understands that while technology may evolve at breakneck speed, the essence of what it means to be human remains constant. As a global schools' group, we will continue to invest in the development of character traits that will stand the test of time, shaping not just careers but lives of purpose and meaning in this ever-changing world.

Nell Montgomery
CEO, Psychiatry UK

Nell is the CEO of Psychiatry UK, the UK's leading online psychiatric service. She is also a qualified Executive Coach at C-suite and Board level at Aesara Partners and for INSEAD's Global Leadership Group. Nell is a UKCP accredited psychoanalytic psychotherapist and has been involved in crisis situations and where mental health issues are present, attachment and relational issues in the workplace, Imposter Syndrone, as well as resilience and diversity issues at work. Nell is a member of UKCP, BACP and The Bowlby Centre. She is EMCC and ICF accredited.

After graduating from Cambridge with a double first in Social and Political Sciences, Nell joined Goldman Sachs. In 2001 Nell was Managing Director and member of the Board of Investec Securities UK where she led the institutional sales and trading side of the business.

What work skills do you think will be most important or valuable as Artificial Intelligence continues to advance?

After graduating from Cambridge with a double first in Social and Political Sciences, Nell joined Goldman Sachs. In 2001 Nell was Managing Director and member of the Board of Investec Securities UK where she led the institutional sales and trading side of the business. AI is revolutionizing every industry on the planet, and in the world of healthcare and psychiatry, it has already made significant breakthroughs. We believe AI will provide solutions to the ever-increasing demand for healthcare and will enable us to leverage doctors and clinicians to focus on the areas where they can add the most value, while removing much of the friction of administration and logistics.

Psychiatry UK is fully embracing AI to support our doctors and clinicians to improve the quality of the patient experience and effectiveness of clinician time. From providing effective treatment plans, to analyzing vast datasets and recognizing patterns to aid diagnosis, AI will be a game-changer. In fact, we are already using AI to deliver clinical letter writing, which can free up at least 20% of doctor's time to focus on their patients. That is a huge win when clinician time is so valuable, doctor capacity is limited and increasing numbers of patients require our intervention.

In the not-so-distant future, AI will become advanced enough to be able to support doctors in diagnosis and prescribing. However, at Psychiatry UK we don't believe AI will be able to replicate or replace the essential elements of the human-to-human interaction between patient and doctor, any time soon.

If anything, the skills needed from doctors and clinicians now requires more empathy, compassion, and critical thinking than ever before. For example, clinicians are responsible for helping patients navigate the inevitable trade-offs they face when making decisions about their treatment. All treatments can have unpredictable, positive, and negative effects, which varies for each patient. Navigating the decision of which drug to take will be less daunting for the patient if they are supported by a clinician who has a comprehensive understanding of both the positive and negative aspects of treatment. Therefore, only a doctor at this stage with empathy and compassion can sit down with a patient and guide them through all the possible side effects and advise on a human level, which treatment would work best for their specific needs.

Overall, human expertise is essential in interpreting AI-generated recommendations, making informed decisions, and providing compassionate patient care. As AI continues to advance, we will place an even higher value on those skills that only a human can provide.

How can we best prepare for the skills you describe above?

AI, and the skills to build, deploy and utilize it effectively and appropriately, need to be baked into the strategy and culture of your business. Therefore, continuous training and adaptation will be crucial – including understanding the limitations and potential biases of AI systems, as well as knowing how to interpret and integrate AI-generated insights to inform diagnosis and treatment plans.

As AI adoption accelerates, we will likely see an unprecedented transformation wave of upskilling and reskilling as organizations and professionals move to harness the opportunities provided by AI. Businesses will need to be forward focused in devising their resourcing plans, identifying technology talent at an early stage, and seeking to integrate more change and human resource experts into the workforce to help drive this wider transformation, whether this is changing traditional

career paths, evolving hiring practices, or leading to an evolution in processes and roles. As an already virtual and technology driven business, we are keenly aware of this.

AI will undoubtedly enhance the work of modern, mental health professionals, serving as a valuable tool for supporting diagnosis, treatment planning, and monitoring progress. However, it cannot replace the invaluable skills humans provide such as empathy and critical thinking, which are essential for psychiatry support – so enhancing these very human skills in doctors and clinicians will be essential. In summary, we believe AI is best used as a technology to enhance and assist human doctors, rather than to substitute them.

Phillip Souta
Global Director of Tech Policy
Clifford Chance

Phillip Souta is Global Director of Tech Policy within Clifford Chance's Tech Group, a cross disciplinary team of 600+ lawyers globally advising on Tech risk and opportunity.

He focusses on public policy and political risk in tech law and regulation, including AI, cybersecurity, privacy, online child safety, biometrics and IP, and provides strategic advice to clients across a range of sectors. He was named Risk Advisory Individual of the year in London. Phillip is a member of the Clifford Chance Political Change team and sits on the firm's Thought Leadership Board. He practices as a barrister qualified in England and Wales.

What work skills do you think will be most important or valuable as Artificial Intelligence continues to advance?

We are still in the very early stages of appreciating what impact AI will have on how we work. Beyond the fact that we know the impact will be transformative, there are questions it seems almost impossible to answer, but which we cannot ignore. What should we learn, and what should we teach for success in the workplace? Some might argue that there is nothing we can learn to do that AI will not be able to do in 10 years. That may be true, but in a world where human agency and flourishing will still be central, we must still work to become the best we can be.

I believe that the skills people will need to thrive are broad, not general. 15 years ago I studied Philosophy, Logic and Scientific Method. I was pretty sure this ranked as one of the more practically useless degrees I could do before I got to the serious business of law. I did it out of pure interest. I am now using what I learned about the specifics of applied ethics advising companies on AI, but more broadly, forensic, critical thinking, every day. That is a skill which can and should be taught. Critical thinking will be central in being able to direct the powerful AIs that will do most of the "doing" of the future – be it in coding, design, physical work, or intellectual work like due diligence in corporate transactions.

I also believe emotional and psychological qualities that allow people to flourish, and be happy, can and should also be taught. Resilience, empathy, the ability to be effective in social situations, to speak to small or large groups of people, to be honest and direct whilst being respectful and kind – are teachable skills. They will be essential in a world where human interaction may actually become more important. Much of what we do now in front of our computer screens will not be done by us in the coming years. The shape of professional life will change, and that will bring uncertainty – which is stressful, so we need to practice resilience – but is also likely to mean that human contributions are more to direct what a business does, to set goals and strategies with other people, working with AIs.

How can we best prepare for the skills you describe above?

Companies and schools can support people by helping them to develop these skills. They can also do the hard work of making their people and students as technologically adept to use AI as possible. Dealing with people well and getting the most out of ourselves and our teams is a skill – getting the best out of AI is no less of a skill and should be seen as no less important.

Piers Linney
Executive Chairman & Co-founder
Implement AI

Piers Linney is an entrepreneur, investor, and former Dragon on the prime-time BBC show Dragons' Den (Shark Tank in the USA). With a background in law and investment banking, Piers has established himself as a leading figure in the UK business world, particularly in the technology sector.

Piers is a LinkedIn 'Top Artificial Intelligence Voice' and is the Executive Chairman and Co-founder of Implement AI which supports businesses to unlock the power of AI. He has sat on the board of Nesta, the UK's largest (£600m) innovation foundation, and British Business Bank during the roll-out of £90bn of Covid support. Piers is also an advocate for diversity in business and sits on Sky's Diversity Advisory Council. He was a pioneer in the UK cloud computing sector and sat on the boards of the UK Cloud Industry Forum and TechUK.

What work skills do you think will be most important or valuable as Artificial Intelligence continues to advance?

What work skills do you think will be most important or valuable as Artificial Intelligence continues to advance?

In the swiftly evolving landscape of Artificial Intelligence (AI), identifying the skills that will remain invaluable is crucial. The progression from AI-assisted to AI-first workplaces necessitates a blend of adaptability, creativity, emotional intelligence, technological literacy, and strategic thinking to navigate the future job market effectively.

Adaptability and Lifelong Learning: The cornerstone of future employability is adaptability. As AI automates routine tasks, the ability to learn new skills and pivot in response to changing industry demands becomes indispensable. This encompasses staying informed about technological trends, understanding AI's role within one's field, and seeking out opportunities for continuous skill development.

Creativity and Problem-Solving: Despite AI's ability to generate content and solve structured problems, the uniquely human capacity for creativity and complex problem-solving is likely to attract a premium, as will human (analogue) experiences. In industries driven by innovation and strategy, the ability to conceive novel ideas and navigate uncharted challenges will remain a competitive edge.

Emotional Intelligence (EI): Emotional intelligence—the skill to perceive, understand, and manage emotions—retains its significance in the AI era as IQ, or intelligence, is commoditized and its cost tends towards zero. In professions that demand empathy, leadership, and nuanced communication, the depth of human emotion and connection offers a clear advantage over AI's analytical capabilities.

Technological Literacy: Understanding the fundamentals of technology and AI is crucial, even as the landscape shifts towards more intuitive AI interfaces and code is replaced by the English language. Technical literacy empowers professionals to collaborate effectively with AI, leveraging its strengths to amplify productivity and creativity while remaining vigilant of ethical considerations.

Strategic and Critical Thinking: In an uncertain future shaped by AI, the ability to think strategically and critically is invaluable. Professionals who can anticipate future trends, assess the broader implications of AI integration, and make informed decisions will be pivotal in steering their organizations towards sustainable success.

Fine Motor Skills: Embodied AI (robots) and the replacement of physical labor will take longer to become cost-effective due to the costs of physical machines. Trades and jobs requiring fine motor skills will be harder for machines to replicate. Hairdressing is likely to be a safe career for some time.

The skills that amplify human potential beyond AI's reach will remain in high demand. In the future, trades that require a human touch that have not been highly prized in the past, compared to cognitive output, may become very well-paid. In the longer run, especially with the arrival of artificial general intelligence (AGI) that can learn exponentially and design cheaper robotics, the list would need to be reviewed.

How can we best prepare for the skills you describe above?

Private, public and third sector organizations will play a pivotal role by fostering a culture of continuous learning and innovation. Investing in employee development through training programs, workshops, and access to learning resources can enhance adaptability and creativity. Businesses should also encourage cross-disciplinary projects that allow workers to develop and apply new skills in diverse settings, promoting a more resilient workforce. Talent acquisition strategy will drive a need to augment workforces with AI to automate the mundane so that talent can focus on more meaningful work.

Change in education is slow, but it will become important that education is re-invented and curricula revised to reflect the changing skills landscape and AI augmentation. This includes integrating AI and technology education across disciplines, emphasizing critical thinking, creativity, and emotional intelligence in teaching methods, and fostering a problem-solving approach to learning. Partnerships with industry can provide practical experience and insight into the evolving demands of the job market.

For individuals the time to review your career plan is right now, as noted in my recent post on this topic.

Sharath Jeevan OBE
Executive Chairman, Intrinsic Labs
Author of "Inflection" & "Intrinsic"

Sharath (https://www.intrinsic-labs.com/about) is a globally recognized authority on navigating leadership inflection moments. His global clients include pre-eminent global corporations, public sector and nonprofit organizations. Sharath is the author of the books "Intrinsic" and "Inflection". He teaches leadership at both Oxford and Cambridge universities.

What work skills do you think will be most important or valuable as Artificial Intelligence continues to advance?

It's clear that the human elements of Mastery are going to grow significantly in terms of labor market value. These human elements include classic definitions of communication, collaboration but also need to include the areas of self-awareness, reflection and the ability to reinvent ourselves in response to changes in organizational needs and labor market conditions. It also requires understanding of how to nurture our own and others' potential and how to stay motivated and resilient through ups and downs and reinvention during our career inflection moments. Finally, it needs us to build strong social networks horizontally and vertically ideally across different sectors and backgrounds.

How can we best prepare for the skills you describe above?

We need to build these elements into how we develop people all the way from school to the workforce. It requires us to create genuine reflective spaces where workers or students can take time to think about these questions and share ideas and thoughts with others and support each other. I am building a version of a programme like this at Said Business School at Oxford University for example.

Rob Nail
Strategy and Leadership Coach and Advisor

Rob is an innovation consultant, leadership coach, investor, and wannabe surfer, but mostly, a proud husband and father. Previously, he Co-founded Velocity11 in 1999, building robotics and automation for drug discovery and cancer research - acquired by Agilent Technologies in 2007, where he attempted to be a catalyst for change at a big company. He gave up in 2009 to go surfing.

Rob came back to change the world as Associate Founder and the former CEO of Singularity University (SU). Today he continues as faculty for SU, leads the technology innovation curriculum at the Nomura SRI Innovation Center (NSIC) and is a Venture Partner on AI Safety at Lionheart Ventures. His personal mission is to spread hope for an amazing future through inspiring stories, credible roadmaps, and collaborative networks.

What work skills do you think will be most important or valuable as Artificial Intelligence continues to advance?

How can we best prepare for these skills?

Embracing the AI Revolution with a Mindset Shift

Although the capabilities of artificial intelligence are difficult to keep up with today, we should assume that pace of technological progress will continue to accelerate and will ultimately reshape all businesses, jobs, and society itself. Corporate leaders, educators, and policy makers must prioritize adaptability and adopt a new mindset to navigate the disruptions to come.

Be Better Humans, not Better Robots

A core mindset shift required is a reevaluation of what constitutes “human” work. Instead of fearing that AI will "steal" our jobs we can recognize that many of those jobs or aspects of those jobs weren’t meant for us in the first place. Tasks that prioritize efficiency and productivity, optimize repetition, or are inherently “dull, dirty or dangerous”, are easily considered as jobs for robots but what about creative tasks or project management? The fear of "losing jobs to AI" has overshadowed the discourse, whereas a nuanced reflection of what we spend time on and why, could lead to new outcomes. New horizons of opportunities open up as we turn over work to the robots and begin to explore what is the next work to be done.

What are the lasting human endeavors?

As an exercise to understand what skills are needed for the future, let’s imagine a future, perhaps 20 or maybe even 100 years from now, where we reach an “event horizon” or “singularity” period where technology can perform all physical and cognitive tasks faster, better, cheaper, and safer than humans. By taking a huge leap of faith, let’s assume (BIG assumption) that we take advantage of these capabilities and create a world where technology supports all of our basic needs (including incredible AI education and healthcare) which is accessible to all, such that no one needs “jobs” to survive. What do we do then?

In this future scenario, there are three domains of human endeavors that last:

1. Empathy – Activities that revolve around human connection, such as nursing and caregiving, will remain quintessentially human.

2. Entertainment – The arts, gaming, and creativity will flourish, with humans seeking innovative ways to engage and delight.

3. Exploration – The eternal quest for knowledge, from the cosmos to the core of human consciousness, as well as the classic questions of our existence and the nature of reality will continue to drive our spirit of discovery.

While this “Star Trek” fantasy may seem unlikely, it could help us to identify the enduring human roles and tasks that AI cannot easily replicate or that inherently bring us joy and satisfaction. We can then gracefully turnover all the other “robot jobs” to the robots and cultivate workspaces and society where human ingenuity, happiness, and empathy are the most valued assets. In the meantime, leaders must embrace the transitions to come by fostering a culture of continuous learning and adaptability

Robert Buckland
Senior Advisor
Engine AI

Robert Buckland is a senior adviser to Engine AI. Engine AI enables Enterprises to extract maximum value from their data, providing them with the tools needed to power analytics and AI applications. Robert was previously Chief Global Equity Strategist at Citigroup.

What work skills do you think will be most important or valuable as Artificial Intelligence continues to advance?

How can we best prepare for these skills?

I put Citi's two questions into the leading AI chatbots. They gave very similar, yet eminently sensible answers: be digitally literate, leverage human-AI collaboration, hone your critical thinking, develop your human-centric skills, be a life-long learner. It was as if the robot students were all answering the same question from the same robot text-book, which of course they were. A very solid B+, but no more .

Then I asked the same questions of my colleagues around the Engine AI office. These are people who spend every day on the cutting edge of what AI can do. Their answers were much more diverse, and interesting. This is what they said:

Whatever skillset you decide to build, don't ignore the potential impact of AI. For example, studying languages helps to build valuable analytical and critical thinking skills. Reading classic foreign literature helps build emotional intelligence, raise cultural awareness and improve communication abilities. But don't expect to get a job as a translator afterwards.

Alternatively, you could choose a profession which is less threatened by AI, maybe an electrician or a plumber. But, even here, you will probably need to use AI to compete with the other electricians and plumbers.

AI is a tool. Just like Microsoft Word or Excel are tools. All help to improve productivity. Anybody who doesn't use these tools will soon be left behind. Nowadays, Word or Excel skills are necessary but not sufficient to succeed in most professions. AI will be no different.

More vocational university courses should increasingly include training in AI. That includes Law, Medicine, Finance, Engineering. Don't pay up for an expensive degree which doesn't help you understand how AI could be deployed in your chosen profession. And stay in touch with developments once you do enter the job market. If you are going to be made obsolete, then you should at least be able to see it coming and do something about it. Keep iterating your skills towards new growth areas and AI augmentation rather than substitution.

Some professions will need to rethink their entire career progressions. When I started as a trainee equity analyst, it was my job to do mundane, generic, repetitive work. That was the price I paid to learn more valuable skills from my bosses. Eventually, those learnt skills allowed me to become a boss, and I then employed the next generation of trainees. But AI is very good at the mundane, generic, repetitive work. Current bosses don't need to employ an army of trainees. This offers clear opportunities to cut costs and enhance productivity, but I can't help wondering where the next bosses will come from.

Roger L Kneebone
Professor of Surgical Education and Engagement Science, Imperial College London

Roger is a clinician and educationalist who leads the Centre for Engagement and Simulation Science at Imperial College London and the Royal College of Music–Imperial Centre for Performance Science. His multidisciplinary research into contextualized simulation and embodied knowledge builds on his personal experience as a surgeon and a general practitioner and his fascination with domains of expertise beyond medicine. Since 2019 he has been the fourteenth Professor of Anatomy at the Royal Academy of Arts. From 2018-2021 he was Gresham College Visiting Professor of Medical Education.

Roger's book Expert: Understanding the Path to Mastery was published by Penguin in 2020 (paperback edition 2021) and his fortnightly iTunes podcast Countercurrent features exploratory conversations with unconventional people whose interests and careers cross traditional boundaries. www.rogerkneebone.co.uk

What work skills do you think will be most important or valuable as Artificial Intelligence continues to advance?

How can we best prepare for these skills?

The ability to work with other people in real time (whether in person or online) will remain critical. High quality work demands emotional intelligence, physical skill, persistence, good judgement and genuine empathy. We cannot take these for granted, and we need to provide the conditions for them to develop and flourish.

The acquisition of expert skill is a long process. The traditional guild system provides a handy reference point (though its descriptive terms are no longer gendered). First you spend years as an apprentice. You learn to do things as they are already done, whether you like it or not. Next you become independent, using those skills to make your living as a journeyman. Finally you become a master, passing on your knowledge and wisdom to others following in your path.

During those apprentice years, much of your work entails repetitive tasks - dull, tedious and of little apparent value at the time. A machine or AI could do them equally well and often better. Outsourcing such tasks makes sense from the perspective of the final product and business economics. But that overlooks the value to you of doing this apparently mindless work, because it's only through prolonged repetition that you develop your awareness of excellence, recognize variety and nuance within your materials, and learn to work with other people - whether you get on with them or not.

Alongside those elements of our work we can and should outsource to AI, we must highlight the human capacities we wish to retain. We need to nurture those aspects of expertise that enable people to respond, adapt to and exploit AI as it becomes increasingly powerful. These elements include coping with boredom, working with people of all kinds, and retaining our humanity in an unstable world.

These skills are especially important in professions such as business, nursing, medicine and teaching, where interpersonal skills are pivotal. In my own work as a clinician, diagnosis and treatment are being transformed by AI. Yet it was only through an arduous apprenticeship that I learned the human skills of 'reading' and responding to vulnerable people - a process that cannot be replaced by technology. Competence and empathy require the ability to listen to the meaning 'behind' what people say and interpret their wishes or fears. AI can present a convincing simulacrum of expertise and concern but cannot offer genuine empathy or wisdom.

The exciting new vistas which AI offers must be balanced by those human skills that are built on a genuine interest in others and a care for their wellbeing. These take years to develop, and there are no short cuts. There is a danger of losing these abilities without noticing their loss. People and AI must work in partnership, not opposition.

Dr Tracy Rea
Consulting Director
Gobeyond Partners

Dr Tracy Rea's career history to date spans over varying industries. Tracy currently works as the EMEA Banking Lead and Consulting Director for Concentrix and is Chair of the Board Parkour UK. Previously she held the role of European HR Director at Laing O'Rourke and Head of Business Operations at Lloyds Banking Group.

The early days of Tracy's career were grounded within high performance sport, as Performance Director of Scottish Gymnastics in the lead up to the 2014 Glasgow: Commonwealth Games, as well as competing internationally (in athletics) herself. Tracy's PhD examines the concept of talent transfer within sport, and this was the stimulus for Tracy to try and prove the hypothesis herself across industries and roles. Tracy has also written an Exec MBA module on Global Talent Management and is regularly presenting/lecturing in her specialist area.

What work skills do you think will be most important or valuable as Artificial Intelligence continues to advance? How can we best prepare for these skills?

I am a passionate advocate of Talent Transfer and have tested the hypothesis myself of moving across industries and roles (please see bio). With all of these roles, I have utilized the Talent Transfer Lifecycle Model to prove that transferable skills can be accumulated to create a portfolio of skills, knowledge and experience, that brings diversity of thought by cross fertilizing ideas between sectors and roles.

The concept of Talent Transfer applies on a macro level to organizations that are embracing AI and challenging themselves about how they can reskill and upskill employees to enable them to adopt this tool and develop skills by incorporating into 'new ways of working', as it continues to advance. As well at the micro level: individuals wanting to adopt the tools available and transfer their talent to more in demand roles or additionally upskill themselves to be more employable and competitive. Although building your AI skill set doesn't mean abandoning your current expertise; rather it can complement and enhance your existing skill set[24].

Skills of the future are always challenging to anticipate but the additional complexity of AI means that predicting sustainable human skills of the future will be even more multi-faceted. Organizations need to be purposeful in their planning to upskill and reskill employees and potentially target certain behaviors as they can train for skill (and hire for attitude). According to Microsoft, 82% of leaders globally said employees will need new skills in an 'AI powered future.'

The report found that the three top skills, leaders believe are essential are analytical judgement, flexibility and emotional intelligence[25]. And employees need to be flexible in their willingness and ability to adapt to changing job roles (having a growth mindset), and taking on a continuous/lifelong learning mindset, which will be key to career success. Ikea's CHRO, Ulrika Biesert, recently shared in an interview: "We're automating most of our processes, but we're also retraining our people." 8,500 IKEA call center workers have been retrained as remote interior designers and employees in stores are being asked to work across multiple departments. Biesert says: "We need to get better at reskilling and upskilling, but this also requires our co-workers to have a little bit more of an open mindset that it's okay to learn."[26]

My experience of people that have been successful in transferring their talent is because they were open to new learning and they were curious. But they were also given the right environment and support to succeed. Employers need to create capacity to enable colleagues to learn rather than expecting this to be done 'side of desk' or in their personal time.

And giving colleagues access to learning platforms is a good start, but they also need the time to apply this in their day jobs and to adopt this new way of working, which of course will take time and investment. It will also be received as a powerful retention strategy. Abby Pinto (L&D at Thomson Reuters) has adopted AI learning days for colleagues and said: "We wanted to carve out the time and space for employees to build knowledge and skills."[27] If an organization wants to remain competitive, then more opportunities like this example will be required to embed the adoption of AI.

[24] https://www.cnbc.com/2023/04/13/
[25] https://www.cnbc.com/2023/04/13
[26] Sam Forsdick (April 2024 in raconteur.net) in an interview with IKEA's CHRO Ulrika Biesert: https://www.raconteur.net/talent-culture/
[27] https://www.linkedin.com/

Ying Zhou
Professor of Human Resource Management
Director, Centre for the Future of Work
Surrey Business School

Ying Zhou is Professor of Human Resource Management and Director of the Future of Work Research Centre at the University of Surrey. Her research is focused on job quality, occupation, and employee well-being. Her research has been presented to the UK Cabinet Office, House of Commons, OECD, European Commission, European Council and cited in UK, French, Welsh and EU policy documents. Her research appears in leading academic journals. Ying is a recipient of the Surrey Business School Impact Award and the Academy of Management Overall Best Paper Award. Ying received her MPhil and DPhil in Economic Sociology from Oxford University.

What work skills do you think will be most important or valuable as Artificial Intelligence continues to advance?

Three broad types of skills are likely to see growing demand in anticipation of the 4th industrial revolution. The first is digital skills. This includes the ability to work with AI, machine learning, robotics, and other smart digital technologies. A recent OECD report suggests that although AI-related online vacancies currently comprised less than 1% of all job postings in 14 OECD countries, they have increased by 33% between 2019 and 2022, with machine learning seeing a particularly marked growth[28]. As a general-purpose technology, AI will transform a wide range of occupations in the coming decades.

The second is advanced cognitive skills, such as solving complex problems, engaging in critical thinking, analyzing and interpreting data, and generating innovative ideas and strategies. For instance, with the advent of large language models such as ChatGPT, critical thinking is increasingly required to distinguish between credible and unreliable sources of information and to understand and contain the risks of AI.

Last but not least, the demand for interpersonal or socioemotional skills is on the rise. Skills such as persuading, negotiating, public speaking, counselling, advising, and caring will become increasingly valuable. Such competencies are unlikely to be fully automated in the near future, not just due to technical challenges but also owing to the fundamental human need for fulfilling social connections.

How can we best prepare for the skills you describe above?

To effectively cultivate these in-demand skills, a multifaceted approach is essential. Educators and employers should deliver training in a more flexible way to meet the increased need for hybrid working in the post-pandemic world. Additionally, policy makers are urged to explore strategies to enhance the relevance and affordability of training programmes.

Beyond structured training, there has been a growing recognition of the importance of informal learning. Effective work performance requires more than the possession of formal knowledge because substantial practical expertise is acquired through experience on the job and the sharing of knowledge among co-workers. Jobs should be designed in ways that encourage workers to use and share their knowledge and skills. Research based on the European Working Conditions Survey suggests that high involvement management (characterized by high task discretion and organizational participation) is strongly related to the prevalence of informal learning. Employee involvement, on its own, accounts for a quarter of the variance in informal learning in Europe[29].

In short, the best skills strategy will combine formal training and informal learning to encourage individuals to develop skills effectively, use these skills in their everyday work, exercise initiative to acquire additional skills when needed, and share their knowledge and expertise with their co-workers.

[28] Emerging trends in AI skill demand across 14 OECD countries. OECD Artificial Intelligence Papers. October 2023, No.2.
[29] Gallie D, Zhou Y (2020) Employee Involvement, Work Engagement and Skill Development. Dublin: European Foundation for the Improvement of Living and Working Conditions.

Durable Human Skills of the Future

What Machines Can't Master

In the following chapter, we want to discuss skills unique to humans. The term soft skills started in the 1960's by the US Army to denote skills that did not use machinery. While soft skills are still often used, they do not capture the importance and range of human skills. Other human skills terms get used - people skills; transferable skills; power skills; interpersonal skills; non-technical skills; 21st Century skills; or durable skills - but they all mean slightly different things.

We use the term Durable Human Skills (DHS), to denote the exact set of skills we want to discuss. In essence, we are referring to the group of skills that would be difficult for AI to replicate, skills that would stand firm in an era where many cognitive skills and even skills we previously thought as being unique to humans are being encroached on and eroded by AI.

In our 2019 Technology at Work 4.0 Citi GPS report we included views on skills that would be important as AI advanced. In the conclusion we summarized these as the 4C's or Creativity, Communication, Collaboration and Critical Thinking. Since then however new AI models are encroaching on Communication (ChatGPT already producing 1bn words per day[30]) and Creativity (such as image models like Dall-E or Sora). Given the question of what DHS are going forward is critical and gets asked often when discussing the Future of Work we explore the topic in more detail.

A Qualitative Analysis of the Expert Interviews

The interviews from Chapter 2 offer a wide range of perspectives on the question "What work skills do you think will be most important or valuable as Artificial Intelligence continues to advance?"

Some contributors hold a more conservative view on the changes AI can make, arguing that AI is just a tool like Microsoft Word and Excel, and all we need to do is to learn how to use it wisely. Whereas some express more aggressive views on the AI-dominated future, suggesting that it will disrupt everything we know, reduce the value of education significantly and substitute many work tasks in the future.

We therefore performed a qualitative semantic analysis on these interviews to seek common ground, divergent views and surface the hidden messages to arrive at the high-level takeaways from Chapter 2.

[30] https://www.independent.co.uk/tech/chatgpt-openai-words-sam-altman-b2494900.html

Background

Looking at the background of our interviewees, nine of them are from the public sector while the other 19 are from the private sector (Figure 10). To break things down further, 5 of them are from a research background, 4 from coaching, 4 from HR Tech, another 4 from consultancy, 3 from education. Combined together, these interviews offers a unique collection of perspectives from policymakers, academic researchers, frontline education professionals, AI professionals, consultants, executive coaches, HRs, investors and companies from various industries at the forefront of the AI transformation.

Figure 10. Summary of Interviewee Background

Sector	Industry	Number of Contributors
Public	Research	5
	Education	3
	Government	1
Private	Coaching	4
	HR Tech	4
	Consultancy	4
	Investment	2
	Media	1
	Banking	1
	Health & Wellness	1
	Law	1
	AI	1

Source: Citi Global Insights

Note that many of the interviewees come from diverse backgrounds, for example switching between government, academia, investing or coaching into private companies. For the sake of simplicity, we only include one of their many roles throughout their career journey, either their current role or the one that's most pertaining to the interview.

With all the different lenses provided by the interviewees through which we can catch a glimpse of the AI future, we can hopefully consolidate different viewpoints and paint a holistic picture of what an AI future would look like with our qualitative analysis below.

DHS That Matter in an AI Age

A key takeaway from our analysis is that Heart skills (communication, emotional intelligence, empathy, H2H collaboration) are mentioned significantly more than other skills (Figure 11).

Communication is mentioned by 18 out of 28 interviewees, or 64%. It may have different names when mentioned, including "negotiation", "the ability to articulate oneself in social situations" or "oracy skills". Digital literacy ranks the 3rd with 15 mentions, or 54%.

Other cognitive skills like critical thinking, creativity and problem solving are also mentioned quite often as the skills that will gain more importance in an AI world.

Figure 11. Mentions of Different Skills (as % of total interviewees

Skill	%
Communication	64%
Emotional Intelligence	57%
Digital Literacy	54%
Empathy	54%
Critical Thinking	46%
H2H Collaboration	43%
Problem Solving	43%
Creativity	39%
Adaptability	32%
Leadership	32%
Dexterity	25%
Learning Ability	25%
Resilience	21%
Perspection	21%
H2M Collaboration	11%
Ethics	11%
Entrepreneurship	7%
Self-Awareness	7%
Organisation	4%

Source: Citi Global Insights

In addition, adaptability and learning stand out as core skills mentioned by many interviewees. This is not captured to the full extent by the above table possibly because they are mentioned with alternative phrases or just embedded within a general tone.

Further breaking down the number of mentions by sector, we can see that both private and public sides agree on most of the skills that will matter more in an AI age: communication; emotional intelligence; literacy and empathy. The private sector emphasizes more in the Change category, including adaptability and learning ability (Figure 12), whereas the public sector underscores more on Hand skills (dexterity) and Cognitive skills like problem solving (Figure 13).

Figure 12. Mentions by the Private Sector (%)

Skill	%	Δ
Learning Ability	32%	7%
Adaptability	37%	5%
Organisation	5%	2%
Critical Thinking	47%	1%
Emotional Intelligence	58%	1%
H2M Collaboration	11%	0%
Ethics	11%	0%
Resilience	21%	0%
Perspection	21%	0%
Leadership	32%	-1%
H2H Collaboration	42%	-1%
Digital Literacy	53%	-1%
Empathy	53%	-1%
Communication	63%	-1%
Entrepreneurship	5%	-2%
Self-Awareness	5%	-2%
Problem Solving	37%	-6%
Creativity	32%	-8%
Dexterity	16%	-9%

Source: Citi Global Insights

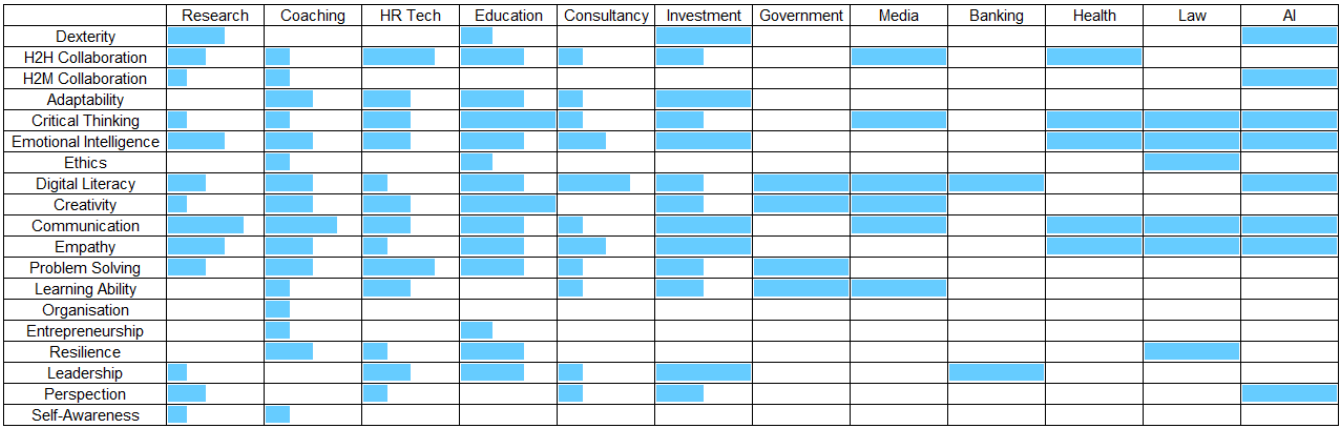
Figure 13. Mentions by the Public Sector (%)

Skill	%	Δ
Dexterity	44%	19%
Creativity	56%	16%
Problem Solving	56%	13%
Entrepreneurship	11%	4%
Self-Awareness	11%	4%
Communication	67%	2%
Digital Literacy	56%	2%
Empathy	56%	2%
H2H Collaboration	44%	2%
Leadership	33%	1%
Resilience	22%	1%
Perspection	22%	1%
H2M Collaboration	11%	0%
Ethics	11%	0%
Emotional Intelligence	56%	-2%
Critical Thinking	44%	-2%
Organisation	0%	-4%
Adaptability	22%	-10%
Learning Ability	11%	-14%

Source: Citi Global Insights

Figure 14 shows the importance of each DHS by industry as measured by the number of mentions over the number of interviewees from that specific industry. More blue filling the cell, means the more important that specific DHS is to the industry. We can see that for generic industries, more DHS tend to be mentioned (e.g., many blue fillings for industries like research, coaching, HR tech, education, consultancy and investment). Whereas for specific industries, only the DHS relevant to that particular industry tend to be mentioned (less blue fillings for industries like media, health, banking, law and AI).

Figure 14. Importance of Each DHS by Industry

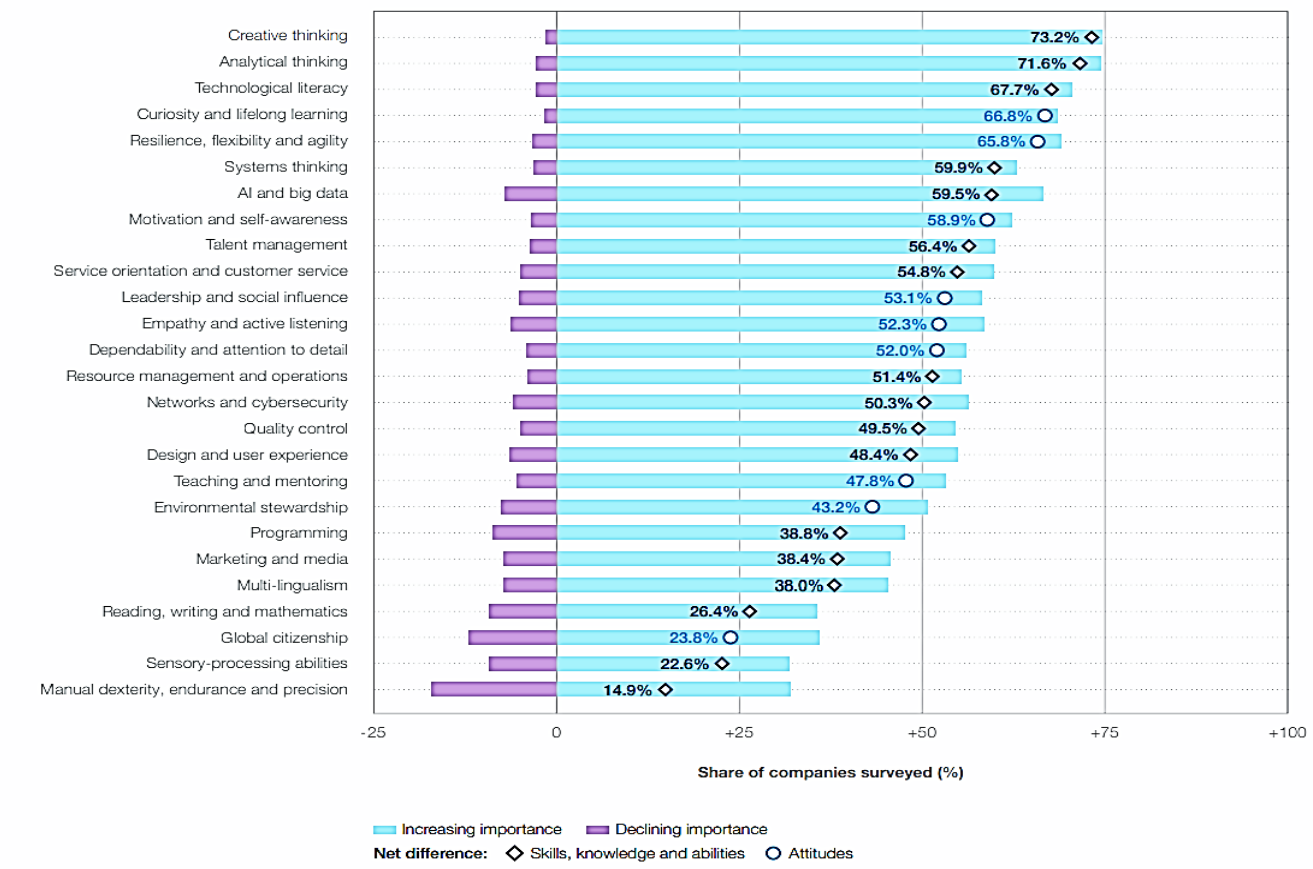


Source: Citi Global Insights

Three Categories of DHS

We note the findings above have similarities to those from the World Economic Forum analysis shown in Figure 15.

Figure 15. Skills on the Rise 2023



The Future of Jobs Survey uses the World Economic Forum's Global Skills Taxonomy. The share of companies which consider skills to be of stable importance to their workers is not plotted.

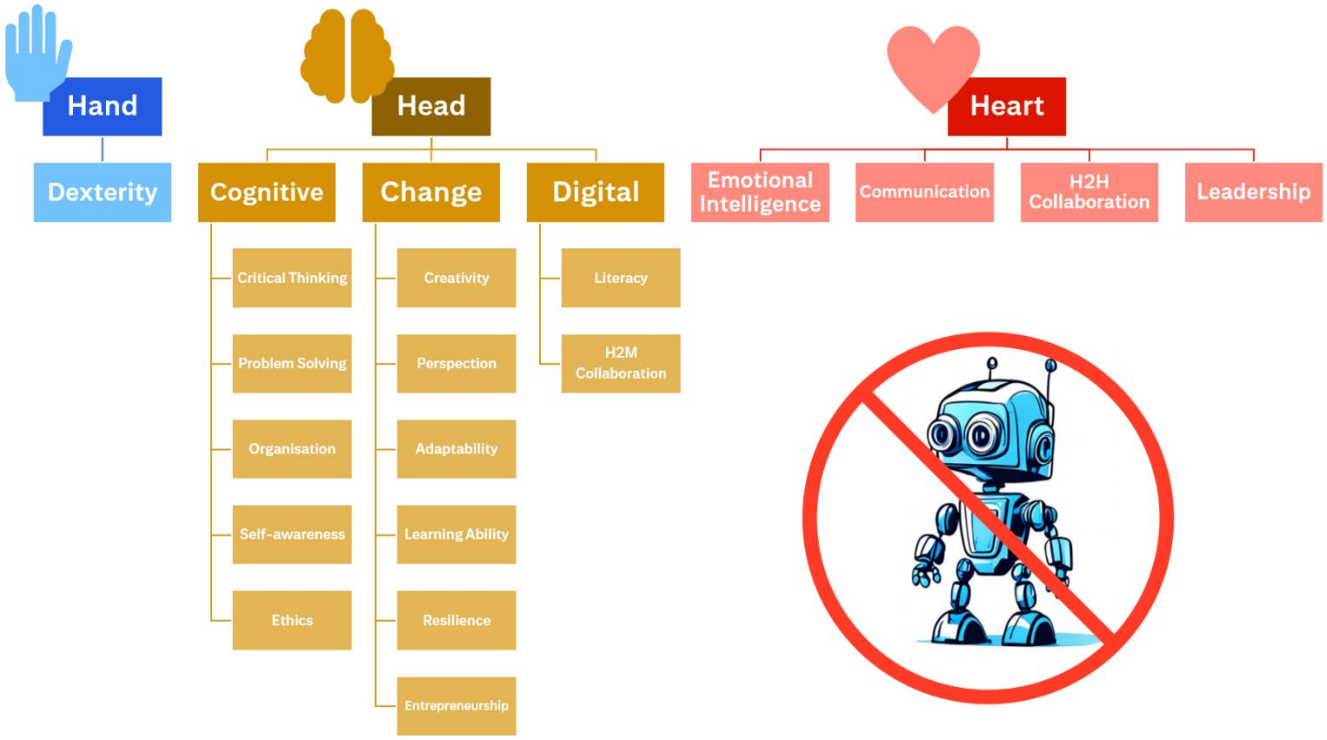
Source: World Economic Forum, Future of Jobs Survey 2023; International Labour Organization, ILOSTA

We also note that skills analysis can get very complicated – LinkedIn's skill taxonomy contains 41,000 skills at the last count.[31] Given there are many skills within the DHS bucket, we have arranged them in three primary categories: Hand, Head, and Heart, as illustrated in Figure 16. Many blue-collar skills like dexterity fall under the Hand category. Human-centric skills like empathy, communication, human-to-human (H2H) collaboration and leadership fall under the Heart category.

The Head category has three subcategories: Cognitive, Change and Digital. The Change section includes skills like creativity and adaptability. The Cognitive section includes skills like critical thinking and organization. The Cognitive section includes skills like literacy and human-to-machine (H2M) collaboration.

[31] Why It's Important to List Skills on Your LinkedIn Profile

Figure 16. DHS by Category



Source: Citi Global Insights

For clarity we unpack the skills outlined in Figure 16 below.

Hand

- **Dexterity** – for many hand roles computers will not be able to achieve human like levels of performance within the next few decades at a low enough cost to substitute human jobs. Computers are making progress in several areas, such as keyhole surgery, picking fruit, or driving cars, but humans will retain competitive advantage in many trades (eg electrician, plumber, gardener, hairdresser), or areas of hospitality (eg cleaning a table), or caring (eg nursing). As Hans Moravec, professor of robotics and AI at Cargnie Mellon University noted in 1980, computers can beat humans in intelligence (eg chess) but fail to have the mobility of a young child (eg moving chess pieces). Moravec's paradox should protect many roles that require Dexterity for many years to come.

Heart – these skills are often the most difficult for computers to replicate.

- **Communication** – an increasing portion of human work will be interacting with people, so interpersonal communication skills, such as high-end customer service, will be important. Presentation skills and non-verbal communication help story-telling and engagement. While salespeople help persuade others, communication also includes active listening and empathy, negotiation and conflict management.

- **Collaboration** – this includes human-to-human (H2H) collaboration, teamwork, mentoring and coaching. Network specialists will help connect people, including interdisciplinary and intra-cultures. H2H relationship building will become more valuable as digitization continues.

- **Leadership** – this will include motivation and mattering skills, as well as social influence, critical thinking, conflict resolution and holding people to account.

- **Emotional Intelligence** – the ability to understand and manage your own emotions, as well as the emotions of others. This includes empathy, which is the ability to understand how others feel. EI also includes compassion. This skill links to several other heart skills.

Head – Higher Cognitive Skills – while AI will be able to take on more cognitive tasks, a strong list of higher cognitive areas will remain important and valued.

- **Critical thinking** – this includes asking the right questions, judgement to make informed decisions, recognizing ethical or risk issues, understanding ambiguous situations or the nuances of social and cultural factors. However, there is a danger that AI reduces our need to think, and this enfeebles us - we already outsource navigation to Waze, use auto-complete for words, or translation tools. AI may get smarter as we get dumber. And while knowledge may be instantaneously accessible and become a commodity, it is worth heeding Stephen Hawking's warning that "the biggest enemy of knowledge is not ignorance, but the illusion of knowledge." Critical thinking will be…critical.

- **Problem Solving** – this includes finding solutions to challenges and organising a plan of action.

- **Organisation** – dependability and attention to detail, ranks sixth in the WEF rankings. While computers can surpass us in this area, it extends to planning, delegation and execution, time management and self-control. In a world of information overload with machines battling to hijack your attention (weapons of mass distraction), where your attention goes your time flows. Organisation can also include understanding and following procedures and the nuances of compliance related matters.

- **Self-awareness** – the ability to understand your own strengths and weaknesses will be important for making informed decisions about your future. This relates to motivation, or understanding what drives you at different stages of your life. This in turn relates to what you find meaningful, purposeful and 'mattering' - the difference one seeks to make in the world.

- **Ethics** – a danger of mass AI content production is trust falls in society, making trusted brands more highly valued. Ethics also includes moral choices in which only humans should decide.

Head – Change Skills – this is the longest list of skill categories in the illustration in Figure 16. As Marshall Goldsmith notes in Chapter 2, change is hard, and we need to get better at it.

- **Creativity** – the ability to develop and implement new ideas, new R&D, and new innovations. Humans can be curious, can wonder with imagination, brainstorm, grasp abstract concepts, think outside the box and make intuitive leaps to solve problems. People can handle ambiguity and uncertainty better than AI. While our experts took difference stances on creativity, with new AI tools able to proliferate prototypes (eg via Digital Twins) or hallucinate to create new ideas, Carl Frey notes in Chapter 2 AI tools are likely to amplify human creativity, not substitute it.

- **Perspection** – the mental process of evaluating future possibilities and using these projections to guide thought and action[32]. Computers will be better than humans at understanding past knowledge and present data. Humans will hold a competitive advantage in looking at the future. This skill can position us ahead of change and help in jumping to new jobs.

- **Adaptability** – the ability to adapt to change. We do not know all the skills that will be needed ahead, but as we highlighted in Technology at Work 4.0 that AQ (Adaptability Quotient) could trump EQ and IQ in an AI world (ie AQ>EQ>IQ). As Charles Darwin noted "It's not the strongest of the species that survives, nor the most intelligent that survives. It is the one most adaptable to change."[33] In reality, behavioural change is hard for humans and transformer technology and networked computers may be able to change quicker than we can, but adapting will need to be a meta-skill in a world of constant change.

- **Resilience** – while this could be a skill under adaptability, it is important enough to stand alone. The ability to bounce back from setbacks and challenges is important. This includes viewing setbacks as learning opportunities and actively seeking growth challenges to move forward. Or asking for help when needed. Resilience also includes git, fortitude, a growth mindset, emotional stability and regulation, mental wellness, openness to challenge and feedback.

- **Learning to learn** – is an increasingly important skill in our changing world, where workers need to reinvent themselves. The school system was born out of the Industrial Revolution, tertiary education ballooned in the Knowledge Economy and now quaternary education (post graduate) will be needed for lifelong learning. Computers can also do well at learning - we now have self-learning AI and networked computers that transmit new learning instantly - so our learning skill needs to be focused either in change areas or areas where humans have competitive advantage. Employees will want evidence of learning-ability. They will hire on what you could learn, rather than what you have learnt. This includes curiosity. Given there is a danger that AI dilutes our curiosity, by feeding us rapid answers to everything, note Albert Einstein's words - "I have no special talent, I am only passionately curious."[34]

- **Entrepreneurship** – this includes initiative taking and change making, but also a commercial and balanced risk-taking mindset. There will also be a need to understand the customer and bring new innovation solutions to market in an economic and responsible way.

Head – Digital Skills – one of the most emphatic suggestions from the experts in Chapter 2 was the necessity for many people to work with AI.

- **Digital literacy** – the ability to understand digital tools and technologies. Digital literacy will be increasingly important in an AI world, just as the 3 Rs (Reading, wRiting, aRithmetic) were in the 19th century. AI isn't going to replace people, but people who use AI are going to replace people who don't. Note it is estimated that 2.7bn people still do not have access to the internet today.[35]

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[32] Kellerman, G.R. and Seligman, M.E., 2023. *Tomorrowmind: Thriving at work with resilience, creativity, and connection—Now and in an uncertain future*. Simon and Schuster.

[33] https://www.yourdictionary.com/articles/charles-darwin-quotes-life-contemplate

[34] https://www.inc.com/marcel-schwantes/

[35] https://s41721.pcdn.co/wp-content/uploads/2021/06/SNAPSHOT-REPORT-2023-FINAL.pdf

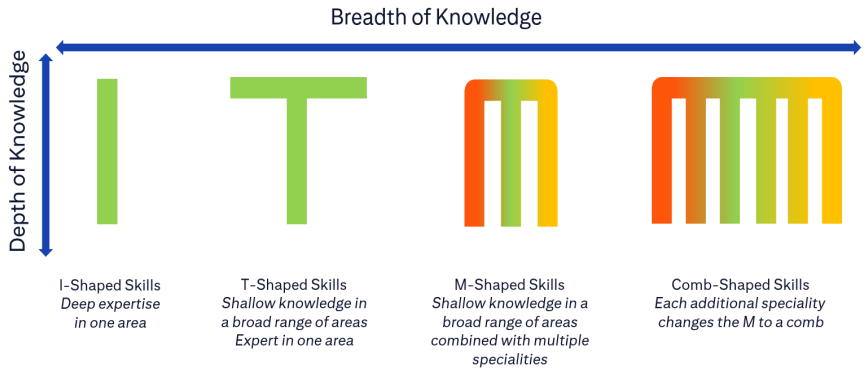
- **Digital collaboration** – increasingly, roles have and will involve collaborating with machines (H2M, or Human-to-Machine). This will include humans-in-the-loop similar to airline pilots today. Often AI work will need human approval, or rubber-stamping, including checking for bias or flaws. Work will also involve cooperation between humans and AI, such as prompt engineering, to get the best out of machines. Or knowing how best to structure problems as prediction problems that machines can tackle. In addition to a significant shortage of AI professionals (as highlighted in our Unleashing AI report), the majority (64%) of men in the US says they are worried that they should know more about AI[36]. It is worth noting a big, related issue in this area – the current gender imbalance in digital skills is huge, with for example females making up just 16% of computer science-related degrees in the UK[37] and 21% in the US.[38]

Skills Portfolios

An aim of the categorization above is to identify DHS. As happened in previous industrial revolutions new skills may be needed that we do not yet know. For now, the skills described above are not mutually exclusive and should be thought of as a portfolio of skills. Some people will have, or develop, a competitive edge in some of these skills. Harvard psychologist Howard Gardner highlighted in 1983[39] that intelligence comes in multiple forms, not just IQ, including: logical-mathematical; spatial-visual; verbal-linguistic; musical; interpersonal; intrapersonal; bodily-kinesthetic; naturalist; existential. Extending Gardner's thinking – 'don't ask how intelligent a child is, ask how a child is intelligent.'

Often expertise is developed at work in one domain, as illustrated below by I-shaped skills. This should not however reduce the focus on transferable skills that can be used across domains and time horizons, as represented by T-shaped skills in Figure 17. Many of the DHS noted above fall into this category.

Figure 17. Skills Shapes



Source: Citi Global Insights

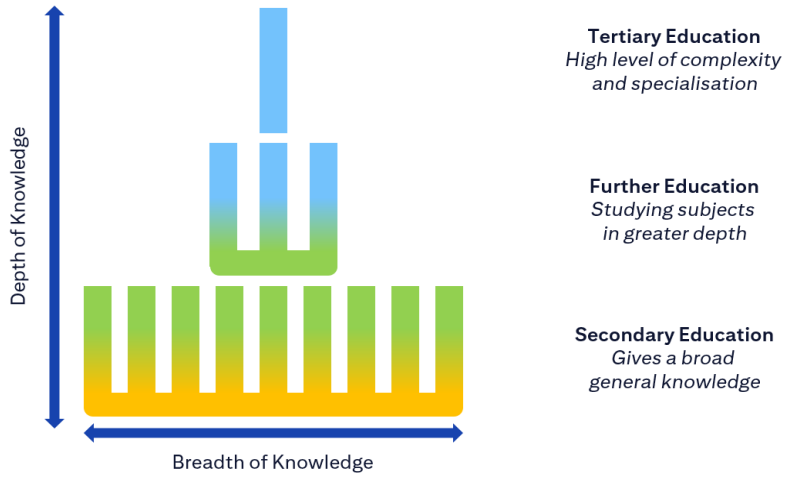
[36] https://economicgraph.linkedin.com/research/future-of-work-report-ai
[37] Women in STEM Statistics - Stem Women
[38] Women in Tech Stats 2024 | Women in Tech Network (womentech.net)
[39] https://tophat.com/glossary/m/multiple-intelligences/#:~:text=This%20theory%20suggests%20human%20intelligence,%2C%20naturalistic%20and%20bodily%2Dkinesthetic .

We have also added M-shaped skills to illustrate the need for dynamic skill acquisition. The transferable skills across the top remain, and the deep current area of expertise is shaded in green, but the previous area of expertise in red is becoming an area to move away from, while the amber area is an area to move towards. Often this movement will be into adjacencies.

The Comb-shaped skills, or MM, tries to illustrate this dynamic over a career, versus the M is more a moment in time. The US Bureau of Labor calculate that the average American has 12.7 jobs between ages 18-56.[40] Many of these will be lateral moves into the same job at a different firm, but the combination of an average 12+ jobs today and the changing skills needed ahead in an AI age, illustrate the need to keep adapting. The DHS or transferable skills across the top both act as an anchor and build over time.

In contrast, the skills picture during education (Figure 18) are almost of the opposite of the work picture in Figure 17. DHS are often at the bottom as pupils first learn these skills and they are also not the focus of most school tests. Instead, pupils learn a broad number of subjects in secondary education, which narrow in further education and often narrow further to one domain area of expertise in tertiary education. Many of the DHS skills are not a consideration in this latter stage of education. This seems likely to change.

Figure 18. Education

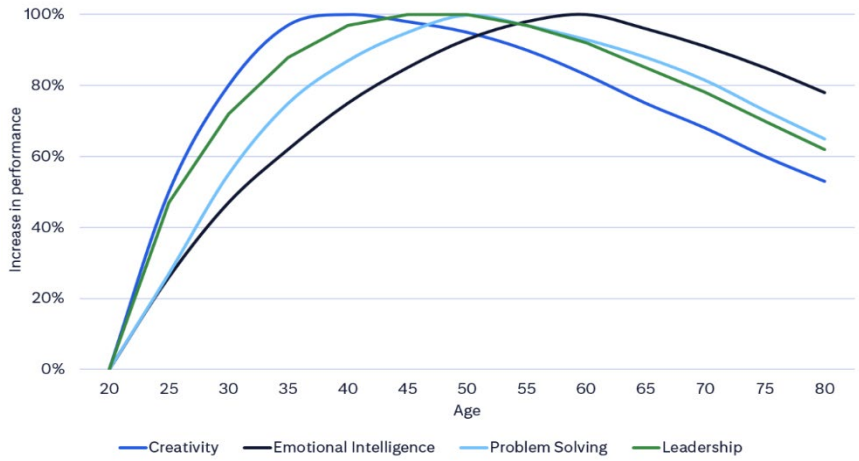


Source: Citi Global Insights

We also noted in Chapter 1 that the falling half-life of knowledge can mean many tertiary education subjects do not have the lasting relevance in the work environment that they are used to. For example, in Citi's Education GPS[41] we noted an engineering degree in the 1920's was estimated to have a half-life of 35 years, dropping to a decade in the 1950's and now is just 12-18 months for a software engineer. The race between education and technology is challenging, especially for technical skills. In contrast a number of DHS have improving and cumulative levels over the majority of a career, with lower decline rates in later years, as shown in Figure 19.

[40] https://www.bls.gov/news.release/pdf/nlsoy.pdf
[41] https://www.citigroup.com/global/insights/citigps/education-back-basics

Figure 19. Durable Skills Performance Levels



Source: Citi Global Insights

How To Prepare

While the first question to our experts in Chapter 2 focused on the type of skills that would be most important or valuable as AI advances, the second question asked how we (people, companies, educators or policy) can best prepare for these skills. We summarize their views below.

Companies

I. **Skilling** – this involves strategic identification of current skills, future needs and gap planning. Upskilling and reskilling require both cost and time investments. A LinkedIn survey found only 52% of employees feel their manager encourages the use of work time to learn new skills.[42] Creating the room to upskill is a necessity and the best firms will get this right culturally. Training is often informal, with learning taking place by doing (praxis), under the supervision and time investment of a senior, mentor or coach. Despite this in surveys, almost half of workers believe their workplaces are unprepared for the future of work and only half (52%) of employees believe their manager encourages them to learn new skills in work time.[42] Time extends to help from others given often training will be informal, will be learning by doing (praxis), mentoring and coaching.

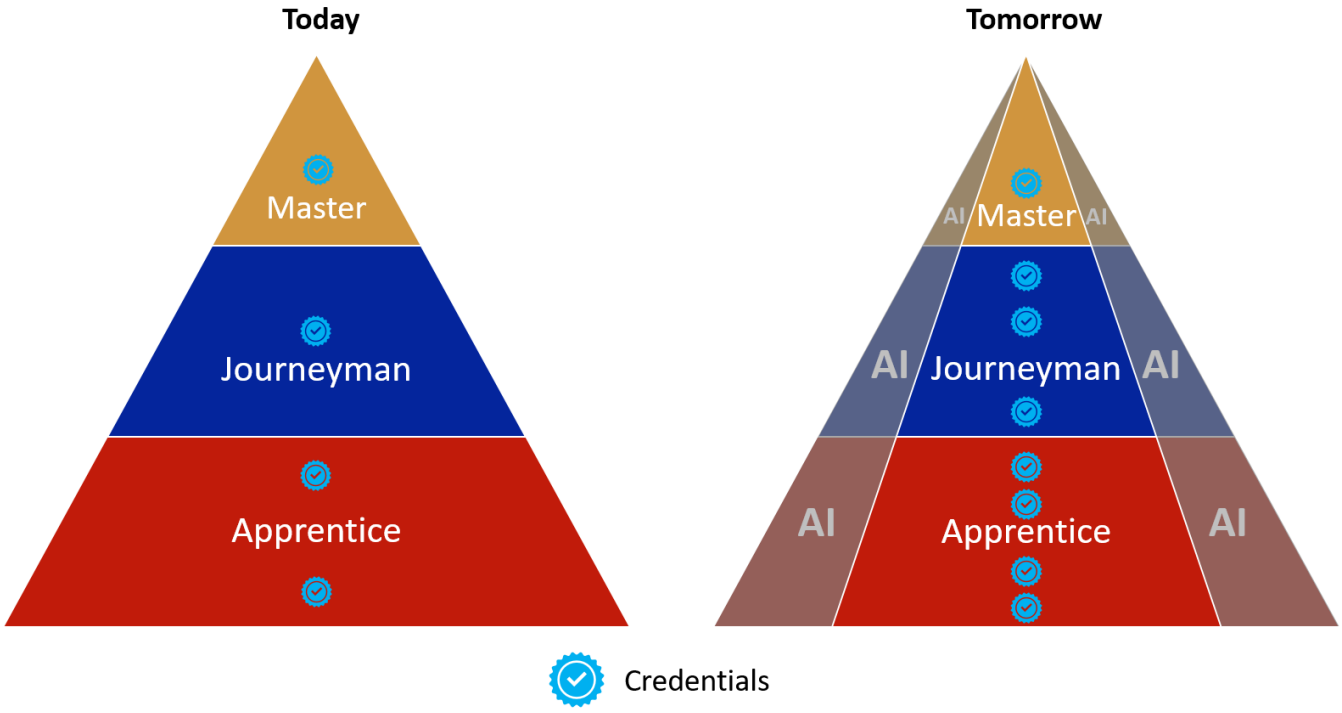
II. Adopting a learning culture extends into a **culture of experimentation** in which failing is an acceptable part of a growth mindset.

III. If the ability to adapt is a core transferable skill, recruitment can skew more towards **hiring for aptitude** and then training for skills.

IV. Second and third order effects due to AI will occur. Thinking ahead, several experts are concerned about deskilling, or **skill enfeeblement**, in which apprenticeship tasks are the easiest to automate but are also needed to allow critical thinking for human-in-the-loop AI use, to reach expert levels, or occupy leadership positions. Companies will have to balance these areas, possibly with a faster way to **gain apprenticeship**, increased accreditation and CPD (Continuing Professional Development) requirements. This is illustrated in Figure 20 below.

[42] https://news.linkedin.com/2022/march/our-skills-first-vision-for-the-future

Figure 20. A Path to Mastery



Source: Citi Global Insights

I. **Leadership** matters for all the points above and leadership training can have a positive ripple effect across organisations. This includes leading transformations; behavioral change; accountability and follow up; and helping employees thrive amongst uncertainty. Reality however may differ from theory - according to the UK's Chartered Management Institute "*82% of workers entering management positions have not had any formal management and leadership training, adding to the UK's stock of 'accidental managers'.*"[43]

II. **HR roles** have an important part to play in all the above, including skilling and leading change initiatives.

Education

I. **Digital literacy** and skills are as foundational for the 21st Century as the 3 Rs (Reading, wRiting, and aRithmetic) were in the 19th and 20th Centuries. One of the main themes from the experts in Chapter 2 is AI is a new tool that many will need to use or get left behind. This includes understanding its uses and limitations.

II. **Curriculum's also need to change** more towards Durable Human Skills that AI cannot do. Several experts noted this should include wellbeing and resilience. The Industrial Revolution gave birth to universal schooling and another education revolution is possible in this AI age. Research from Pew

[43] https://www.managers.org.uk/about-cmi/media-centre/press-releases/bad-managers-and-toxic-work-culture-causing-one-in-three-staff-to-walk/

suggests "just 16% of Americans think that a 4-year college degree prepares students very well for a well-paying job."[44]

III. We need more and **better evaluations of non-IQ skills.**

IV. Several experts note that **tutorial style learning** will matter more than ever, both via humans and via edtech AI tutors.

V. **Universities should become multi-versities** to enable lifelong learning, with flexible, agile, short courses on topics industry cares most about. Degrees could be unbundled into more bite-sized, stackable micro-credentials or nano-degrees. More academic qualifications can also be skillified – i.e. translated into skills.

Policy / Society

I. Policy-makers have an important part to play to **change the education curriculum**. Currently the factory towards cognitive credentialling leaves little space towards Durable Human Skill education.

II. As David Goodhart notes, we may already have reached 'peak head' and need more and better **alternative paths to tertiary education**, such as vocation courses and apprenticeships. Many DHS led themselves to learning by doing over classroom work.

III. Education needs to be **affordable for people across their lives**. This could include skill vouchers for lifelong learning, support for more vocation courses, or incentives for companies to invest more into human rather than physical capital.

IV. If **heart and hand work become more valuable** as AI impacts more head roles, policy can help improve the pay, conditions, training, and prestige of these roles.

V. As Anton Korinek warns, as AI advances we may need to **rethink the role of work** in society. This is a big question for another time, but a risk of significant AI substitution and collapse in wages needs forethought. The conclusion will include increased emphasis on the other points above.

Just one thing? – 'Room'

The above is only a summary of some of the debates highlighted by the contributors in Chapter 2 as ways in which we may need to change going forward. Over the years we have noticed that if you provide one suggestion, people will often ask for more. If on the other hand you provide a list, they often ask for the top one. In the process of writing this report one major point did emerge – 'Room'.

In a fascinating conversation, Sir Anthony Seldon told us he did not like the title of our last report – AI Doom or Boom for Jobs – and suggested the answer was 'Room'. The skills highlighted in Figure 16 will not shock people. We have categorized them as hand, head, heart partly to denote a shift taking place in the world of work towards heart roles. A different simplification is: work with machines

[44] https://www.pewresearch.org/social-trends/2016/10/06/5-the-value-of-a-college-education/

(ie using digital skills); or do things that machines cannot do well (ie Durable Human Skills).

Training towards these DHS is very possible – you can for example go onto Coursera today and take courses in all of them. Coursera already has over 7,000 courses available. The DHS ones we found varied in length (taking between 2 and 128 hours each to complete), with an average of 28 hours. These courses are put on by different universities, companies and other institutions from around the world. Most are available in over 20 languages, with high peer review ratings and can be taken flexibly in one's own time.

Sir Anthony's point was partly about agency but primarily that we need to create 'Room' in education institutions, companies, and policy to make sure we are creating the space and opportunity to get better at these DHS.

This was echoed by other experts in Chapter 2. Everyone is busy – busy learning to pass knowledge exams at school or busy meeting the demands of current tasks at work. It is sometimes said that soft skills are the hard ones, but maybe the hardest thing is actually finding time to act forward. This links to Marshall's important point about the difference between 'knowing and doing.'

A general theme coming from the expert views is all need to understand, prepare for and act ahead of the disruption in skills coming in our AI era. As part of an increased focus on DHS, one of these action items is for better measurement and evaluation of DHS. We turn to credentialing next.

Credentialising DHS

DHS are on the Rise

DHS (e.g., communication, teamwork and leadership skills) are exerting more significant influence in hiring decision making than ever. According to LinkedIn's Global Talent Trends report, 92% of HR experts think DHS are just as or even more important than technical skills.[45] At the same time, 89% of recruiters believe that when a hire doesn't work out, it usually comes down to a lack of DHS.[45]

Our recently published Citi GPS on *Core Skills* discusses the shifting skill demands in great detail and measures the demand change quantitatively. The report identified two major groups of DHS (Figure 21): 1) collaborative leadership and 2) interpersonal and organized and monitored whether they appear more in job ads over time.

Figure 21. Key Words for the Two DHS Groups

DHS Components	
Collaborative Leadership	**Interpersonal and Organized**
Strategic	Competing priorities
Leadership	Interpersonal
Influence	Organized
Collaborate	
Creativity	
Negotiation	
Coaching	

Source: Citi Global Data Insights

Share of job ads requesting collaborative leadership skills increased from 50% to 61% from the period 2014-15 to 2018-1Q 2020 (Figure 22). Share of job ads requesting interpersonal and organized skills increased from 25% to 31% during the same period. In addition, collaborative leadership skills went from commanding zero wage premium in 2014-15 to garnering a positive wage effect in 2018-1Q 2020.

Figure 22. Share of Job Adverts Requesting Each Skills Group Across Two Time Periods

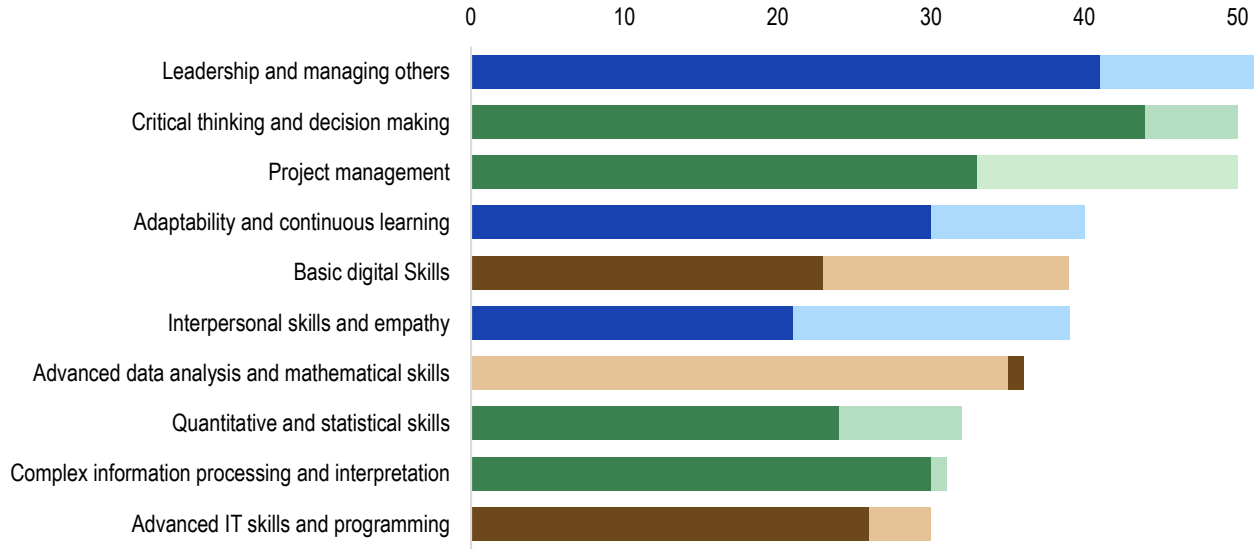
		Collaborative Leadership	Interpersonal & Organized
2014-15	% Job Ads # Job Ads Inspected	50.1% 71,718	24.7% 35,335
2018-1Q 2020	% Job Ads # Job Ads Inspected	61.1% 374,087	30.9% 188,981

Source: Citi Global Data Insights

A McKinsey survey suggests that companies are focusing more on developing DHS through reskilling after the pandemic. Social and emotional skills account for three of the five biggest increases (Figure 23).[46] The number of companies addressing empathy and interpersonal skills doubled in 2020. It's also worth noticing that companies' priority to develop some technological skills like advanced data analysis and mathematical skills even dropped slightly across 2019-20.[46]

[45] LinkedIn Report: These 4 Ideas Are Shaping The Future Of HR And Hiring
[46] Building Workforce Skills At Scale To Thrive During—And After—The Covid-19 Crisis

Figure 23. Skills That Companies Have Prioritize to Develop, % of Respondents



Blue: social and emotional skills; Green: advanced cognitive skills; Brown: technological skills.
Deep Colour: 2019; Light Colour: 2020.
Source: McKinsey

According to Rohan Rajiv, Director of Product Management at LinkedIn, "Foundational soft skills were featured in 78% of jobs posted globally over the last three months."[47]

These changes should come as no surprise given that:

- more than 50% of jobs require teamwork;[48]
- a Stanford study reveals that collaboration increases productivity by 50% by boosting employees' motivation and helping them become more engaged with their work;[49]
- DHS are more durable and hence highly transferable compared to the ever-changing technical skills.

"While most people are hired for their technical abilities, their soft skills give them career durability," says Alexandra Levit, author of *Humanity Works: Merging Technologies and People for the Workforce of the Future*. DHS are becoming even more important as some technical skills such as writing, coding and web design are becoming increasingly automated and potentially more replaceable by AI models like GPT-4 and Gemini.

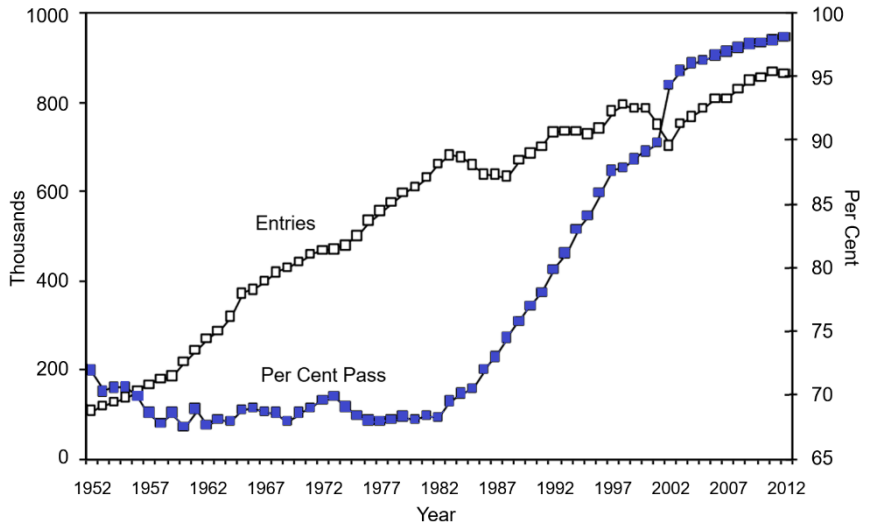
[47] Why DHS Are More In Demand Than Ever
[48] 35+ Compelling Workplace Collaboration Statistics [2023]: The Importance Of Teamwork
[49] Cues Of Working Together Fuel Intrinsic Motivation

Most DHS are not Straightforward to Assess

As Peter Drucker, who helped establish the theoretical foundation of modern management theory, once famously said, “You can’t manage what you can’t measure.”

The trend in cognitive credentialing over recent decades has been enormous: as shown in Figure 23, alongside credential inflation, UK A-level candidates have grown more than 8-fold since the 1950’s[50]; US college candidates are up over 60% since 2000[51]; China’s college candidates have risen 12-fold since 2000; Associate Chartered Accountant student intakes have increased 10-fold since 2006[52]. This is partly due to demographics but also due to the importance of cognitive grades to secure jobs. Going forward, as AI advances, we expect a trend towards credentialing of Durable Human Skills will increase significantly.

Figure 24. Trends in A-Level Take-Up and Passes (A-E)



Source: Professor Alan Smithers, Centre for Education and Employment Research (CEER), University of Buckingham. A-LEVELS 1951-2014.

DHS are usually more intangible and unquantifiable than hard skills. This has made them challenging to measure objectively so interviews often surface anecdotal evidence or pose hypothetical situations. This is made harder still because there is a surprisingly low overlap between the skills people think they have and the one they actually have – a Forbes article puts the overlap at just 10%[53] – and the figures are worse for the unskilled.

In addition to measurement difficulties, DHS differ in multitude by their innateness (to what extent these skills are innate vs. acquired) and demand size on the job market. Figure 25 shows our assessment of these dimensions of DHS, with a big caveat that this process was more art than science.

[50] https://www.alansmithers.com/reports/AL2014.pdf

[51] Number of bachelor’s degree recipients U.S. 2032 | Statista

[52] icaew_ar23_full_report.ashx

[53] https://www.forbes.com/sites/tomaspremuzic/2018/06/14/can-you-really-train-soft-skills-some-answers-from-the-science-of-talent/

The higher the 'Difficulty To Measure' score, the more difficult it is to measure the proficiency level of a specific skill. We carry out literature reviews on the availability of assessment tools for each skill to determine this score.

The higher the 'Innateness' score, the more innate (i.e., difficult to acquire through learning and training) a skill is. This score is measured by the availability of online learning material.

Demand Size of the skills on the job market is measured by the number of job postings on *Indeed.com* over the past 14 days.

Here are our findings:

- Emotional intelligence and creativity are generally considered to be more innate skills while critical thinking, self-awareness, problem solving and organization skills usually can be improved more easily through additional training;
- The ability to learn, problem solving and collaboration skills are more sought after in the current job market whereas self-awareness, entrepreneurship and emotional intelligence are mentioned less often;
- Organization, Leadership and Entrepreneurship skills are more difficult to measure whereas there are many different assessment tools for emotional intelligence, empathy and critical thinking skills.

Figure 25. DHS Innateness vs. Difficulty to Measure (Bubble Size: Demand)

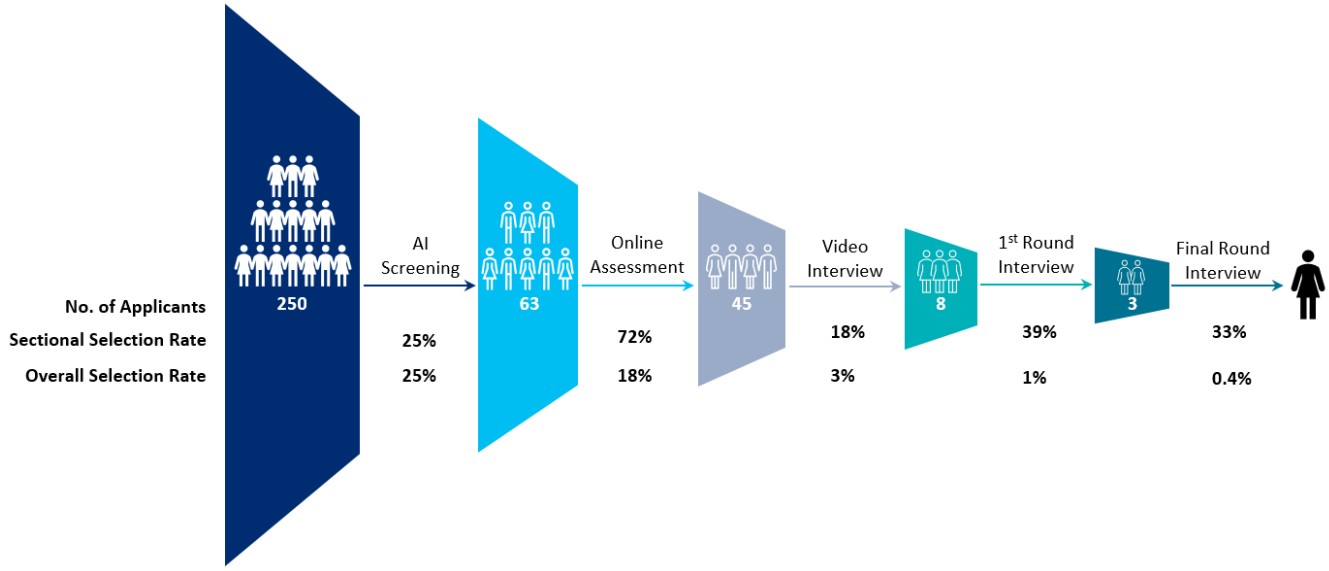
Source: Citi Global Insights

How DHS are Currently Measured during the Selection Process

In the second report from our AI meets Human Capital (Management) series *Will You Be Hired by AI?*, we talked in detail about the talent acquisition process. Both human skills and technical skills are typically assessed prior to the actual face-to-face interviews.

After the lengthy and tedious application form, 25% of all applicants who passed the initial computer screening (Figure 26) need to go through the online assessment process to demonstrate to their perspective employers that they have the skills required for the role.

Figure 26. Selection Process for an Average Interview



Source: Citi Global Insights

Cognitive Tests

An online assessment usually comprises a set of subtests designed for the specific role under recruitment. For example, candidates recruiting for a software engineer role will probably receive coding tests, whereas for a banking / consultancy type of role, candidates are likely to receive tests on their numerical or Excel skills.

Apart from the conceivable tests on technical skills, various other unexpected tests often complement to exam candidates' cognitive capabilities across multiple dimensions (e.g., numerical/verbal reasoning, reaction time). Examples include reading comprehension, diagrammatic reasoning and critical thinking questions.

Some companies even "gamify" their assessments. One example is the Cognify assessment developed by the online assessment provider Criteria who offers a wide range of online tests for technical skills, emotional intelligence, personality and cognitive capabilities. Their tests are widely adopted by large corporations (e.g., Deloitte) and have been administered over 40 million times.[54] Cognify is the gamified assessment arm of Criteria. The assessment comprises six mini games to measure various cognitive capabilities of a candidate.[55]

[54] Criteria
[55] The Definitive Guide to the Cognify Mini-Games Test

One of the six mini games is called *Resemble*, where candidates are asked to reassemble the test image with the individual pieces provided. To add to the challenge, Cognify may require the player to resemble the image as if it was rotated. Candidates generally have 3 minutes to complete 9 rounds of Resemble games.[55]

Situational Judgement Tests

Towards the end of an online assessment, a Situational Judgement Test (SJT) usually ensues to assess the candidates' DHS and cultural fit through asking them to rank different reactions under various scenarios or to choose to what extent they agree or disagree with statements about one's personalities (Figure 27).

Figure 27. Sample SJT Scenario

You and a colleague from another department are jointly responsible for coordinating a project involving both departments. Your colleague is not completing an appropriate portion of the work. What should you do?

A. Ask your supervisor to discuss the problem with your colleague's supervisor.

B. Remind your colleague that the project will not be completed effectively without effort from both of you.

C. Tell your colleague that you will discuss the problem with your colleague's supervisor if your colleague refuses to work on the project.

D. Tell your colleague that nonparticipation creates more work for you and makes it harder to finish the project.

E. Ask someone else from your colleague's department to help with the project.

Situational Judgment Tests: An Overview of Development Practices and Psychometric Characteristics

Source: Human Resources Research Organization (HumRRO)

A SJT usually contains a) somewhere between 10 to 50 scenarios, each accompanied by 4-9 responses to be ranked by their desirability or b) somewhere between 50 to 100 statements to be evaluated based on candidates' self-assessments.

After the SJT, candidates will usually receive feedback (Figure 28). They can have a better understanding of where they shine and where they may need to improve so that they can adjust themselves to be more effective and more well-rounded in the workplace.

Figure 28. Sample SJT Feedback

Your Highest Scoring Strengths

These are likely to be things that you do well and that you enjoy doing. You are likely to feel energised when you are using these strengths to complete a task and feel fully absorbed in what you are doing.

When you think about your future, it can be useful to think about these strengths and how you can make the most of them. These developmental tips will give you ideas for what you can do to make use of your strengths.

Your highest strengths that were identified in your Job Simulation assessment were:

Resolver

Your results suggest that you are an effective problem-solver, no matter how complicated the problem or its impact. You are likely to enjoy solving problems in a timely and effective manner and always provide clarification to others and ensure that issues are fully resolved before moving on.

How to develop this strength further…

- Keep an eye out for opportunities to support others when they might be struggling to solve a problem. Try to coach them and give them insight into how you approach difficult problems.
- Seek out increasingly difficult or complex challenges to solve; it is likely to motivate you.
- If you have found a way to solve a certain problem, look to see if there are systems or processes you can implement that mean other people will not have to solve the same problem again.

Take care…

Be careful not to help people by explaining the answer when they may wish to figure it out for themselves. It can often be a more effective way to learn.

Your Less Developed Strength

Less developed strengths are likely to be things that you do less well and that you find less enjoyable than your highest scoring strengths. You may find situations associated with these strengths draining. Please remember that even though this is your lowest scoring strength, this does not mean that it is a weakness.

If you consider these strengths personally important for driving your career forward, then you may want to think about how you can develop your capability in these areas. However, as this assessment only measures the selected strengths for EY, it is likely that you will have many more strengths that you can use instead of these.

The lowest strength that was identified for you during the completion of the EY Job Simulation assessment was:

Credibility

Your results suggest that you may find it difficult to instil trust and confidence in others through the way that you present information. You may lack conviction in your style or may need to be more assertive at times.

- Seek out opportunities that require a variety of communication styles. Volunteer for activities such as presenting and writing blogs that will allow you to practise different ways of communicating.
- When faced with a communication task, invest some time in considering the needs of your audience. Try to understand their motivations, and how you could adapt your language and tone to best suit these.
- Make sure you understand your topic. If you can have confidence in your knowledge and understanding, you are more likely to impart this knowledge in a more credible manner.

Source: EY One Assessment

Science behind SJTs

Scientific studies on validity of SJT results point to divergent results depending on which specific set of SJT to use. Understandably, quality of SJTs, as with any selection method (e.g., cognitive tests, assessment centers, interviews) is largely influenced by specific configurations like format, design, development and scoring system.

Despite the lack of consensus on their exact validity among scientific communities and the need for further investigations, SJTs remain widely adopted among most Fortune 500 and FTSE 100 companies owing to their practicalities – assessing multiple job-related durable human competencies with a single test at an acceptable, albeit vague, level of validity. Studies have proven that SJTs:

Criterion validity refers to the extent to which a test or measure predicts or correlates with an external criterion or outcome (e.g., job performance).

Construct validity refers to the extent to which a test or measure captures the theoretical construct or concept that it is supposed to measure.

Criterion-related validity is concerned with the practical utility and application of the test or measure, while construct validity is concerned with the theoretical meaning and interpretation of the test or measure.

- have useful levels of criterion validity and incremental validity over cognitive ability measures (few predictors have this power)[56];
- have construct validity: SJTs most often assess leadership and interpersonal skills, and those that measure teamwork and leadership have relatively high validity when predicting job performance[57];
- have small to moderate group differences (lower than cognitive ability measures), making them an important predictor of performance[58];

Avoid Faking in SJTs

SJTs are low-fidelity simulations, which means that candidates are usually given the written descriptions of scenarios. It can be difficult to immerse themselves in hypothetical situations and SJTs can be susceptible to manipulation and untruthfulness, although they appear to be less vulnerable to faking than traditional personality measures[59].

Given studies indicate 30%-50% of job applicants are untruthful in personality tests[60] with some showing cheat rate as high as 78%[61], faking can seriously affect the rank order of applicants and ultimately who is hired – measures against faking must be taken.

One way is to limit the number of times anyone can take certain SJT in a given time period. If one takes the same SJT enough times in a short time, one learns how to tweak the answers to obtain a more desirable outcome, one that fits better with the value and culture of the company they want to apply for, but not necessarily reflect their true self.

We therefore suggest that skills wallet providers to put a cap on how many times one can take the same SJT in a certain timeframe or at least explicitly display the number of attempts for a particular SJT in the feedback report.

Video Interviews

After online assessment, 18% of the initial applicants on average move on to the next stage and receive a video interview assessment where they are asked to record their answers to some pre-determined questions. The scope of the questions are usually broad, testing candidates' understanding of the industry or the company, their DHS or cultural fit for the company and their career plans and motivations.

According to Figure 26, 97% of all the applicants are filtered out after the video interview stage. Only 3% are able to make it to face-to-face interviews.

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[56] Situational Judgement Tests
[57] Situational Judgement Tests: Constructs Assessed And A Meta-Analysis Of Their Criterion-Related Validities
[58] Situational Judgment Tests: The Influence And Importance Of Applicant Status And Targeted Constructs On Estimates Of Black–White Subgroup Differences
[59] Operational Threats To The Use Of SJTs: Faking, Coaching And Retesting Issues
[60] Lots Of Companies Use Personality Tests For Hiring Decisions. Here's Why That Can Backfire.
[61] This Is How Candidates Cheat Personality Tests - Dreamtalent

To summarize, the current selection process relies on behavioral based questions during interviews and psychometric tests to assess a candidate's DHS. Behavioral based interview questions are often subjective – human evaluators can be influenced by a candidate's race, gender, or other factors. On the other hand, psychometric tests are often criticized for their lack of adaptability and sensitivity to individual differences.

Over half of job candidates don't like many of the current pre-employment assessments for various reasons.[62] Some main ones include:[62]

- 47% of candidates think they take too long;
- 37% of candidates think their purpose is unclear;
- 30% of candidates think they don't relate to the job.

Given that DHS will become increasingly important in the coming AI era, the demand for measuring them will increase and we need better and more efficient tools to do it.

Better Assessment Tools are Available but Unfortunately Not Widely Adopted

People tend to be overoptimistic about their DHS. As a result, the quality of data collected on perspective employees' DHS are not always reliable. It is no secret that job candidates can play fast and loose with the truth in their hiring process to get a better shot at the job opportunity. Studies indicate that 30%-50% of job applicants are untruthful in personality tests[63] with some showing cheat rate as high as 78%[64].

In an ideal world, a more trustworthy way to assess DHS are through scientifically designed tests that are statistically proven to be effective. Part of the reason why DHS have not been appreciated enough previously is that they are not measured in a reliable and precise sense. That said potential solutions are growing. We were surprised when looking into validated tests for selected DHS to see how many exist. Figure 29 provides examples of some of these. If DHS do indeed become more important, we expect these tests will continue to improve and could see more unification and standardization ahead.

[62] Candidates Dislike Long, Irrelevant Pre-Hire Assessments
[63] Lots Of Companies Use Personality Tests For Hiring Decisions. Here's Why That Can Backfire.
[64] This Is How Candidates Cheat Personality Tests - Dreamtalent

Figure 29. Sample Assessment Tools for DHS

DHS	Assessment Tool
Critical Thinking	Collegiate Assessment of Academic Proficiency (CAAP) Critical Thinking California Critical Thinking Disposition Inventory (CCTDI) California Critical Thinking Skills Test (CCTST) California Measure of Mental Motivation (CM3)
Problem Solving	COMPRO test MicroDYN MicroFIN Interactive Scenario Based Assessment System (ISBAS) Programme for International Student Assessment (PISA)
Organization	Children's Organizational Skills Scales Student360 Insight Program (S360) Time Management Scale
Self-Awareness	Congruence-d Congruence-r
Ethics	Criteria Cognitive Aptitude Test (CCAT) Cambridge CEM Cognitive Abilities Tests Student360 Insight Program (S360) Study Skills Scale Think One Learning Ability Assessment
Creativity	Abedi-Schumaker Creativity Test Similes Test Test for Creative Thinking-Drawing Production Torrance Tests of Creative Thinking (TTCT)
Perspection	Best Practice Assessment Competency Models
Adaptability	Adaptability Scale Assessment Toolkit for Leader Adaptability Skills (ATLAS)
Learning Ability	Criteria Cognitive Aptitude Test (CCAT) Cambridge CEM Cognitive Abilities Tests Student360 Insight Program (S360) Study Skills Scale Think One Learning Ability Assessment
Entrepreneurship	General Measure of Enterprising Tendency v2 (GET2) FLIGBY
Adaptability	Assessment Toolkit for Leader Adaptability Skills (ATLAS) Adaptability Scale
Resilience	Children's Organizational Skills Scales Student360 Insight Program (S360) Time Management Scale
Entrepreneurship	FLIGBY General Measure of Enterprising Tendency v2 (GET2)
Emotional Intelligence	Emotional Competence Inventory, Version 2 (ECI-2) Emotional Intelligence Questionnaire (EIQ) Emotional Quotient Inventory (EQ-i) Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT)
Communication	Communication Skills Attitude Scale (CSAS) Indiana University Simulation Integration Rubric (IUSIR)
Collaboration	Assessment of Interprofessional Team Collaboration Scale (AITCS) Assessment and Teaching of Twenty-first Century Skills (ATC21S) Programme for International Student Assessment (PISA) Student360 Insight Program (S360) Teamwork Scale
Leadership	Emotionally Intelligent Leadership for Student Inventory (EILI) Gallup's CliftonStrengths instrument Leadership Attitudes and Beliefs Scale LEAD-Self instrument
Empathy	Basic Empathy Scale (BES) Empathy Quotient (EQ-60) Interpersonal Reactivity Index (IRI) Questionnaire of Cognitive and Affective Empathy (QCAE) The Toronto Empathy Questionnaire (TEQ)

Source: Citi Global Insights

Unfortunately, these tests are not widely adopted in the hiring process to assess candidates' personalities. Most of these tests are developed for one specific DHS. Considering that most candidates are often burnt out by the hiring process, it's not realistic to ask these poor candidates to complete every desired assessment for all the DHS the company want to evaluate.

That's why companies usually turn to alternative approaches like behavioral based questions and situational judgement tests instead to do the trick. These methods can help HRs understand different dimensions of a candidates' personality traits faster but are often criticized for their lack of scientific background, inflexibility, homogeneity, subjectiveness and ambiguity. What's more, because they are mostly scenario based, they are also more susceptible to manipulation and untruthfulness.

Therefore, existing DHS assessment methods can potentially: 1) produce unreliable results; 2) slow down the hiring process; 3) risk disengaging candidates and therefore may put companies at disadvantage when competing for talents on the market. HR experts are in urgent need of more efficient and more accurate tools in their arsenal to assess candidates' DHS to make sure the results reflect their true personalities.

Generative AI: A New Way to Assess DHS

Generative AI can measure DHS during interviews without interviewees even realizing it using what they say or how they say it. Assessments can also measure if a candidate is a good cultural fit for the company.

Natural Language Processing (NLP)

Fine-tuned AI models are good at recognizing patterns. For example, trained with MRI scan data, deep learning models have proven able to predict the survival rate of brain cancer patients after receiving radiotherapy treatment with c.85% accuracy.[65]

Equipped with exceptional NLP capability from the latest large language models (LLMs), AI can now recognize patterns much better in complex semantic tasks. Similar to how deep learning models can predict survival rate for patients, LLMs can predict the "survival rate" of perspective employees in an organizations based on their DHS and cultural fit.

Talent Select AI is offering this exact solution. With over 15 years of experience in HR technology, the company has focused specifically on AI solutions for candidate assessment and psychometric testing industries over the past few years. In early 2023, they launched its conversation analysis solution backed by AI.

What's interesting about Talent Select AI and sets their patent-pending product apart from their rivals is that it doesn't need any additional tests to measure the DHS of candidates, just the usual interviews. The company leverages NLP tools to assess whether a candidate is a good fit or not through two steps:[66]

[65] Glioblastoma And Radiotherapy: A Multi-Center Ai Study For Survival Predictions From MRI
[66] TalentSelect.ai™

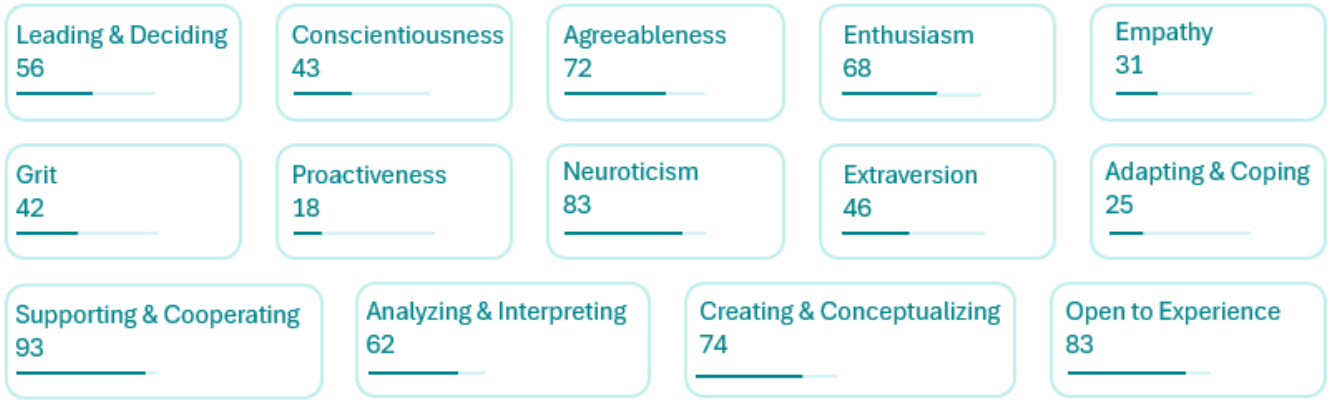
I/O research is a branch of applied psychology study focused on employee attitudes, behaviors, emotions, motivation and stress in the workplace. The general goal is to improve the effectiveness, health and well-being of organizations and employees therein through recruitment processes, training programs, feedback, management systems and other interventions.

1. extract the required traits and competencies for a position from the job description and the company's value and culture;
2. analyze the specific words a candidate uses during an interview and infer their personal traits and competencies from these word choices.

The model is trained with millions of job interviews spanning a broad sample of job and company types and fine-tuned with decades of established research in language and industrial organizational (I/O) psychology.[67] Combined with regular bias audits following the U.S. Equal Employment Opportunity Commission (EEOC) regulations and emerging AI privacy legislations, their product is deemed to be accurate and unbiased.

The AI-powered insights can help HRs gain a holistic understanding of unique skills, personality traits, and professional competencies of a candidate in the form of numerical scores (Figure 30). The model covers a wide range of work-related indicators: the Big Five Personality Traits[68], the Great Eight Professional Competencies[69], and four new proprietary Motivational Traits: grit, enthusiasm, proactiveness, and empathy – 17 in total.

Figure 30. Sample Personal Traits and Professional Competencies Covered by Talent Select AI



Source: Talent Select AI

Talent Select AI has shown to bring significant improvement to the hiring process:[70]

- 98% reported greater confidence in selection decisions;
- 80% increase in underrepresented applicant selection;
- 50+% faster hiring decisions.

[67] TalentSelect.ai™

[68] The Big Five Personality Traits model was first proposed in the 1980s and includes 5 dimensions of personality: 1) openness to experience (inventive/curious vs. consistent/cautious); 2) conscientiousness (efficient/organized vs. extravagant/careless); 3) extraversion (outgoing/energetic vs. solitary/reserved); 4) agreeableness (friendly/compassionate vs. critical/judgmental); 5) neuroticism (sensitive/nervous vs. resilient/confident).

[69] The Great Eight Professional Competencies models was first proposed in 2002 and includes 8 dimensions of professional competencies: 1) leading and deciding; 2) supporting and cooperating; 3) interacting and presenting; 4) analyzing and interpreting; 5) creating and conceptualizing; 6) organizing and executing; 7) adapting and coping; 8) enterprising and performing.

[70] TalentSelect.ai™

Computer Vision

The HEXACO personality test was first proposed in the book *The H Factor of Personality* by Ashton and Lee and is based on a six-dimensional model of human personality that include honesty-humility (H), emotionality (E), extraversion (X), agreeableness (A), conscientiousness (C), and openness to experience (O).

Generative AI models can be used in video interviews to track eye movements, micro-expressions, vocal tones, body language and other subtle cues that often go unnoticed by the human eye in real time. They can then analyze the data collected and offer insights into candidates' personality and EI.

What's more, it's been proven that AI can judge personality traits more accurately than humans.[71] A study showed that AI can predict HEXACO personality test scores at up to 90% accuracy.[72]

Talent Intelligent Platforms (TIPs)

Another AI-enabled tool in HR's quiver to better understand candidates' DHS is Talent Intelligent Platforms (TIPs). We talk more about this in *Part 1: TIPs for Skill Migration* of our *AI Meets HCM* series.

To put it simply, TIPs are software platforms that use data analytics and AI to gain insights into talent trends, skills gaps and workforce planning and help organizations make data-driven decisions about their workforce.

The industry leading TIP solution from Eightfold AI is trained on over 1 billion data points, including CVs and career trajectories.

Typically trained with hundreds of millions of job descriptions and hundreds of millions of CVs, TIPs are particularly good at two things: 1) inferring one's skills based on their past experiences; 2) predicting one's potential skills based on their existing adjacent skills. This exceptional inference and predicting power can be used for both knowledge skills and DHS. TIPs can not only tell whether one has certain DHS or not, but also quantify how good their DHS are.

Transformer models can infer candidates' skills directly from their past experiences (e.g., education, location, companies one worked in, people one knows) gathered from various sources (e.g., CVs, application forms, social media).

The AI models can tell, for example, that a software engineer is most likely familiar with a certain package in Python from the fact that they worked in the machine learning team at Google in 2010, where and when this specific package was used. If this software engineer stayed longer at Google, they will be able to conclude their skills from the projects they were involved with.

In addition, the platforms can even infer the skills of someone from the skills of people who perform similar functions or people to whom they were connected in their previous roles.

Transformer-based AI model goes beyond inferring skills from past experience – they can also uncover the relationships among different DHS and predict what a person is capable of doing, not just what they have done in the past.

Say if a job candidate John has got DHS A on his CV while he didn't mention whether he has DHS B, he might be passed over for jobs that require DHS B. But as many people who come from similar backgrounds also have DHS B, the platform can infer that DHS B is an adjacent skill to DHS A and John probably has DHS B as

[71] Computer-Based Personality Judgments Are More Accurate Than Those Made By Humans
[72] Detecting Personality Traits Using Eye-Tracking Data

well – DHS A and B may be adjacent and fall under the same category as we outlined in Figure 16.

With more easily quantifiable DHS, it'll be easier for L&D leaders to directly link the overall improvement in DHS repository to the improvement in team productivity and financial performance together and thus lobby for more budget. This will in turn allow companies to offer better DHS training and better DHS repository management, which will further link DHS and team productivity – a positive loop.

For the first time, employees can track the progress of their DHS training based on outcome rather than on process. They are thus more likely investing additional time in DHS training. In addition, with more L&D support, retention rate will improve, which means companies are more likely to get the return on their investment in corporate training.

In conclusion, as DHS increase in importance, there will be: an increase in measuring DHS via tests; an increase in the measurement of DHS by AI; an increase in DHS inferred by AI; an increase in the collection of DHS data. Increasingly this data will be housed in portable skills wallets. We discuss skill wallets in the next chapter.

Skill Wallets Will Grow

Learning and Employment Records (LERs) is the moniker for a comprehensive, interoperable digital record of learning and work experience. LER may include degrees, training records, employment history, social badges and other skill certificates.

While the same concept goes by other names like Interoperable Learning Records (ILRs) and Comprehensive Learner Record (CLR), LER is the name used by the American Workforce Policy Advisory Board (AWPAB), a group of 23 major players across multiple sectors of the economy.

Members include leading representatives from higher education (President of WGU, President of AACC), government (U.S. Secretary of Commerce, Governor of Indiana) and private enterprise (President and CEO of Walmart).

Following credentialising skills that we discussed in Chapter 4, the next step is for individuals to aggregate all the assessed and certified skills into a single place (i.e. skills wallet) so that they can pull their validated skills out and share them with employers anytime with a single click. Hence, this is what we are going to cover next.

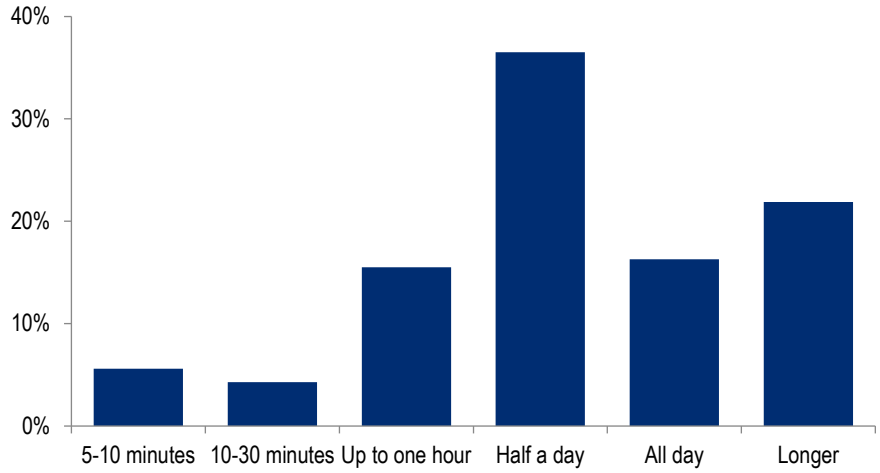
All sorts of credentials should in theory be "pocketable" into the wallet: IDs, contact information, criminal records and Learning and Employment Records (LERs). This chapter highlights that the use of Skill Wallets is starting to happen. We believe they will become the norm in time.

In the following Chapter, we start by discussing the benefits skill wallets can bring to both applicants and HRs. We then talk about how they can transform the talent acquisition and talent management practice within organizations and eventually help them move into a more efficient skills-based structure. We then go on to mention progress from private companies in the area and pushes from governments and universities. We conclude by raising the concern around data security and pointing to the blockchain and Web3 solution.

Portability & Shareability

To begin with, applying for a job is much easier with a Skill Wallet. Applicants don't need to spend so much time filling out the application forms prying into every detail of their background anymore – education, work experience, certificates, criminal records and more. One poll suggested that 90% of applicants spend more than 30 minutes to complete a job application form (Figure 31).[73] They can instead import everything requested by the recruiter from their skills wallet with a single click.

Figure 31. How long do you spend filling out a job application form?



Source: jobs.ac.uk

[73] Job Application Forms Take Too Long To Complete

Skills wallet will also save applicants much time going through the selection process.

We detailed a typical pre-employment assessment process to assess candidates' DHS in Chapter 4. These assessments (cognitive tests, SJTs, video interviews) might be manageable assuming the candidate only applies for one company, but that is rarely the case. On average, a candidate has to make 162 job applications to land a job.[74] That means candidates have to prove their skills through online assessments 40 times and video interviews 29 times given the average selection rate for each step.

Every one of these online assessments and video interviews take time to complete. Take the Cognify game we mentioned earlier as an example, the six mini-games usually take 30 minutes in total to complete. But be mindful that Cognify is only one test in the online assessment pack that usually contains three or four different tests.

The actual time required for an online assessment depends on the specific company and position a candidate applies for and can vary significantly. For example, it would probably take longer for software engineers who need to take coding tests as part of their online assessment.

Generally speaking, the timed tests for technical skills and cognitive capabilities usually take 10-15 minutes each to complete and there are usually two to three of them. The psychometric test for DHS and cultural fit is usually not timed but can take half an hour or more to complete (the test usually contains several dozens of scenarios or statements for candidates to evaluate or rank). Altogether, a single set of online assessment can easily take a good hour or more to complete in one go.

For video interviews, the assessment usually contains 5-8 questions. Candidates usually are given between 30 seconds to 2 minutes to prepare their answers and up to 3 minutes to record it. They can typically review the first recording and opt to record for a second time in case the first one is interrupted or doesn't come out well. Considering the breathers between questions, it can take well north of 30 minutes to complete a video interview.

This means for an average candidate to land a job, they most likely need to spend well over 100 hours just on the pre-employment assessments – note that we didn't even take into account the preparation time, which is usually much longer than the assessment themselves. No wonder nearly half of candidates think pre-employment assessments take too long.

It's a full-time job finding a full-time job.

– Richard Nelson Bolles, Author of The Best-Selling Job-Hunting Book, *What Color Is Your Parachute?*

On top of that, it's certainly not the best use of their time. The desirable skills commonly under pursuit tend to overlap to a large extent, especially when candidates are applying for similar positions, which is usually the case. Many companies even use the same assessment tools for their pre-employment assessments. For example, both Microsoft and Amazon use SHL as part of their pre-employment assessments. But sadly the test results are not sharable across companies even if the tests are identical. Candidates have to do it multiple times in this case.

[74] How Many Applications Does It Take To Get A Job?

With skills wallet, all their credentials including certificates for all their skills, hard or soft, are easily portable and readily sharable with recruiters – candidates don't need to go through similar tests over and over again for pre-employment assessments. This will save them tremendous amount of time to focus on more important questions like what they really want to do, their career planning and company-specific questions.

Transparency & Verifiability

A digital skills wallet will make HRs' lives much easier, too.

Screening used to be based solely on applicants' self-reported experiences and skills. It may not be the case that they are all truthful about their qualifications and competencies.

As we mentioned in the previous chapter, most studies indicate that 30%-50% of job applicants are untruthful in personality tests[63] with some showing cheat rates as high as 78%[64] to better their position. Candidates may list "master Excel" on their CV just because they know some simple functions (e.g., SUM, AVERAGE, MAX), or they may list "conversational Spanish" on their CV just because they know *¿cómo estás?* In Spanish.

That's why companies usually carry out background checks between extending an offer and officially onboard an employee. The duration of a background check obviously depends on how thorough a company want to be with their new hires. That said, it's not uncommon for a background check to take several weeks, especially for large corporations or more senior positions. Figure 32 shows how long each section of a background check usually take.

Figure 32. Typical Duration of a Background Check by Process

Section	Estimated Duration
Identity Verification	10 minutes for a basic check if the ID matches the real person to several days for a thorough investigation via government agencies, e.g., tracking down the Social Security Number (SSN) in the US
Criminal Record Checks	1-3 working days for domestic criminal history to a couple of weeks for int'l criminal record checks
Employment Verification	10-20 working days depending on the responsiveness of previous employers, even longer for int'l checks
Reference Checks	2-5 working days
Driving record (MVR) Check	1 hour to 1-3 working days depending on the level of scrutiny
Education Verification	1-2 weeks, longer if extra details needed, e.g., transcript, relevant courses, exchange records
Credit Checks	10 minutes for online checks to 2-5 days for more detailed checks with credit bureaus
Drug Testing	10 minutes for onsite tests to 3-10 days for lab-based tests
Professional Certification Verification	c. 2 working days

Source: Citi Global Insights

Despite the length duration, most background checks are nowhere near comprehensive. Third-party background check agencies can only do so many things – they may be able to verify a candidate's employment history, past salaries and reasons for departure, but it's almost impossible for them to verify every skill candidates claim they have on their CVs.

Things will be changed with digital skills wallets – candidates won't be able to add whatever skills they want, or they think they have unless it's verified by the corresponding professional bodies.

According to 91% of recruiters, a perfect CV should be no more than 2 pages.[75] There are only so many things one can fit on a CV, especially for experienced senior candidates. A well-prepared job seeker usually has 3 to 4 different versions of CVs for different types of jobs. Given a single CV can never cover everything, the question "Tell me something that's not on your CV?" is often asked during job interviews.

With everything in the digital skills wallet certified, HRs don't need to go through the prolonged background checks anymore and hiring managers don't need to spend so much time during the interviews trying to figure out whether the interviewees possess the skills they claim they have. Instead, they can focus on more important questions like the applicants' career plans, their motivations or whether they have a correct understanding of the role.

Workplace Digital Transformation

Skills Based Talent Acquisition

The pandemic accelerated digital transformations and AI will accelerate continue to do so. As we discussed in *Part 2: Will You Be Hired by AI?* Of our *AI Meets HCM* series, AI can help companies broaden talent reach, offer better assessments and automate administrative tasks (e.g., drafting job descriptions, scheduling interviews) during the hiring process and assist candidates through their application process from step zero.

Digital skills wallets will take the hiring to a next level, allowing candidates and companies to reduce the assessment process and hire based on skills.

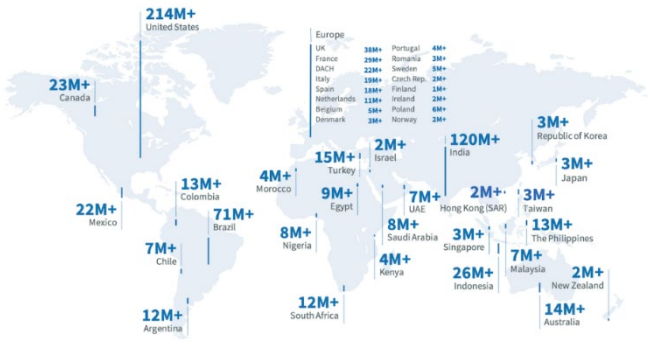
Skills are the new currency for talents. For example, the share of recruiter searches on LinkedIn that include a skills filter has increased by 25% over the period 2019-23 – 45% of recruiters explicitly used skills to filter candidates by May 2023.[76]

Because recruiters are increasingly using skills filters, members are also adding skills to their LinkedIn digital skills wallets like crazy. Over the last 12 months, members have added 680 million skills to their digital skills wallets, up 80% yoy.[77]

LinkedIn has a huge database on job postings and personal profiles, which positions them advantageously over others to build their own digital skills wallet: The company recently hit the 1 billion member benchmark across over 200 countries[78] (Figure 33) and is still expanding rapidly – exhibiting over 10% CAGR since the pandemic (Figure 34). LinkedIn hosts 75 million organizations on its platform (Figure 35) and many use it for recruiting or as a media center to publish news about their business[79];There are 101 job applications submitted per second (8.7 million per day), 6 people hired per minutes (8,640 per day) and 2 million posts[80], articles and videos published per day[81] through LinkedIn.

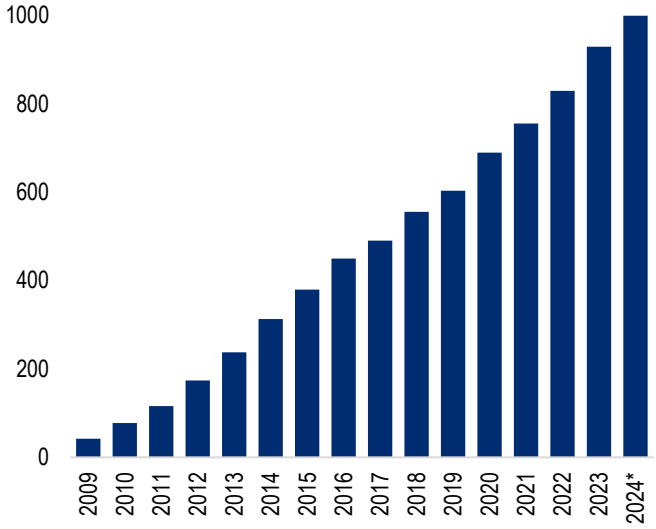
[75] How long should a CV be?
[76] Recruitment, Job Search... : Do You Have The Skills?
[77] The Most In-Demand Skills for 2024
[78] LinkedIn
[79] LinkedIn Usage And Revenue Statistics (2024)
[80] LinkedIn Statistics And Facts
[81] 90 LinkedIn Statistics You Need To Know In 2024

Figure 33. Geographical Distribution of LinkedIn Members



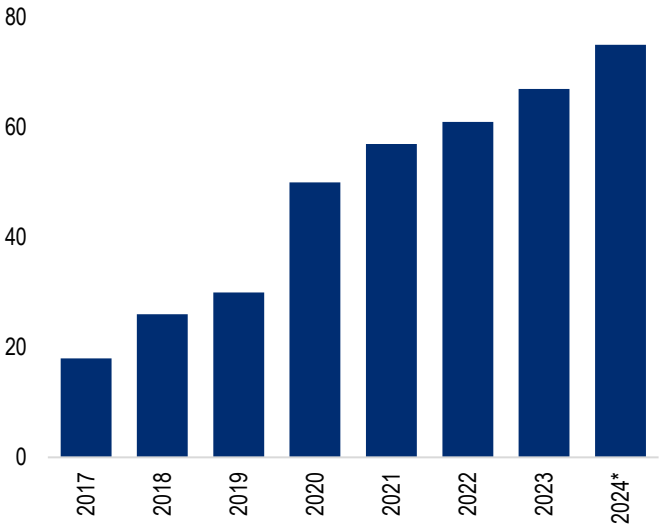
Source: LinkedIn

Figure 34. LinkedIn Global Annual Users 2009-2024* (in mns)



Source: LinkedIn

Figure 35. LinkedIn Global Organizations Hosted 2017-2024* (in mns)



Source: LinkedIn

Apart from adding skills manually to their digital skills wallet, LinkedIn is rolling out a new feature called personalized key skills suggestions among their premium subscribers. As one of the largest data powerhouses in the field of talent acquisition, LinkedIn can dump all their proprietary data (e.g., job descriptions, education/career records, skills) into their AI model to mine the hidden patterns and identify which key skills usually correspond with which job positions. That's precisely why LinkedIn can suggest key skills for members to add based on their past experiences.

The skills added to the digital skills wallets are unfortunately not yet certified by relevant professional bodies – there is still a long way to go on this process – but LinkedIn has an Endorsement toggle for added skills that members can choose to turn on and off. Once turned on, people, one has connections with, can endorse these skills, and vice versa, which will add credibility to digital skills wallets (Figure 36).

Figure 36. LinkedIn's Add a New Skill and Endorsement Features

Source: : LinkedIn

An alternative way to increase the credibility of technical skills in one's digital skills wallet on LinkedIn is through skill assessments. These assessments are usually available for various software engineer roles (e.g., user interface engineer, data engineers, algorithm engineers).

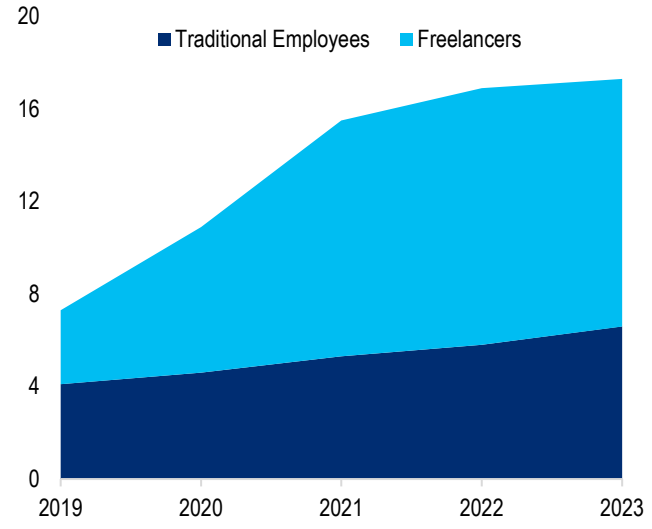
An assessment usually contains 15 multiple choice questions with a time limit of 90 seconds for each question and a passing score of 70% or above. Once passed, a badge will be added to that specific skill on your skills list. If not, nothing will happen on the profile, but some relevant courses will be suggested to the member, who can re-sit the assessment in 3 months.

With everything verified at a granular level before hand, companies are able to carry out more accurate screenings. Hiring will be based on skills rather than degrees or whether one has worked for large corporations. More skills transparency will lead to fairer and more efficient selection process. Diversity, equity, and inclusion (DEI) will also improve as a result.

Made possible by the surge in remote working technologies, how we work has changed a lot since the pandemic. Digital nomads are becoming the new trend. According to a study from MBO Partners, 17.3 million US workers (or 11% of US total workforce) describe themselves as digital nomads as of 2023, as shown in Figure 37.[82] Another separate research pointed out that the global number of digital nomads is expected to top 40 million this year and rise to about 60 million by 2030.[83]

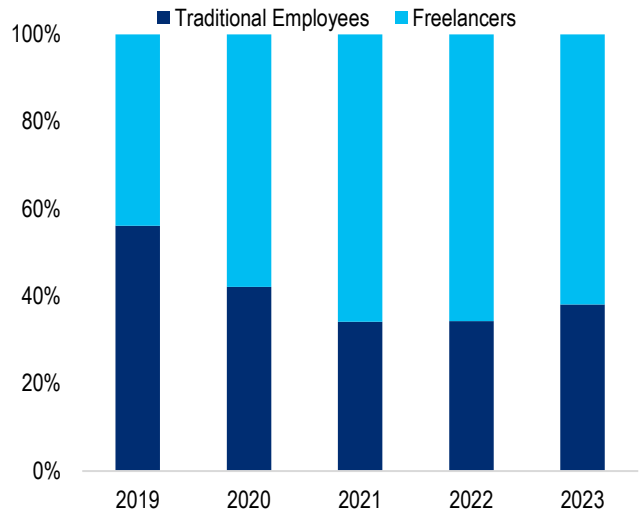
[82] Digital Nomads: Nomadism Enters The Mainstream
[83] WYSE Travel Confederation: Growth And Developments In The Digital Nomad Market Since COVID-19

Figure 37. No. of US Digital Nomads by Type (in mns)



Source: MBO Partners

Figure 38. US Digital Nomads by Type (%)



Source: MBO Partners

Figure 38 shows that most digital nomads are freelancers (making up over 60% of total digital nomads in the US in 2023), who tend to take temporary jobs and move from place to place. This means that they are constantly seeking the next job. Even for the remote-working traditional employees, they tend to switch companies more often than their on-site colleagues – they can do the interview at home over Zoom.

With cultural shifts like nomadism and job hopping gaining traction in the post-pandemic world of work, we expect a surge in the number of people seeking jobs on the market. A more efficient selection process will help both applicants and hiring companies save a great deal of time and therefore be in great demand. Skills wallet will play a crucial part in the digital transformation process for talent acquisition industry.

Skills Based Talent Management: Upskilling & Reskilling

We can't stress enough the urgent need to upskill and reskill the existing workforce to help them migrate to skills of the future in preparation for new jobs to come – the pace of change in the world of work is not like anything we've seen before. In *Part 3: AI Doom or Boom for Jobs?* Of our *AI Meets HCM* series and Citi's *Technology at Work 7.0* GPS, we highlighted how new waves of automation driven by the digital transformation will sweep across the workplace and fundamentally reshape how we work.

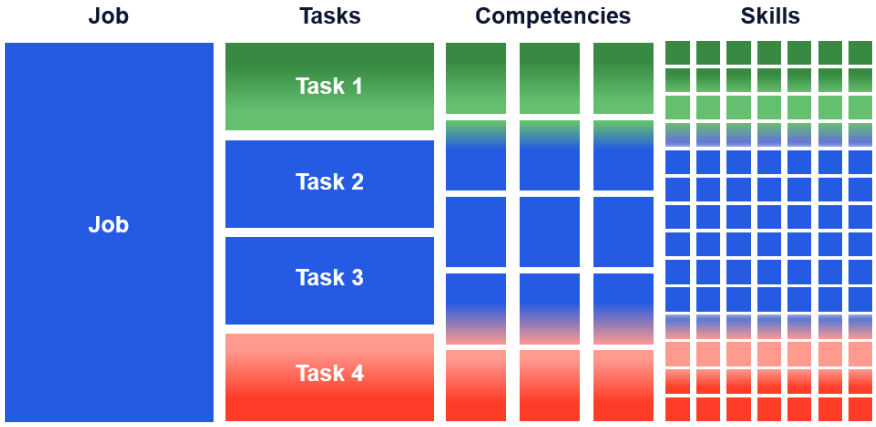
Digital skills wallet will help lay a solid foundation for AI-powered intelligent workforce planning. With greater skills transparency made possible by digital skills wallet, companies can have enhanced visibility into their overall skills repository and individual employee's skillset. Such omniscient visibility is a necessary base for AI to operate.

Digital skills wallet can offer clearer insights into what skills are possessed collectively and to what level, how skills are distributed across different cohorts, what skills are lacking or need improving and how to bridge the skills gap through workforce planning. Companies can then build their skill taxonomies on these data, which will allow companies to manage their skills repositories and talent pools more efficiently and more compassionately.

Digital skills wallet can foster companies' transition into skills based organizations. Once companies know who has which skills, they can break down work into gig projects and match those gig projects with workers based on their skills. That way, workers can work on a multitude of fresh projects that allow them to take the best advantage of and further develop their talent. With more accurate project match and higher talent utilization rate, productivity and efficiency improvement will follow naturally.

While using the skills based model to arrange work might not be suitable for every role as some roles require regulatory approvals and others involve confidential information, there are always projects within the organization that can be assigned flexibly to workers with the right skills and hence achieve better utilization of talents and improve efficiency.

Figure 39. Jobs, Tasks, Competencies, and Skills



Source: Citi Global Insights

With skills information down to the most granular level, companies will also be able to tell their employees which required skills are already matched or which are lacking for the positions that they are interested in. Targeted L&D materials will then be delivered to their employees to help them upskill and reskill.

Increased skills transparency brought by digital skills wallets allow both companies and employees to proactively plan the upskilling and reskilling to bridge the skill gaps. Employees can hence futureproof their career while companies can better align their skills repositories to their strategic vision.

Digital skills wallet can help career coaches compare 1) current skills of an employee with adjacent skills of the future and 2) the career trajectory of an employee with those of more senior employees who went through similar journeys in their early career and point to the employee the most suitable career development direction and even the step-by-step plan to get there.

Good managers of course already try and do this, but career decisions backed by big data from digital skills wallets allow for more tailored and more scientific human capital management down to the individual level, even for a workforce of tens of thousands of employees.

Digital skills wallets will help grow sustainable L&D cultures for all. They can augment one's manager, even when your manager changes. Or help to highlight talent hoarding by managers, where they intentionally or subconsciously attempt to

retain their best employees beyond the natural course of the working relationship and often to the detriment of the employee's personal development.

Robust and comprehensive support in L&D can better engage employees, which will lead to high satisfaction levels. This will in turn lead to not only higher productivity but also higher retention rate, offering greater returns on investment. According to a Deloitte study, organizations with a strong learning culture are 92% more likely to develop novel products and processes, be 52% more productive, be 56% more likely to be the first to market with their products and services, and 17% more profitable than their peers. Their engagement and retention rates are also 30–50% higher.[84]

The Private Sector is Already Doing This

Edalex

Edalex offers education technology solutions that connect seamlessly with existing learning systems, pull together siloed training and L&D data and make these data accessible, understandable and meaningful. The garnered insights can foster more informed and more efficient decision making.

They offer three main products currently: Credentialate; OpenEQUELLA; OpenRSD.

OpenEQUELLA is a digital repository used to discover, manage and share any learning content.

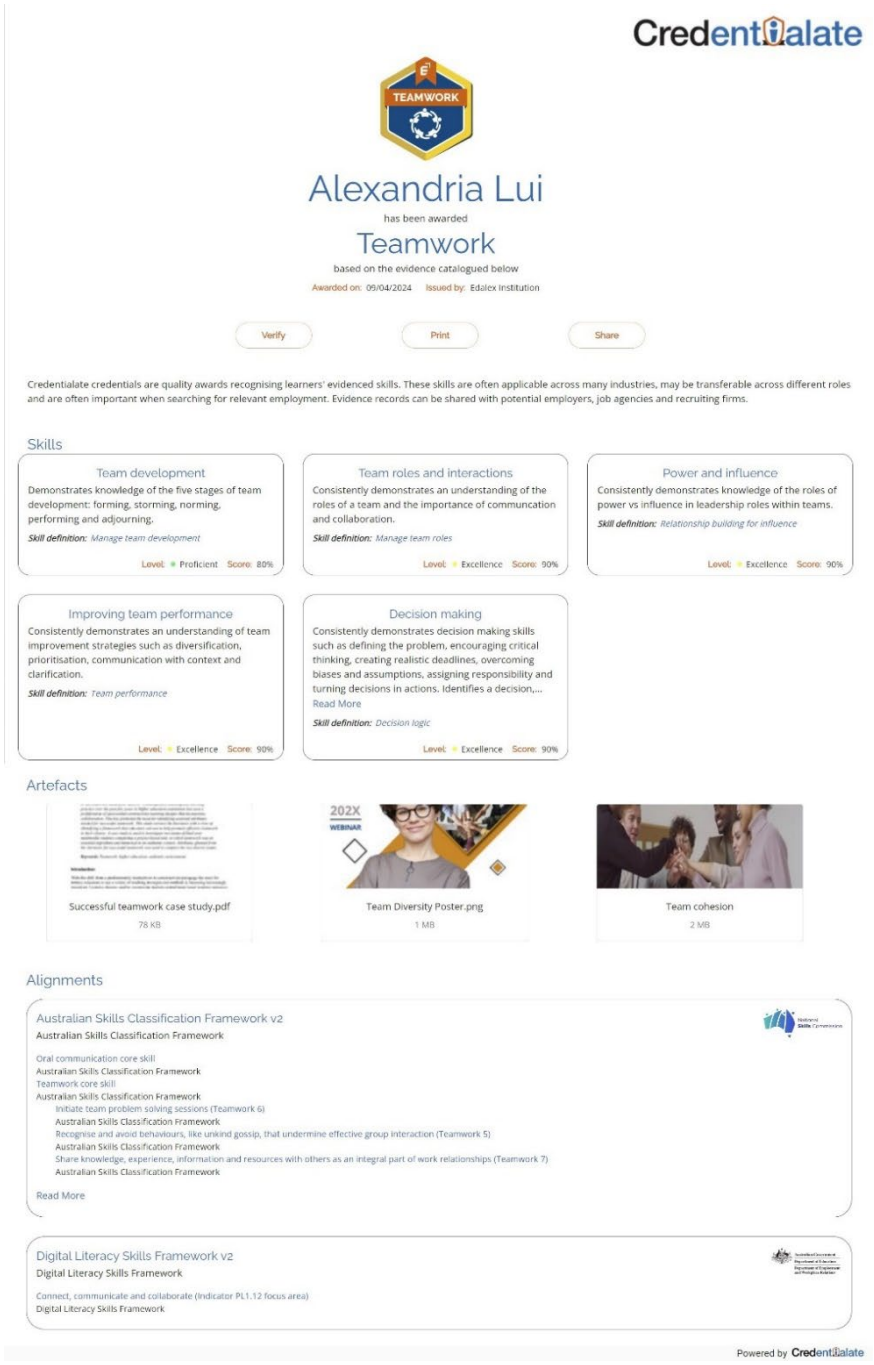
Credentialate helps people discover and share evidence of workplace skills.

According to Credential Engine, a nonprofit credential and learning service provider, there are over 1 million credentials available to be earned globally and c.60 thousand credential providers across the US.[85] When a badge is issued by a LMS, there's usually very little information attached to the badge, and it's not customized for the leaner's idiosyncrasies.

For example, even if Alex has received a Gold badge in Collaboration, he might find it difficult to share it with the company he wants to apply for because it's not clear to many people what a Gold badge in Collaboration means (as compared to a Silver one). This can seriously limit the value and usability of the badge.

[84] Becoming irresistible: A new model for employee engagement
[85] Credential Engine

Figure 40. Sample Evidence Supported Badge from Credentialate



Source: Edalex

Credentialate can help Alex find evidence to substantiate the badge and detail the exact extent his collaboration skill by providing quantitative, qualitative and artefact evidence (documents, audio and videos) for his DHS (Figure 40). This makes his DHS badge much more easily understandable by others and hence increase its shareability and interoperability.

Credentialate does this by extracting data from OpenEQUELLA and leading LMS and assessment platforms (e.g., Moodle, Blackboard, Totara) and then feeding them to series of models and tools that can automatically gather the evidence to

support the claims to have certain skills.[86] They can then issue their own badges with supporting evidence or provide that to other third-party badges.

From an institutional perspective, Credentialate is able to surface insights and trends hidden behind these DHS data – the tool can gather all the individual skills data and present them in aggregate with visualization tools to an organization.[86] Companies can hence make better and more informed decisions about L&D and upskilling and reskilling programs based on these insights. 76% of learners are more confident speaking about their skills after using Credentialate.[87]

OpenRSD helps learners create, store and share Rich Skill Descriptors (RSD) essentially functioning like a skills wallet. RSD is a metadata standard that contains all sorts of skills related data:[88] skill statement; occupational data (to indicate the skill alignment to relevant jobs and occupations); intelligent labor market data (to identify employers or the industries who require certain skills for a given job); standard and certification data.

OpenRSD allow users to align their data with external open skills library or framework. For example, one can align their RSD with Australian skills classification if one is creating an Australian RSD. Additionally, RSD can be aligned with each other. This makes it easier to establish a network of skills, which in turn increases understandability and shareability of the skills data.

Combining these three tools together will lead to a huge synergy. OpenEQUELLA helps centralize L&D content and learning records, which can be fed to Credentialate to uncover what's behind one's DHS – evidence them and elucidate the proficiency levels. The supporting evidence from Credentialate, together with other data (e.g., occupational data, intelligent labor market data), will then be pocketed into OpenRSD, which can be shared to prospect employers thereafter.

1EdTech

1EdTech is a non-profit edtech with the aim to accelerate the digital transformation of learning. Part of their goal is to make it easier for learners to store, view and share their learning records. Their digital credentials workstream includes the Comprehensive Learner Record (CLR) standard, Open Badges and Competencies and Academic Standards Exchange (CASE).

CLR standard is proposed with the aim to build a digital record of learning that includes every step of the journey throughout one's lifetime, from the earliest stages of learning (K-12) to advanced education to career achievements. The CLR standard allows individuals to store and manage their learner records like degrees, certificates, licenses, courses, competencies, skills and internships in a verifiable and machine-readable format.[89]

Open Badges is a world's leading type of digital skills badge that is verifiable and portable. According to the 2022 Badge Count report, its open-source standard has been adopted by 53 platforms with c.75 million badges issued to individuals by mid-2022 to certify their skills and achievements.[90] The report also revealed that there

[86] Edalex Credentialate
[87] Edalex Credentialate
[88] openRSD Launch Webinar
[89] 1EdTech Comprehensive Learner Record (CLR) Standard™
[90] 2022 Badge Count Report

were 521,070 total Open Badges worldwide that individuals can earn in 2022, 430,2721 of which are available from issuers in the US.[90]

Total number of Open Badges available to be earned are increasing rapidly – 10% over the past two years and 172% over the past four years. Number of Open Badge issued also has grown by 73% and 211% respectively over the past two and four years.[90]

With DHS increasingly being sought after, more demand will naturally follow to credentialise them using Open Badge and pocket them into a skills wallet. We therefore expect to see continued strong growth in the adoption of Open Badge – more badges available and more badges issued.

CASE standard is a consistent format to exchange information about learning outcomes, competencies, skills or academic standards in an open, machine-readable format.[91] The aim is to make learning and skills credential data more accessible among employers, learners, training providers and career coaches.

Pushes from Governments and Universities are Needed

While we've seen many pushes from the private side, a standardized data structure is needed to guarantee interoperability among various parties: skills wallet providers; job applicants; hiring companies; training organizations; professional bodies. Limited interoperability and shareability will undermine transparency and verifiability. A whitepaper like the Learner Credential Wallet Specification[92] by MIT and the US Department of Education to set skills wallet data standard is the foundation for the technology's wider adoption. Government involvement can be of great help to drive the adoption of industry standards.

Countries

Singapore

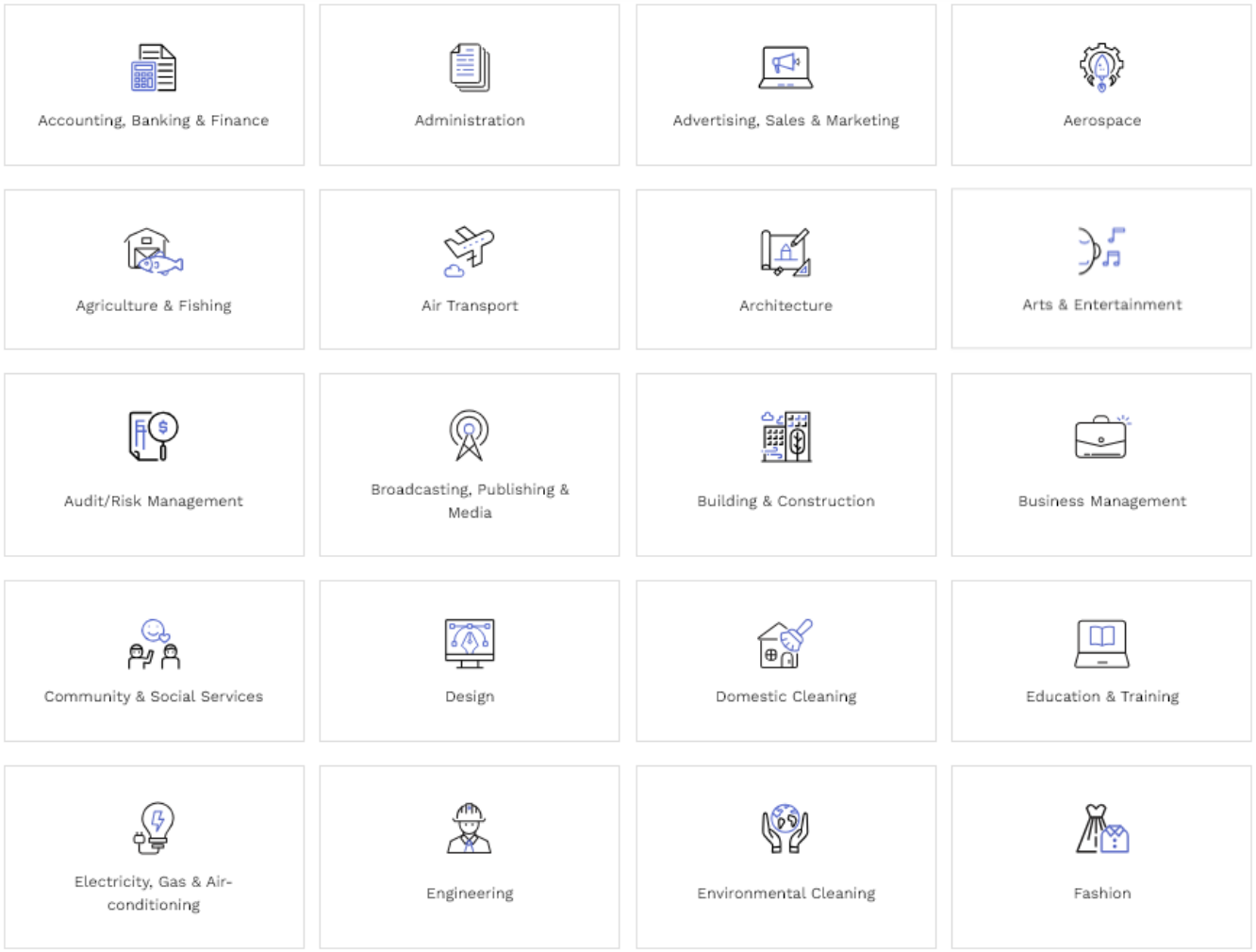
In 2015, Singapore launched the SkillsFuture movement, the four key aims of which are:[93]

- Helping individuals make well-informed choices in education, training, and careers;
- Developing an integrated, high-quality system of education and training that responds to constantly evolving needs;
- Promoting employer recognition and career development based on skills and mastery;
- Fostering a culture that supports and celebrates lifelong learning.

[91] 1EdTech Competencies and Academic Standards Exchange (CASE)
[92] Learner Credential Wallet Specification
[93] SkillsFuture

As part of the movement, an initial SkillsFuture Credit of SG$500 (c. $370) is offered to all Singaporean citizens aged 25 and above, which they can use to offset the out-of-pocket net course fees for eligible courses listed on MySkillsFuture portal. Subsequent top-ups have been made in 2020 and 2024 to further support Singaporeans in their skills development journey.

Figure 41. Examples of Areas of Training on SkillsFuture



For the complete list of areas of training, see: Courses | Myskillsfuture.gov.sg
Source: SkillsFuture Singapore (SSG)

Singapore's Government Technology Agency (GovTech) created an open-source framework of attestation and notary for any document types on the blockchain called OpenAttestation.

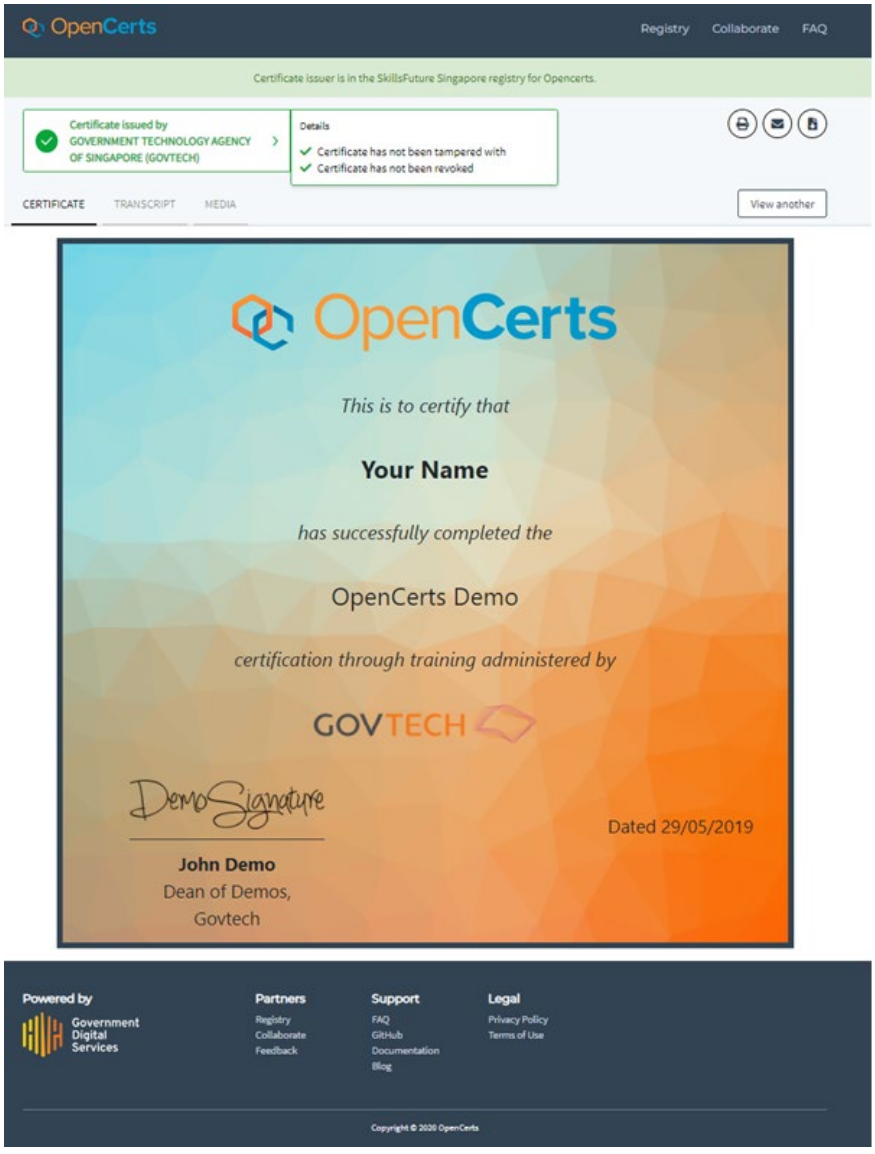
As part of the Smart Nation initiative, GovTech, together with Ministry of Education, Ngee Ann Polytechnic and SkillsFuture Singapore, built further on the OpenAttestation framework and developed an implementable skills wallet called OpenCerts that allows individuals to store, verify and share their educational credentials at a single place with a few clicks.

The OpenCerts idea was first conceptualized in November 2017, implemented in May 2019 and is now widely adopted among institutions within the OpenCerts consortium (e.g., Nanyang Technological University, National University of

Singapore, National Institute of Early Childhood Development). The tool contains three key components:[94]

- An open-source schema for publishing educational credentials;
- A set of tools for generating cryptographic protections for educational credentials;
- The OpenCerts online website for verifying the authenticity of OpenCerts files.

Figure 42. Demo certificate that has been verified by OpenCerts



Source: OpenCerts

[94] OpenCerts - An Easy Way to Check and Verify Your Certificates

Although OpenCerts only offer their services for educational credentials at the moment, it can still be quite useful. For example, it used to be the case that if an employer wanted to verify a degree certificate, they needed to contact the educational institute for confirmation. This manual process can take days to complete. With OpenCerts, they can now do it in a matter of seconds.[95]

The technology has been used to verify over 5000 education credentials monthly, which translates to estimated manpower savings of up to 7 man-months per institute.[96]

It's not difficult to imagine that in the future OpenCerts will be able to expand their capacity beyond just verifying degrees. OpenCerts may onboard more professional bodies (e.g., the Institute of Singapore Chartered Accountants, the Singapore Medical Council, the Legal Services Regulatory Authority) and companies to join the OpenCerts consortium so that professional certificates and in-company L&D can be stored, verified and shared the same way as degrees – more authentic, more secure and more time saved.

To become an OpenCerts issuer, the institute simply needs to deploy a Document Store smart contract with a single click and design a visual template for the certificate. They can then begin to issue credentials for as cheap as 50 cents per batch for up to 50,000 certificates.[96]

Australia

In September 2023, Australia unveiled their national skills wallet plan called National Digital Skills Passport (NDSP) with AU$9.1 million (c. $5.8 million) in initial funding. The NDSP is part of a bigger plan to promote lifelong learning – a key reform to address the current skills shortages and push for the Albanese Government's vision for a more dynamic and more inclusive labor market of the future as outlined in their Employment White Paper.[97]

The Australian Tertiary Admission Rank (ARTR) is a numerical score used in Australia to access and rank the academic achievement of high school graduates. It's used by universities to help determine a student's eligibility for university courses.

The NDSP will allow job seekers to store and share their verified skills and qualifications with perspective employers. It won't just contain one's college degree and ATAR but serve as a centralized repository for one's verified skills, acquired both at school and post-school during vocational education and trainings (VETs). The aim is to make it easier for people to apply for jobs and continuously develop their skills throughout their careers.

Public consultation for the NDSP has begun in January 2024. "With more and more jobs requiring a post-school qualification, it is increasingly necessary for people to upskill and reskill throughout their careers," said Jason Clare, Australian Minister for Education, "A National Skills Passport could make it easier for employees to demonstrate the skills they have, and for employers to have confidence that employees have the skills they need."[98]

Other Countries

Many other countries like UK, US and Canada have similar initiatives, albeit to a limited scale, for certain occupations or for certain categories of credentials. Skills wallets usually come as part of their bigger digital transformation plans to 1) promote lifelong learning and 2) upskill and reskill the existing workforce. The aim is to 1) ease skills

[95] OpenCerts - An Easy Way to Check and Verify Your Certificates
[96] OpenCerts
[97] Employment White Paper
[98] National Skills Passport

shortage issues on the current talent market, 2) help transition the national workforce to a digitalized future of work and 3) futureproof individual employees' careers.

UK offers Digital Staff Passports (DSPs) that enable postgraduate doctors in training and staff who move temporarily to hold a verified portfolio of digital credentials for employment checks and core skills training competencies.[99] The aim is to make personnel move more easily and quickly between different NHS organizations without the need for repeat form fillings, checks and duplicate trainings.

Limited in scale as most government-supported skills wallets may be for now, it's only sensible to further grow their capacities to include more industries and more credential types, which will in turn attract more participating professional bodies, individuals and companies.

Universities

Universities issue certificate as a proof that someone has completed courses so it is not surprising that some universities are at the forefront to drive the adoption of skills wallet. In Singapore the OpenCerts consortium is comprised mostly of universities.

Digital Credentials Consortium (DCC)

The same is also true for the US and beyond. In 2018, the Digital Credentials Consortium (DCC) was founded by 12 universities from 5 countries with the aim to design an infrastructure for digital academic credentials. At the center of their digital credential ecosystem is a digital skills wallet, an application that leaners can use to store, manage and share their credentials.

Current members of DCC: Massachusetts Institute of Technology (US); Delft University of Technology (Netherlands); Georgia Institute of Technology (US); Harvard University (US); Hasso Plattner Institute, University of Potsdam (Germany); McMaster University (Canada); Tecnológico De Monterrey (Mexico); Technical University of Munich (Germany); University of California, Berkeley (US); University of California, Irvine (US); University of Milano-Bicocca (Italy); University of Toronto (Canada); Western Governors University (US).

Building on earlier efforts by the participating institutions, DCC's done many ground work for the digital credential ecosystem.

DCC works with many bodies including the World Wide Web Consortium (W3C) and the Open Wallet Foundation (OWF) to set the standards for digital credential wallets development[100] involving: functional requirements; conceptual flows supporting flexible use of relevant standards and data models; foundational, extensible design based on conceptual flows; interoperability requirements. DCC also works with 1EdTech on Open Badges and the Comprehensive Learner Record and contributes to map the Learning and Employment Record (LER) Ecosystem.[100]

[99] NHS Digital Staff Passport
[100] Digital Credentials Consortium (DCC)

Figure 43. Learning and Employment Record (LER) Ecosystem Map

Source: DCC and others

DCC takes an open-source approach, which is faster, cheaper and more transparent. All of their software for issuing and verifying credentials and the underlying libraries are open source and available on Github.

Organizations and individuals can use DCC open-source software to develop their own credential issuing applications or integrate DCC libraries to issue credentials from their own locally developed software. They also set up a verification site called VerifierPlus to showcase their vision for verification sites, which they hope there will be many in the future.[100]

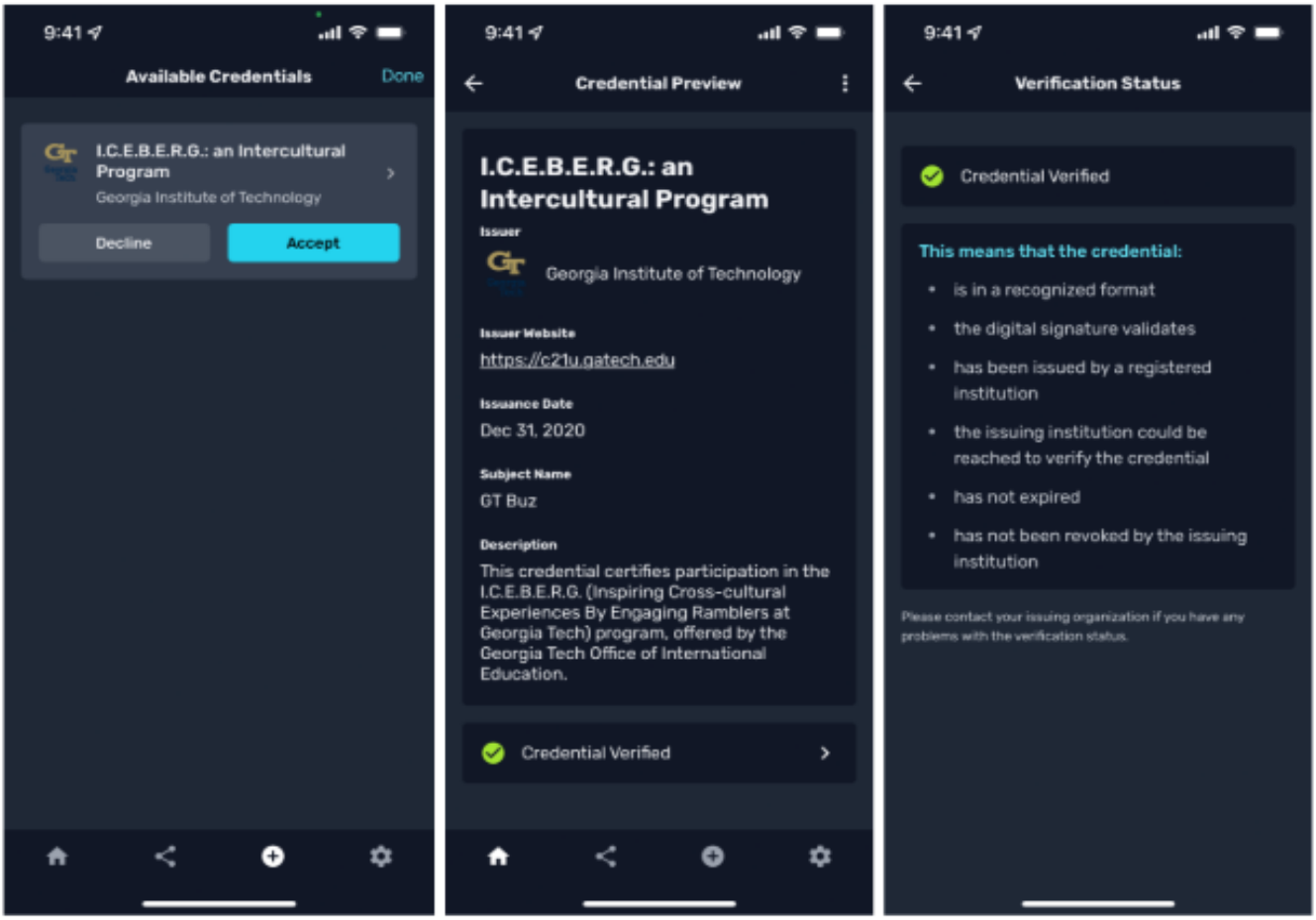
MIT

MIT is among the leading founders and main contributors of DCC. In 2020, MIT entered into an agreement with the US Department of Education to design and implement a wallet to store digital credentials.[101]

Working in tandem with other members of DCC, MIT delivered an open-source mobile application called Learner Credential Wallet (LCW) for storing and sharing academic achievements with verifiable credentials that is available for iOS and Android. Some key features of the LCW include:[101]

- Secure login to the wallet;
- Add a credential via deep link (URI or QR Code) or via a fully encapsulated QR code;
- Display credentials locally—Issuer, issuer logo, credential name, credential description, issuance date;
- Select and share credentials via mobile operating system sharing mechanisms (e.g., save as a file, send a file, etc.);
- Delete credentials;
- Backup and restore the wallet from a file.

Figure 44. Add Credential, Credential Preview and Verification Status



Source: DCC

[101] Open Source Student Wallet Final Report

Don't Underestimate Data Security

Just like digital wallets for money (e.g., Apple Pay, Google Pay), the foremost priority for digital wallets for skills is data security. One way to enhance data security is to move the wallet to blockchain.

What is a Blockchain?

We covered more on what a blockchain is in Citi GPS on *Money, Tokens, and Games*. Blockchain is built based on an underlying technology called Distributed Ledger Technology (DLT). In essence, blockchain is a cryptographical tool to record information and transactions digitally, whether it's between buyers and sellers, or in the case of skills wallet, an educational institution and its graduates.

Decentralization is at the core of the technology, meaning that a public blockchain is neither owned nor maintained by an individual. This in turn ensures that records made on it cannot be altered or destroyed by a single person.

OpenCerts is an example of using blockchain technology to protect data integrity prevent the certificate from being modified or destroyed.

How Skills Wallet Works with Blockchain

When a certificate is added to OpenCerts, a unique digital code called 'hash' is tagged to it. The hash, together with condensed information from the certificate, is stored on the blockchain.

When a hiring company wants to verify the authenticity of the certificate, they just need to open the .opencert file on the OpenCerts site. Its contents will then be compared with what was stored on the blockchain. The system will automatically check if the contents match and if the certificate comes from a recognized institution. Through this, HRs will be able to know if the certificate is valid when they try to view it.[102]

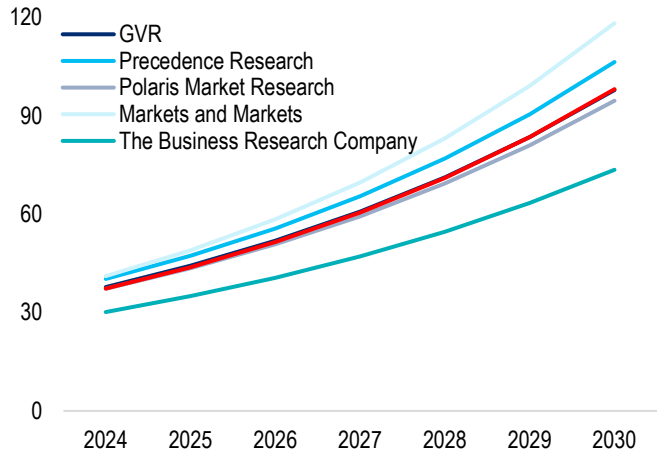
More skills wallets will be blockchain native to safeguard credential data from malicious rewrite. We therefore expect skill wallets to become an integral part of the Web3 ecosystem, leveraging the information transparency and data security enabled by the decentralized structure of blockchain.

Skill wallets have the potential to bring great value in a digitalized world of work. It will fundamentally transform the way companies acquire, manage and develop their talents.

But skills wallet still remains underdeveloped as compared to digital wallets and digital IDs. Five independent sources suggest that global digital ID market stood at $32 billion in 2023 and is expected to reach $98 billion by 2030, growing at a 7-year CAGR of 17.4% (Figure 45). Four independent sources suggest that global digital wallet market stood at $9 billion in 2023 and is expected to reach $65 billion by 2030, growing at a 7-year CAGR of 32.1% (Figure 46).

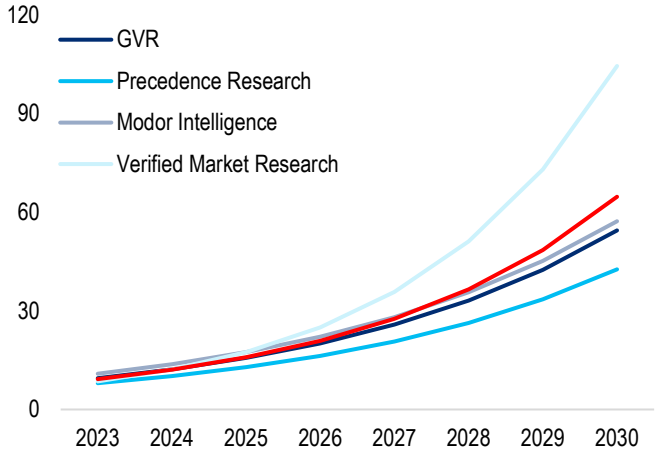
[102] OpenCerts

Figure 45. Global Digital ID TAM (in $bns, red represents average)



Source: Citi Global Insights, Various (See Chart)

Figure 46. Global Digital Wallet TAM (in $bns, red represents average)



Source: Citi Global Insights, Various (See Chart)

In contrast, the skills wallet market is just starting and has significant growth prospect in the next few years. As we will point out in the next chapter, we expect skills wallet to become a key growth driver for the global training market that's been lingering in decline for almost a decade.

DHS as the New Fuel for the Global Training Market

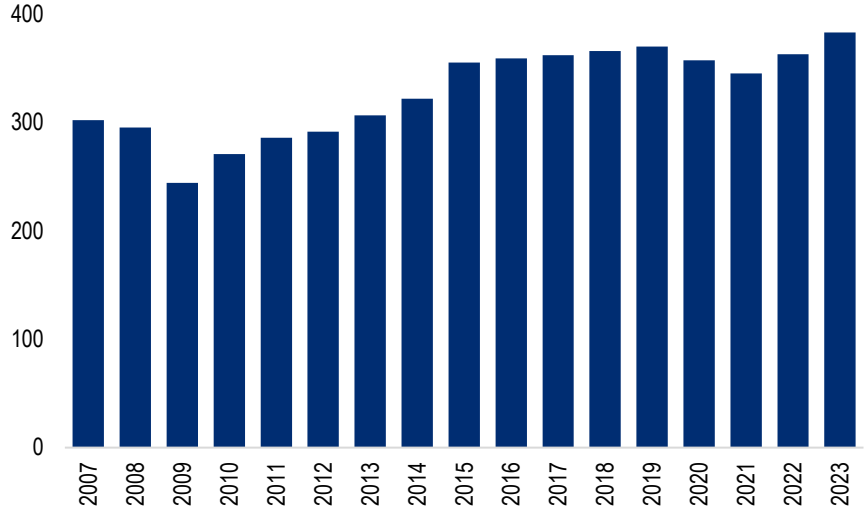
Corporate Training Market Has Been in Decline

The global corporate training market is huge – standing at over $380 billion in 2023 according to Statista.[103] Figure 47 shows that the market experienced significant growth during 2009-15 after the dip caused by the GFC but flattened out during 2015-19. Since 2015, although we've seen years when the actual spending has increased (2015-19 & 2021-23), the L&D budget has dropped in real terms for 8 straight years after adjusting for inflation.

In the UK, employer investment in training plummeted 28% between 2005-22, with UK employers investing only half the EU average per worker.[104] According to the National Employers Skills Survey, the average UK employer provided 7.5 days of training per annum for every worker in the country in 2005.[105] In the latest number in 2022 survey had decreased to 3.5 days[106], a 53% drop.

The situation is similar in the US. According to the 2011 Training Industry Report[107], US companies spent $1,036 on training every year per employee in 2009. The latest number in 2023 decreased to $954 in 2023[108], an 8% nominal decline. But if we include inflation in the calculation, it's actually a 35% fall.

Figure 47. Historical Global Spending on Corporate Training (in $bn)



Source: Statista

[103] Market Size Of The Global Workplace Training Industry From 2007 To 2023, With A Forecast For 2024
[104] Raising the bar: Increasing employer investment in skills
[105] 2005 National Employers Skills Survey
[106] 2022 National Employers Skills Survey
[107] 2011 Training Industry Report
[108] 2023 Training Industry Report

We pointed out the necessity of sufficient, easily accessible, good-quality L&D resources in an organization and their immense benefits in *Part 1: TIPs for Skill Migration* of our *AI Meets HCM* series. To recap, training programs can help upskill and reskill employees to assist their transitions into new roles and hence:

- Companies that encourage learning have been shown to have up to 50% better **employee engagement and retention**[109], better **customer loyalty** (10%), **productivity** (18%) and reduced **absenteeism** (81%).[110]
- Similarly, a 2024 Wiley Workplace Intelligence survey highlighted that one of the top three reasons to leave a company is access is professional development, yet half of companies did not offer L&D outside of mandatory training and the majority of respondents spend less than 2 hours per month on development[111]. The same report noted soft skills training had a positive impact on employee performance but was only offered to 35% of respondents.
- It is **more expensive to hire externally** than to upskill existing employees. For example, in additional to a productivity loss when people leave, it can cost 50% more to hire than upskill a mid-career software engineer.[112]
- In contrast, Retrain.ai highlight that internal L&D can increase **internal mobility** by 57%, reduce hire times by 55% and boost employee engagement by 62%.[113] Excelling at internal mobility has been showed to double retention rates.[114] Research from Josh Bersin has shown companies which excel at internal mobility are significantly more (up to 7x) successful in **transformation and growth initiatives** and in **innovation** (up to 17x)[115].
- Skills training can better **align an organization's skills** repository to its strategic vision and improve the ROI of other investments.
- Research also suggests moving to a skills-first approach to talent (ie hiring for skills not academic qualifications) can lead to a 9-**fold increase in eligible workers**.[116]

[109] https://hbr.org/2022/04/3-ways-to-boost-retention-through-professional-development
[110] https://www.gallup.com/workplace/236927/employee-engagement-drives-growth.aspx
[111] https://newsroom.wiley.com/press-releases/press-release-details/2024/No-Soft-Skills-Training-Spells-Missed-Opportunity-for-Many-Organizations/default.aspx
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[113] https://www.retrain.ai/platform/
[114] https://news.linkedin.com/2022/march/our-skills-first-vision-for-the-future
[115] https://joshbersin.com/enterprise-talent-intelligence/
[116] https://economicgraph.linkedin.com/research/skills-first-report

Why the Declines When the Benefits Seem Obvious?

Given an investment in corporate training pays, it may seem irrational for companies to not grow their training budgets. We believe there are x explanations for the declines:

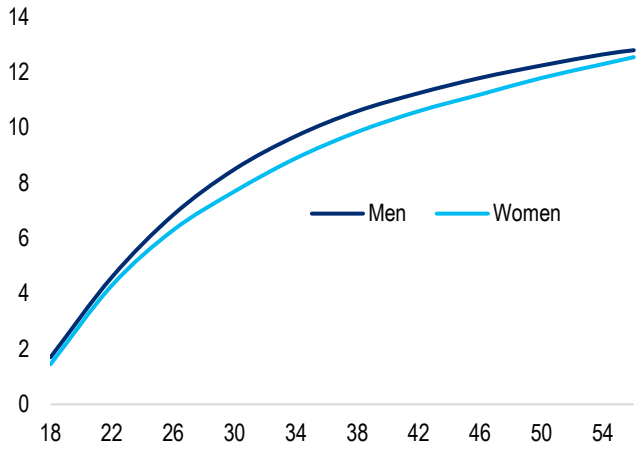
I. Most businesses are impacted by cyclicality of economic cycles and **discretionary spending such as training or advertisement are usually among the first to be hit when companies look to contain costs during financial downturns**. That's part of the reason why corporate training spending was cut back during the pandemic-induced economic downturn (2020-21) and the high inflationary macroenvironment that follows the pandemic eroded any actual growth in the past 2 years (2022-23).

II. Although many studies have demonstrated various benefits of corporate training, it's still **difficult to link the benefits directly to financial gains**, i.e., to be able to say, for example, this amount of extra L&D budget will boost the top line by x% or $x. This makes it challenging for L&D leaders to lobby for more budget. Therefore, **mid- to long-term investments like corporate training often gives their way to more urgent projects during budget allocations**.

III. Businesses are incentivized to **favor investing in capital over people** due to the tax system. This is also influenced by a mega trend towards digitization over the past 30 years, which often substitutes for people based tasks.

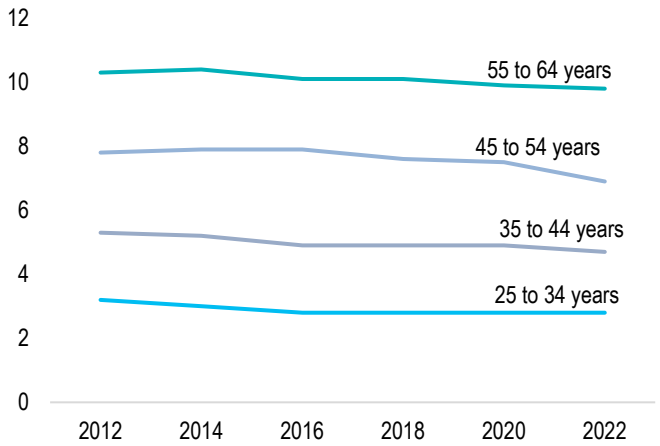
IV. **Tenure matters to ROI**. The average person from the US holds **12.7 jobs** over their career from ages 18 to 56 according to the US Bureau of Labour Statistics (BLS)[117], which means the average tenure of a single job is only 3 years (Figure 48). Figure 49 from the US BLS shows that young people tend to change their job more frequently than old generations – employees aged 25-34 in January 2022 switch their job **every 2.8 years**, whereas the number is 4.7 years for those aged 35-44.[118] Young people are switching jobs at a faster pace as well – median tenure has been shrinking from 3.2 years to 2.8 years in the past decade.[119] With the rise of more flexible work, including gig work and digital labor, **job hopping looks here to stay**.

Figure 48. Cumulative Number of Jobs Held in the US, by Sex and Age



Source: US Bureau of Labour Statistics

Figure 49. Median Years of Tenure in the US, by Age

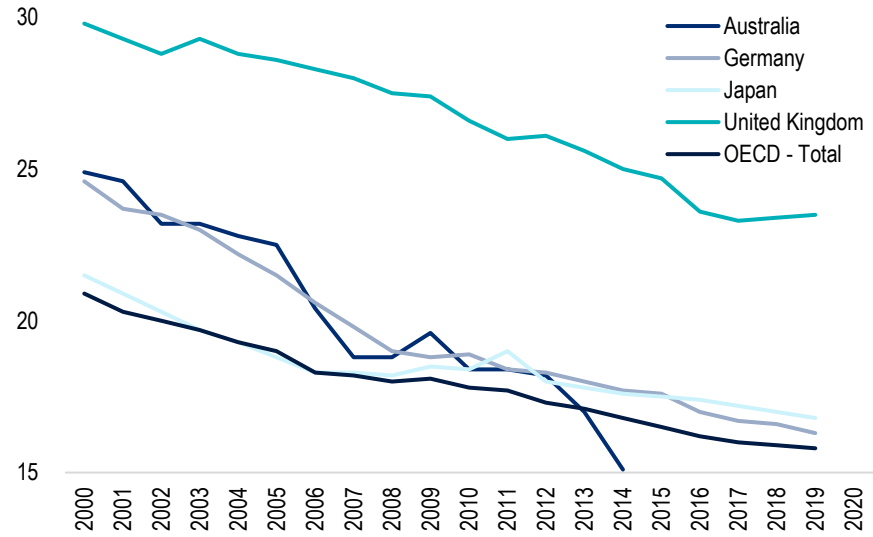


Source: US Bureau of Labour Statistics

[117] Number Of Jobs, Labor Market Experience, Marital Status, And Health
[118] Median years of tenure with current employer for employed wage and salary workers by age and sex, selected years, 2012-2022
[119] Ibid

V. A **fall in the power of unions** (Figure 50) over time could have caused less investment in training;

Figure 50. Trade Union Density (% of Workforce Members of Labor Unions)



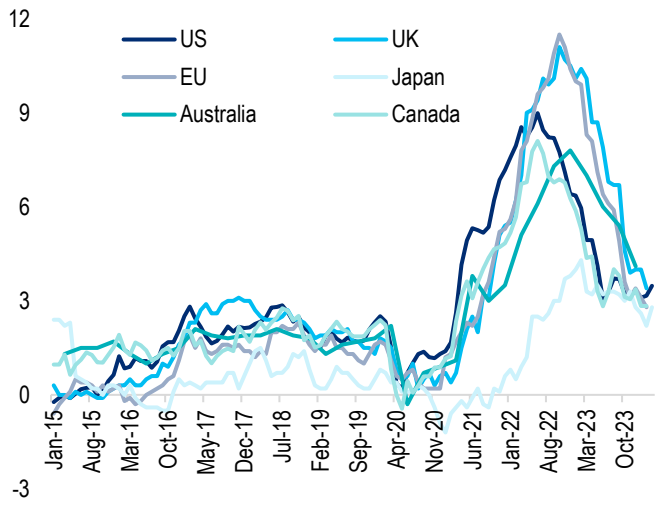
Source: OECD

VI. The corporate training market has undergone a **change away from in-person training to scalable digital offerings** that cut costs (funded by previous in person spending). It could be argued that digital training is more efficient and cost saving for firms, while offering more flexible and personalized learning for employees. On the other hand, there is a danger these **digital self-service offerings become a tick box offering** rather than immersive experiences to help them assimilate into a company's culture.

We Expect Things to Change with DHS Turbocharging the Training Industry

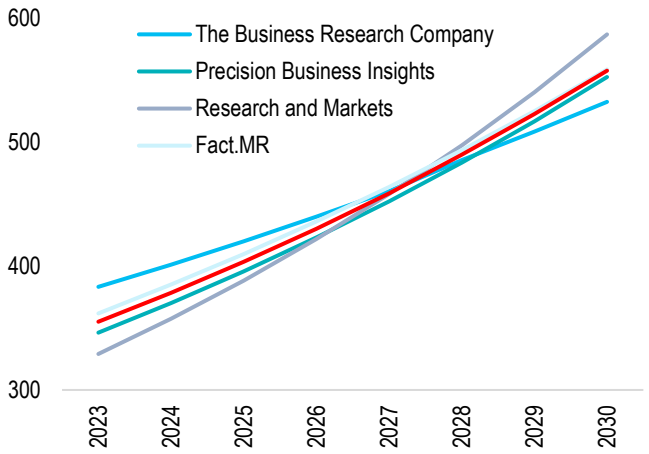
Fortunately, we expect the outlook for the training market to change going forwards. The total addressable market (TAM) of global corporate training is forecast to reach $355 billion in 2024 and then grow to $557 billion by 2030, registering a 6-year CAGR of 6.7% according to four independent estimates (Figure 52). Considering that the latest annual change in CPI is only 3.5% (all item, March 2024), we can hopefully see some growth in real terms for the first time in 8 years.

Figure 51. YoY Change in Consumer Price Index (%, monthly)



Source: Citi Global Insights, Central Banks

Figure 52. Global Corporate Training TAM (in $bns, red represents average)



Source: Citi Global Insights, Various (See Chart)

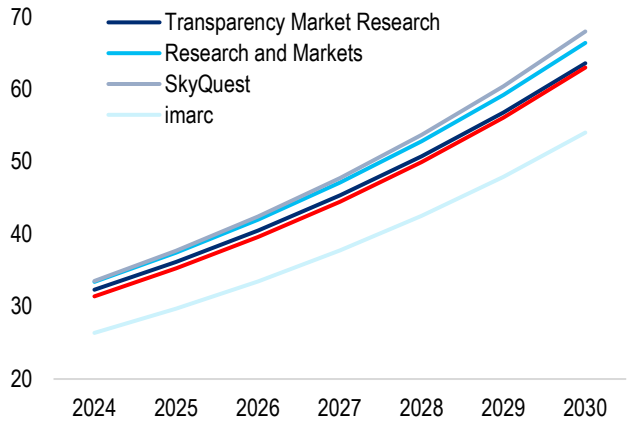
We see several drivers to the training market going forward.

I. If AI is the promised boost to productivity many hope it is, then **investing in training to go alongside investing in the tools** makes sense for companies. A big reskilling wave to use AI tools should be a powerful boost to the training market. AI won't replace people, but people who use AI will replace people who don't. We discuss this in more detail in Citi GPS on *AI Skills* and *Part 3: AI Doom or Boom for Jobs?* of our AI Meets HCM series.

II. This report does not focus on economic growth, but given training spending is often cyclical, any **AI-generated productivity increase** should help. Some of the expected cost savings from the use of AI could be channeled into higher L&D budgets.

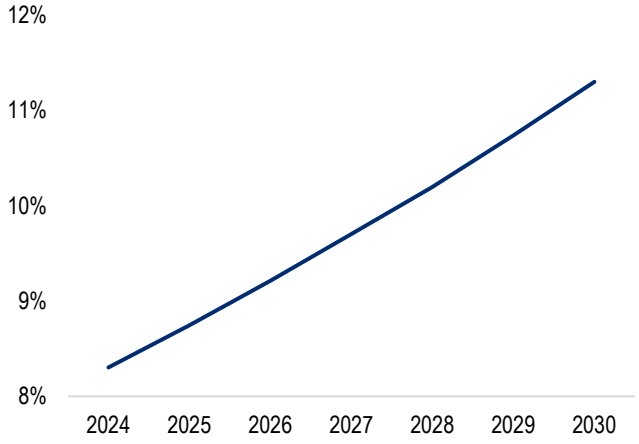
III. As noted throughout this report, the importance of DHS will grow and with it the training of these skills. Four independent TAM sources suggested that global **DHS training market** averaged $31 billion in 2024 and is expected to reach $63 billion by 2030 (Figure 53). The 6-year CAGR is 11.3%, much higher than the overall market. DHSs training accounts for 7.9% of the overall market in 2024 but is forecasted to constitute 11.3% by 2030 (Figure 54). We believe DHS training will become one of the key growth drivers for the corporate training industry.

Figure 53. Global DHS Training TAM (in $bns, red represents average)



Source: Citi Global Insights, Various (See Chart)

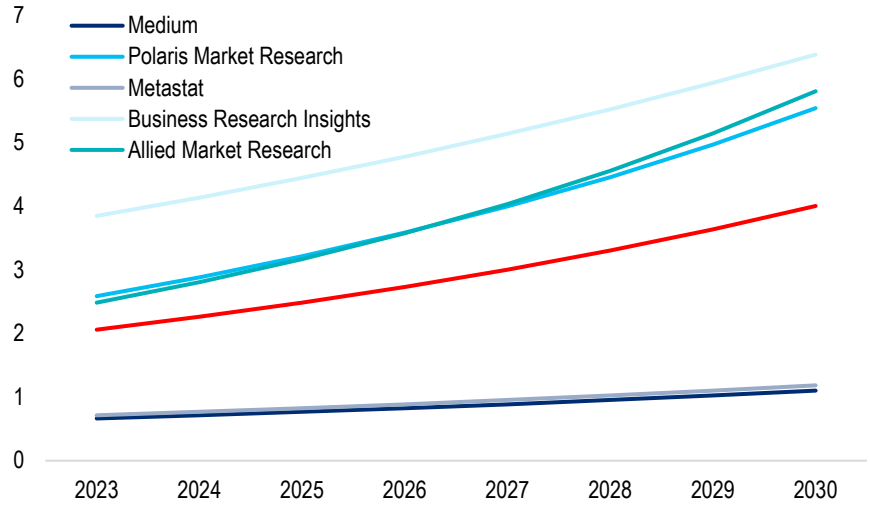
Figure 54. Global DHS Training as a % of Global Corporate Training Market (%)



Source: Citi Global Insights

IV. Given DHS will become more important, we expect DHS to be measured more going forward. We expect **more psychometric testing** for hires into companies to measure their DHS precisely, rather than just for entry level roles. Five independent forecasts suggest that the global psychometric testing market stood at $2.1 billion in 2023 and is expected to grow to $4 billion by 2030, exhibiting a 7-year CAGR of 10% (Figure 55).

Figure 55. Global Psychometric Testing TAM (in $bns, red represents average)



Source: Citi Global Insights

I. One way of improving DHS skills is via coaching. According to data from the International Coaching Federation's flagship Global Coaching Studies[120], the **global coaching market** size sits at $5.3 billion in 2023 and is expected to grow to $6.3 billion in 2024, a 17% increase.[121] The growth is significant considering that the market stood at $2.9 billion in 2019.The market has 126k active coaches as of 2023 and this number is expected to grow to 146k in 2024, a 15% increase.[121] The global coaching market has come a long way given that there were only 71k active coaches worldwide in 2019.

II. We have noted in this and previous reports that talent is attracted to companies who invest in their training. Third party sites, such as Glassdoor, include employee ratings of employers including L&D. **Greater transparency** of good and bad ratings should help employees. If upskilling and reskilling become more important factors in an AI age it is likely that companies will need to respond to attract the best talent. Against this if AI is being used more to substitute than augment employees, companies will be less willing to invest in training. Therefore, it is possible that training becomes more polarized, and talent migrates to the companies investing. If that talent also stays longer at these companies, higher retention rates will improve the ROI of training.

III. Our previous report on **Talent Intelligent Platforms** notes that new AI tools are available to help employees and employers become more skill centric. These tools can help improve transparency, mobility and ROIs. They can identify skills that are emerging or trending in the markets. They can also highlight D&I and pay inequities. Tools are only one part of the equation, but they can help towards improving cultures. There is a long runway to go in this area – according to Josh Bersin, while "most companies are embarking on a journey to skill-based HR….less than 15% of companies have adopted a skills-based approach for sourcing and headcount planning" so far.[122]

In addition to growth in the corporate training market, lifelong learning should also extend into new revenue streams for **universities as they become multi-versities,** catering for adult learning across lives rather than a focus of tertiary education post school. This will require a change in formats to shorter more flexible courses, but the need to retrain should act as a tailwind for quaternary education.

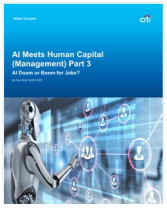
Governments can also support increased skilling, through lifelong learning vouchers and a change in tax incentives.

In parallel with the growth drivers of the training market highlighted above, the formation and growth of a new skill wallet industry should also be significant. The digital wallet market for example is forecast to grow from $9bn in 2023 to $65bn by 2030 and skills wallets could make up a large part of this market.

[120] ICF's 2023 Global Coaching Study
[121] Finally, Accurate Coaching Market Size Data for 2023 & 2024
[122] https://joshbersin.com/enterprise-talent-intelligence/

Any debate around the solutions to the impact of AI on work usually includes the need to upskill and reskill employees. Our concern has been that the data suggests that so far this has been more rhetoric than reality. The need and the opportunity is to turn this into a reality. In the race between education and technology, AI is not hanging around waiting.

Further Reading



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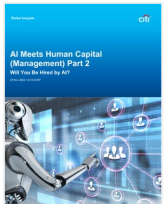

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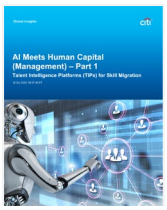

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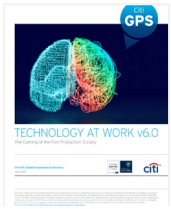

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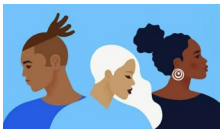

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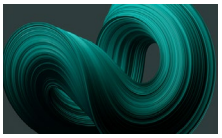

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