AI and Machine Learning for Complex Business Decision Making

PART 5 – HUMANS, MACHINES AND HUMACHINES

In **Part 5** of this six-part series of 10-minute reads, we present highlights of the **2020 MMPA Conference**,[1] **AI and Machine Learning for Complex Business Decision Making**, to illustrate the versatility and ubiquity of new digital technologies and to spotlight CPAs' changing competencies and emerging opportunities.

Part 1 – From Excel to AI: The Analytics Evolution looks at the **analytics evolution** and the way CPAs in finance and audit need to adapt their analytics skillset to keep up with this rapidly changing field.

Part 2 – Technology for Problem Solving warns against the **digital transformation trap**: losing sight of problem solving and, instead, following the lure of technology. How should CPAs assess AI technology and **value creation**?

Part 3 – Systems Thinking and a Framework for Applying AI looks at **systems thinking** – a critical-thinking competency for CPAs – and a **framework** for applying AI and machine learning to complex business decision making.

Part 4 – Data and Trust examines **data management value chains**, new roles for CPAs and initiatives to ensure that data and AI systems are used fairly, accountably and transparently.

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1   The 2020 MMPA Conference was hosted by the Master of Management & Professional Accounting (MMPA) Program and BIGDataAIHUB at the Institute for Management & Innovation (IMI), University of Toronto at Mississauga (UTM). The MMPA Program combines an MBA curriculum with the development of technical and leadership skills vital for the accounting profession.

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Institute for Management & Innovation
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Here, Part 5 – Humans, Machines and Humachines focuses on **human skills**. It introduces AI-augmented intelligence in emerging organizations called **humachines** and the way CPAs' human and technical skills can play a role in commercializing Canada's AI start-ups.

Part 6 – Moving to an AI Advantage looks at the way companies move to an **AI advantage** and steps CPAs can take to be future ready.

PART 5 – Humans, Machines and Humachines

One of the central findings of the Future of Jobs 2018 Report continues to hold – by 2025 the average estimated time spent by humans and machines at work will be at parity based on today's tasks.

THE FUTURE OF JOBS REPORT 2020[2] (WEF, 2020, p. 28)

Humans Versus Machines / Humans Plus Machines

Humans and machines have different abilities and limitations. **Nada Sanders** compares humans and machines and introduces a new type of enterprise: the **humachine**.

It is a mistake for humans to try to be more like machines or to make machines more like humans, says Sanders. The reason for this is something called **Moravec's Paradox**, which explains that where humans are naturally gifted, machines are deficient and vice versa (see **Figure 5.1**).

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2   In total, the report's data set contains 291 unique responses by global companies, collectively representing more than 7.7 million employees worldwide. Out of scope of this report are responses from small companies with fewer than 100 employees as well as responses from the informal sector. The report aims to provide guidance and stimulating discussion. However, the results should be treated with caution when looking to generalize its findings in a manner that could be considered representative of all trends across an entire industry or country. (p. 151)

FIGURE 5.1: MORAVEC'S PARADOX IN MANAGEMENT
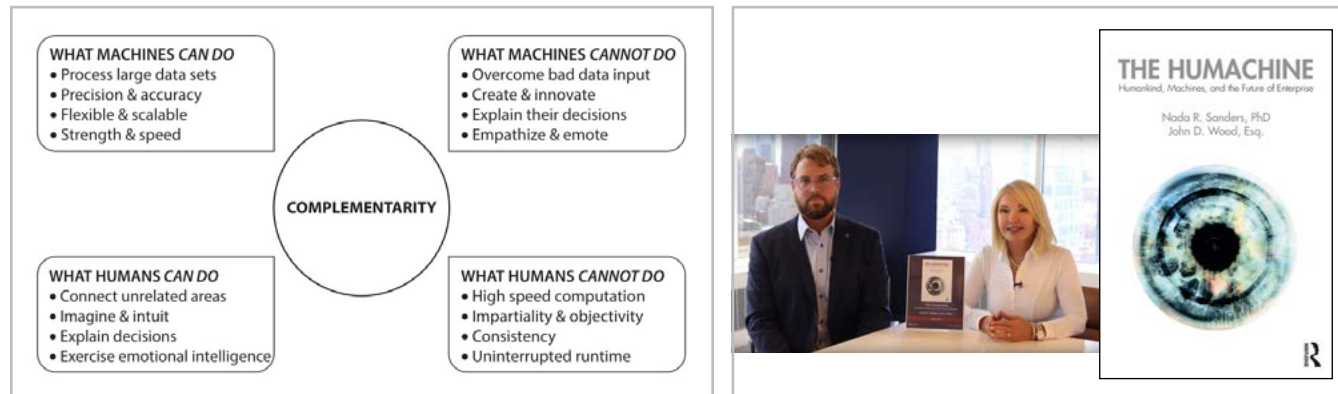
(a) Chart showing the four dimensions of complementarity (Sanders & Wood, 2020, p. 131)

(b) Nada Sanders and John Wood explain Moravec's Paradox in this **video clip** (Taylor & Francis Books, 2019)

For example, Sanders explains,

- Innovations come from humans' ingenuity, creativity and ability to make connections across disparate areas: integrative thinking. Machines cannot do that.

- Organizations need humans to play the role of **translator** (see **Part 3's section, Involve People from the Start**, and **Part 4's section, Data Management Value Chains and Roles for CPAs**): the intermediary who explains a company's analytics strengths and weaknesses to its decision makers; the negotiator with customers and suppliers or who understands the language of business and technology. Machines cannot do that.

- Emotions and empathy are human traits necessary to motivate employees. Machines cannot do that.

By contrast, humans need machines for high-speed computation and processing large data sets. Humans cannot do that. Machines can **augment** human decision making. New organizations called humachines take full advantage of human-machine complementarity.

NEW "WAY FORWARD" COMPETENCY MAP (CM2.0) (2021)

In response to the world's rapid changes from emerging digital technologies, the new *"Way Forward" Competency Map (CM2.0)* presents and re-examines the pre-certification competencies and skills required by CPAs with the goal of creating future-ready CPAs.

Fostering **human skills** and values resilient to automation is an important component.

Augmented Intelligence: Humachines

A **humachine**, explains Sanders, is an enterprise that combines

- the better qualities of humans – creativity, innovation, compassion, judgment – with the mechanical efficiencies of machines – things like big data processing, AI, economies of scale; and

- humans and machines in a **symbiotic relationship** as co-workers.

> What we as humans bring to the table is really different than what machines can, and the key is to bring these together. That's what a humachine does.
>
> **NADA SANDERS**

Systems thinking (see Part 3, Systems Thinking: A Form of Critical Thinking) is also an important characteristic of humachines.

BlueDot: An example of a Humachine

> [Complex problem solving] isn't just about data and technology: it's about human intelligence and understanding a problem that is inherently very, very complex. AI is one tool in the toolbox. How do we innovate in ways that develop solutions that can turn insights into actions?
>
> **KAMRAN KHAN**

Accurate prediction of the global spread of COVID-19

Speaker Kamran Khan introduces the Toronto company BlueDot. It was among the first in the world to recognize the occurrence of undiagnosed pneumonia in Wuhan, China, on December 31, 2019, later called **CO**rona**VI**rus**D**isease 2019, or COVID-19. Within two weeks of the outbreak, BlueDot published the first peer-reviewed scientific paper (Bogoch, et al., 2020) on the virus and accurately predicted in which cities it would first appear.

Augmented Human Intelligence

Using a culturally and functionally diverse team of humans, predictive algorithms, mapping tools and ways of organizing and structuring data, BlueDot analyzes multi-lingual global text and **ethically sourced and properly anonymized data** to forecast potential public (and animal) health threats. (See Figure 5b,c). All data conforms to legal and privacy frameworks.

Its digital platform uses human and artificial intelligence to create a global early warning system to prevent spread of infectious diseases in animals and humans. How? The digital platform has three pillars:

- **Intelligence gathering**. Natural language processing (NLP) of data collected 24 hours a day separates background noise from vital health information (e.g., using contextual analysis, BlueDot distinguishes between Anthrax the heavy-metal band and anthrax the disease and looks for things like case counts, deaths and public health interventions in official and unofficial reports. (See **Figure 5.2a**.)

- **Data Analytics**. BlueDot uses AI in the form of advanced data analytics and digital innovations to organize, structure, integrate, aggregate and analyze diverse data – from airline ticket sales, flight schedules, cell phones, official and unofficial reports, Internet chatter, weather and climate, etc. – in near real time (See **Figure 5.2b,c**).

- **Insights**. BlueDot combines human understanding of disease organisms and the epidemiology of disease with AI-assisted understanding of people movement to identify threats and to generate early warnings. For example, BlueDot predicted the spread of Zika virus to Florida six months before official reports (BlueDot, n.d.).

FIGURE 5.2: BLUEDOT: INTELLIGENCE GATHERING ON COVID-19 FROM TEXT, FLIGHT, AND MOBILE DEVICE DATA

Source (modified): Kamran Khan, BlueDot

(a) Using AI to gather infectious disease intelligence from around the world in near real-time. By combining disease reports and human movement – through (b) airline records and (c) mobile device data – BlueDot establishes context for diseases: what they are, where they are and where they're likely to spread.

Systems thinking required

Action. BlueDot's vision is a global epidemic intelligence platform that provides early warnings of health risks to population-health custodians (e.g., governments), healthcare providers and the general population to mitigate future epidemic risks (See **Figure 5.3**).

> We have the opportunity using data, analytics, technology, and digital innovations to move faster and to move smarter than we ever have before. But ending epidemic risk is not something that government, academia, health care, or any sector will solve alone. We each need to do our respective part. The big challenge is to translate this opportunity into something actionable that can be consumed by these different audiences.
>
> **KAMRAN KHAN**

FIGURE 5.3: AN EARLY WARNING SYSTEM TO MITIGATE EMERGING EPIDEMIC RISKS
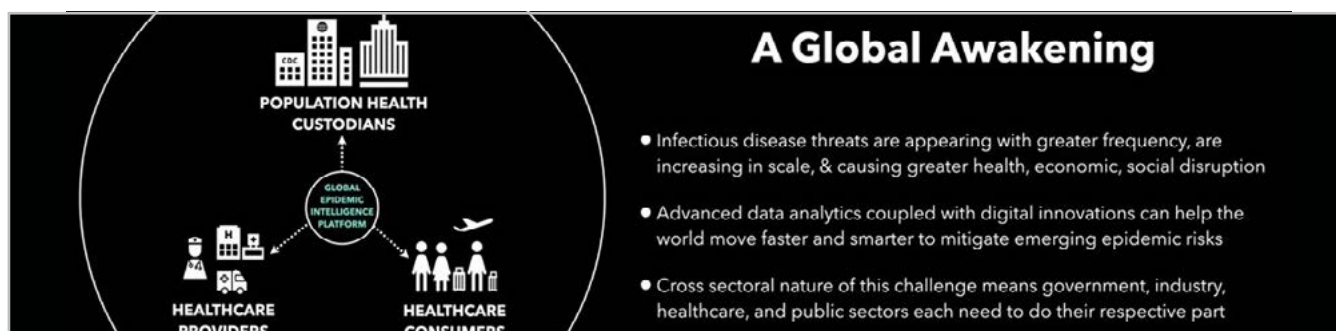
Source (modified): Kamran Khan, BlueDot

BlueDot's vision requires each sector to play a role. Disastrously with COVID-19, the opposite was true: despite BlueDot's and others' early warnings about the initial outbreak, a lack of global consistent, systems thinking around healthcare generated a pandemic.

Bridging Research and Commercialization: A Role for CPAs

BlueDot is an example of a successfully commercialized AI start-up. Canada is positioned to be an AI superstar, says Sarah Villeneuve of the [Brookfield Institute](#), but it needs to "…take steps to build domestic markets, **public trust** and **better governance** (Villeneuve, 2019; emphasis added). Those requirements sound like an invitation to use CPAs' competencies. In addition, tech-savvy CPAs can play a role in AI development in Canada, particularly in bridging the gap between start-up research and commercialization.

OPPORTUNITY FOR CPAs: BRIDGING RESEARCH AND COMMERCIALIZATION

"Given their broad range of roles and skills, CPAs can bridge the gap between researchers who develop AI technologies in a lab and investors who finance and commercialize that research."

"These and other bridging roles are crucial, given the obstacles often found between research and commercialization."

"CPAs who understand the applications and implications of AI can recognize and help monetize AI opportunities, thereby helping create jobs, companies and wealth from that AI commercialization."

CPA ONTARIO [2019], p. 26

Part 6 looks at the way companies move to an **AI advantage** and steps CPAs can take to be future ready.

References, Part 5

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CONTACTS

Michael Wong
Principal
Research, Guidance and Support
email: michaelwong@cpacanada.ca

Davinder Valeri
Director
Research, Guidance and Support
email: dvaleri@cpacanada.ca

Chartered Professional Accountants of Canada