Airbnb, Air Canada, CWT and the Journey to Artificial Intelligence

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Artificial Intelligence (AI), defined by the Oxford dictionary as 'the theory and development of computer systems able to perform tasks normally requiring human intelligence', is not new.

In fact, by some accounts, modern day AI has roots in ancient Greece. Stanford University's Dr Adrienne Mayor, for one, has recently published a book titled *Gods and Robots: Myths, Machines, and Ancient Dreams of Technology.* According to Stanford's website, Mayor's work investigates "how the Greeks imagined automatons, replicants, and AI in myths and later designed self-moving devices and robots".

However, it wasn't until 1956 when it was officially given a name by a young computer scientist, John McCarthy, who coined the term 'artificial intelligence' for the summer conference he was organising at the UK's Dartmouth University.

Since then there have been major technological developments within the field of AI - from AlphaGo, the programme developed by Google DeepMind which became the first to beat a professional Go player, to driverless cars and the rise of facial and voice recognition. As the speed of change has accelerated, so too has the hype. Yet, the reality on many a shop floor is somewhat less glittery than Hollywood films like Space Odyssey, which features an intelligent computer, HAL 9000, would have us believe.

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> Lucio Bustillo, Science and Innovation Manager, Revenue Management, Air Canada Revenue

"The term AI recently re-entered our collective imagination. Today, the concept encompasses an expanding number of advanced analytical and optimisation techniques applied over large volumes of data. However, there is still some road ahead before reaching the point of general artificial intelligence" says Lucio Bustillo, a science and innovation manager at Air Canada's Revenue Management department.

What Bustillo, who has been active in the airline industry for nine years, means by 'general artificial intelligence' is the idea that a machine can be as skilful, flexible and intelligent as a human being. In fact, he argues that most travel companies today are progressing towards what could be more accurately defined as 'advanced analytics'. In this environment, a decisioning suite selects from different forecasting and optimisation models (including neural networks) to make decisions on a large scale. This usually involves large data sets and/or real-time data. However, the term AI is often used because it is relatable and conveys a [justified] sense of wonder".

Little surprise then, that armies of consultants have chosen the term AI over the more pedestrianly named AA.

The newest iteration of analytics has key differences to its predecessors:

- Increased size and diversity of datasets
- [Exponentially] more sophisticated algorithms
- A seamless integration of forecasting, optimisation and decision-making
- A clear focus on end-user & business process integration

Even so, a former lead investor in Google DeepMind, the leading light in AI research, acknowledges that in many cases the benefits of AI are still only reaching the few. In an EyeforTravel interview last year, Fetch AI co-founder Humayun Sheikh, said: "Building a neutral system that is open for any person or company to take part in is currently impossible, and the potential benefits of AI research is closed off to many."

In his view, "the only companies able to run effective AI algorithms and gain insights from their data are those with massive data stores and the opportunity to invest large sums in the right people, as well as the tools to analyse them."

Talent is certainly an issue for companies. "In our limited experience, hiring the right talent seems to be a challenge. There is a visible skills shortage," says Bustillo.

Luckily for Air Canada, however, its home city Montréal is investing in becoming a lead in AI technology which "offers many opportunities to interact and collaborate with experts in the domain."

No artificial opportunity

In every organisation, there needs to be a commercial incentive to invest in new technology. But when it comes to AI it seems there is reason to be excited. In fact reports like this one from McKinsey finds that in travel, "AI can more than double what is achievable using traditional analytic methods, amounting to between 7% and almost 12% of total revenue for the industry".

However, Utpal Kaul, Global Head New Product Innovation, Carson Wagonlit Travel, says that one of the first challenges is defining what it is. "Depending on who you ask, AI can mean anything and everything. But it is important to distinguish the ability of a machine to do a human task, from the ability of the machine carry out a task in a human-like manner. This distinction is important because in order for the latter to happen, a machine needs some basic sentient ability. Therefore, each company needs to determine the specific problem they are trying to solve and then determine which AI application can best address that," he says.

At Airbnb, Theresa Johnson, a data scientist leading a team that is building analytics products, sees AI as a sub-set of data science, which considers longer term issues: "While data science more broadly impacts day-to-day operations and features for users, AI focuses on longer term questions such as 'what should search look like in a world without full size screens?' Or 'how can we predict accessibility needs of users not on our platform yet?'"

Founded in 2008, Airbnb's accommodation marketplace provides access to over five million places to stay in more than 81,000 cities and in 191 countries. With 'experiences', there is access to local communities and interests through 15,000+ unique activities run by hosts in over a thousand markets. Against this backdrop, Johnson says: "Our big priority is understanding the cross-pollination of all of our product offerings with a special focus on homes and experiences. The questions we are trying to answer [using AI] include: Which sort of travellers will most benefit from both a place to stay and things to do, and how do we offer the most relevant options? Which hosts would be both home hosts and experience hosts? If we can solve that, it opens the door for every new aspect of the trip to be host-led."

Given its global scale, one of the biggest challenges for Airbnb is how to surface the best possible properties for a user while also rewarding its most valued hosts. As explained in a *Medium* article by Malay Haldar, an Airbnb machine learning engineer, one of the reasons for this is that once a property is booked, it is immediately removed from Airbnb's list of inventory, so from that point no further data accumulates.

Secondly, although visitors to the site engage heavily at the time of searching, Airbnb only sees its customers once in a while. So for Airbnb to optimise search results, which is tricky at best, it needs to do so in real-time – while the user is on the site. To achieve this, Airbnb is applying a wide range of AI tools, including machine and deep learning techniques and neural network models, to search.

One of the ways Air Canada is looking to harness AI technology is to enhance its forecasting techniques and decision processes across the company.

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Says Bustillo: "AI (and advanced analytics) empowers teams to make better decisions and boosts productivity. It also allows them to leverage unprecedented amounts of data to paint a rich picture of our customers and our environment."

"AI enables us to better understand the behaviour of our network. It can be quickly deployed to enrich existing systems and to optimise the quality of their output".

Step by step

When it comes to delivering commercial benefits, Kaul argues that "chatbots are the easy one", with potential to positively impact both travellers and companies; there are also loads of possible applications. Like many other travel companies, CWT has introduced chatbots, which can very effectively respond to frequently and infrequently asked questions. "In most large organisations information is scattered, and one of the tangible benefits of the chatbot approach is that it can access any number of knowledge bases instantaneously and more efficiently than humans," he explains.

CWT is also piloting bots that are able to help travellers with their travel requirements on the go. As an example, chatbots with an extra layer of intelligence can effectively access a person's upcoming itinerary and make some proactive recommendations. For example, saying something like 'Hey, I see you haven't booked a hotel yet. Should I do that for you?' If the answer is yes, then the bot can consider a user's preferences, company profile as well as its preferred rates to make a highly personalised recommendation.

Elsewhere, CWT is doing a lot of work around predictive analytics including a project to predict the likelihood of flight delays or cancellations with a very high degree of accuracy, and well in advance of a trip.

At Air Canada, different divisions are at different stages of development and progress at different paces. 'Decision Suites', according to Bustillo, could allow users with limited AI experience to adapt models in months (though careful curation, calibration and exception handling are still required). However, truly empowering a team with the right platform, data and algorithms requires transformation across the whole company. User acceptance is the key to any meaningful improvement; it requires a firm commitment to change management and process redesign.

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Handling big data

Any company wanting to deploy machine-learning algorithms needs to handle large volumes of data. Bustillo identifies two main prerequisites to embark on an 'AI' exploration:

- A curated and scalable data environment
- A business problem with clear boundaries and desired outcome

From there, progressively building knowledge and expertise within the organisation is crucial. This can be achieved in a number of ways including by bringing in consultants to develop the first models, or forming joint ventures with research consortiums, and later building development labs in-house. Retaining the intellectual property of the algorithms can be an effective way to build momentum towards cross-functional synergies.

In many cases, it makes sense for expertise to be developed internally as, very often, when building models, data needs to be drawn in from across the organisation and people working with it need maximum visibility.

Airbnb is a strong proponent of democratised data that is accessible to all employees and most tools are built in-house. According to Johnson, Airbnb has developed an open-sourced SuperSet, an enterprise business intelligence application, and Airflow, a workflow management platform, which fall under the umbrella of the Knowledge Repo, a repository that enables employees to share learnings.

She adds: "We also build all of our machine learning and forecasting infrastructure in-house. I specifically work on building forecasting products since most of what's available won't work for forecasting real-time transaction platforms like Airbnb."

More broadly, it is important to stay attuned with the business and not to become siloed in an ivory tower. And if she has any advice it is to "focus on building the team's ability to communicate really technical and nuanced topics to a broad audience".

A day in the life of an Airbnb data scientist

- Starts with a quiet two to three hours of thought and algorithm analysis
- Next comes product team planning, to guide the direction of new products and features
- A learning lunch with invited industry data science speakers
- Publish a knowledge post or present a recent analysis
- Work with engineering to build logging and statistical design to test the impact of rolling out a new feature on a segment of users
- Conduct an interview or grade a take home
- Afternoon data science 'all hands meeting' welcoming new hires and learning about what's happening in data science across the company
- Ends with a one-to-one with manager to plan six to 18-month career goals

Threats and opportunities

If any company knows about challenges it is Air Canada. The airline filed for bankruptcy protection in 2003, from which it emerged in 2004 under the umbrella of ACE Aviation, along with other businesses including regional airline Jazz Airlines, maintenance division ACTS and Aeroplan, Air Canada's profitable loyalty rewards programme.

> **"The belief that 'AI' alone can solve all problems can lead to poor decision making"**
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> Air Canada

Since the global economic downturn of 2008-2010 there has been a lot of catching up to do. To address this, the airline has deployed new strategies and has seen capacity grow by around 50%; the share price has also jumped from mere cents to 25 CAD. Going forward, says Bustillo, Air Canada has "big ambitions. We intend to revamp or replace legacy systems and are catching up with new technologies".

Bustillo's department, as one of the support arms of revenue management, is playing its part. "We build models, analysis tools and reports for daily decisions of the airline. We are also responsible for the calibration of the demand forecasting and optimisation system," he explains.

So what does he make of the hype around dynamic pricing? Historically, the pricing of airlines has been fairly 'dynamic'. From outside the industry, 'dynamic pricing' is the name given to the different prices offered to market segments identified by the characteristics of their itinerary. What airlines see as the next step in pricing techniques is the application of offer optimisation; in other words creating a tailored seat plus an additional services offering.

Whatever the focus, however, no technology should be seen as a 'panacea' for everything. Bustillo is clear that without a clear roadmap, and a laser focus on business processes, the potential of any new technologies can easily be squandered.

He stresses: "For one, a clear understanding of the limits of the technology can be hard to draw. AI technology is meant to power a properly defined business and process, not replace it. However, it is impossible to deny that this technology will be a game changer, and this leads to a significant anxiety of being the last one to get to the party."

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So, despite the challenges, Air Canada sees potential for AI technologies to improve the way the travel industry does business by:

- Increasing operational efficiency; ultimately creating cost reductions that will eventually trickle down to the consumer
- Providing airlines with a better understanding of the demand landscape, whereby customers obtain offers and content to better fit their stated preferences

Ethical dilemmas

Innovative technology led firms like Airbnb are likely to have teams that are more willing to adapt to new roles, but in some parts of the labour intensive travel industry – think airlines, rail companies and cruise liners – it is a different story. In driving greater probability and cost efficiencies, inevitably jobs must go.

"The industry today requires a huge army people for tasks like processing check ins at the front desk and baggage handling, which machines can do more efficiently," says Kaul, "and it is arguable that some of these jobs may not exist in the new normal of the future."

In the highly regulated air transport industry, for example, where many have some form of state support, he wonders if firms are doing enough to understand the impact on their workforce, or to invest in training so that workers can be redeployed in more value creating tasks.

"In our industry, a certain level of anxiety is understandable, and there is a healthy invitation to examine our contribution to the jobs market and career prospects," he stresses, adding that, "it is the job of companies, universities and teams to prepare themselves to embrace new technologies to make businesses more competitive and attuned to the needs of their customers".

Anxiety levels are not to be ignored as Amer Mohamed, who is now chief digital officer at CapGemini Scandinavia, discovered when he was head of digital innovation at Stena Lines. Mohamed, who began the shipping company's journey to be fully AI-driven by 2021, told EyeforTravel in an interview earlier last year that the biggest challenge to the project was shifting culture and mindset. Getting employees to buy in to building something that would eventually become autonomous proved to be a tricky business. "People were genuinely worried about the risk to their jobs, and this posed some challenges to implementation," he said.

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However, according to Kaul, there is an even bigger ethical debate looming. In the future, autonomous vehicles will likely become commonplace and by all accounts accidents will reduce. However, there will still be instances when an accident is unavoidable. In cases like this, will it ever be possible for a car to make an ethical judgement about, for example, whether to collide with a car A carrying a child, or the car carrying an elderly passenger?

"The one thing that AI has not been able to solve is yet is human cognition or empathy," says Kaul.

This remains unchartered territory and these are philosophical questions that developers of today and the future will need to consider.

Nevertheless, while the timeframes are not clear, it seems inevitable that AI will, to some degree or other, transform the workforce of industrialised countries. In fact, in several industries outside of travel, it has already reached a minimum level of maturity to replace repetitive and clerical activities that were in the past considered safe, such as fraud detection.