REPORT
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AI-enabled world will change reality

Airlines underestimating the likely future role of artificial intelligence in day-to-day operations might not only lose out on cost savings and other efficiencies, but also revenue opportunities

It is hard to imagine millennials, let alone the rest of us, going anywhere these days without a smartphone and always-on connectivity. Life, business and travel is very different today to the pre-web era of 25 years ago. There is a parallel situation right now with artificial intelligence, which is at the early stages of development. While it is difficult for us to envision just what an AI-enabled world might entail, many industries, including aviation, are experimenting with initial capabilities.

A minority of airlines already have AI on their radar, according to the 2016 Airline IT Trends Survey co-sponsored by SITA and *Flight Airline Business*. Last year, 6% were working on AI pilot programmes, but by 2026 their numbers are expected to swell to 44% of airlines.

Although AI attracts a lot of excitement, it is worth looking beyond the hype and the widespread misunderstanding. "Into the mid-term future, the competitive advantage of bringing AI into your business to some degree or another will lend itself to an advantage over other non-AI-enabled airlines," observes Jonathan Newman, commercial director of Caravelo, which develops AI-powered chatbot technology.

It is not just those airlines pursuing a first-mover advantage that should start thinking about the value of evolving intelligent machine strategies. "I would say that AI and machine learning will have as dramatic an
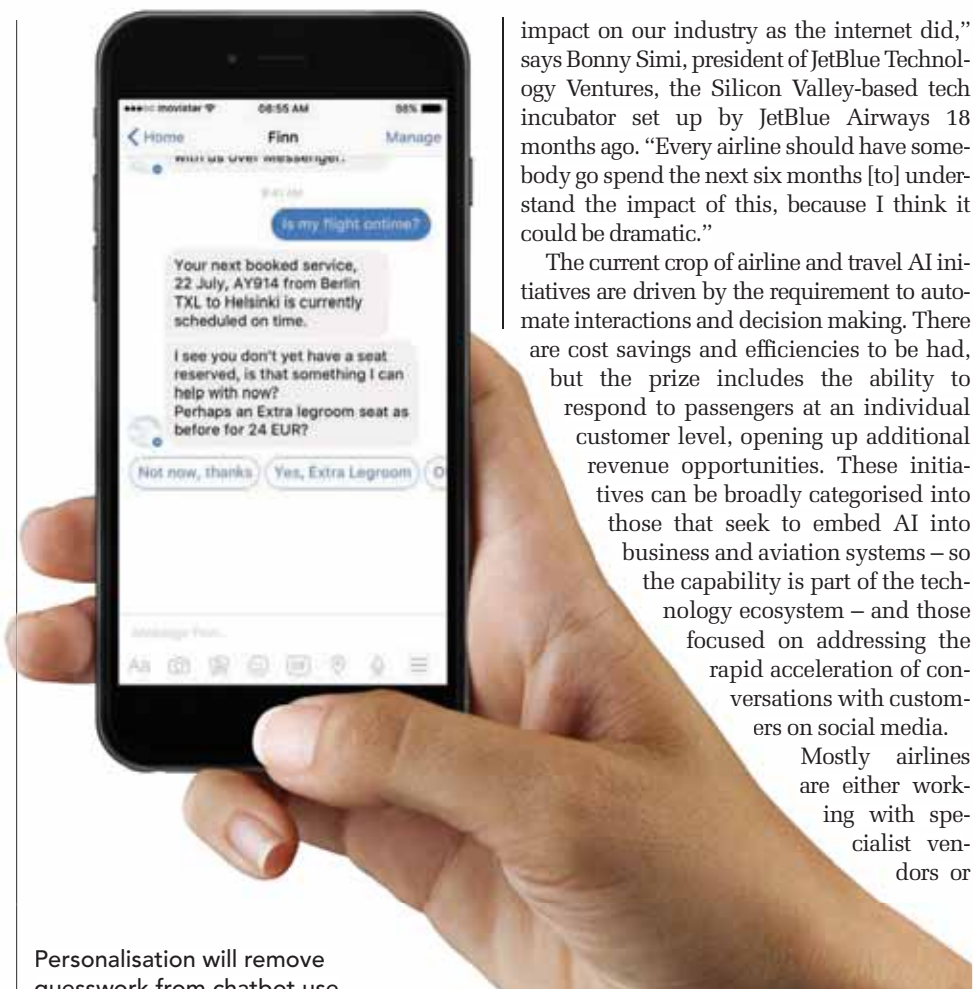
Personalisation will remove guesswork from chatbot use

impact on our industry as the internet did," says Bonny Simi, president of JetBlue Technology Ventures, the Silicon Valley-based tech incubator set up by JetBlue Airways 18 months ago. "Every airline should have somebody go spend the next six months [to] understand the impact of this, because I think it could be dramatic."

The current crop of airline and travel AI initiatives are driven by the requirement to automate interactions and decision making. There are cost savings and efficiencies to be had, but the prize includes the ability to respond to passengers at an individual customer level, opening up additional revenue opportunities. These initiatives can be broadly categorised into those that seek to embed AI into business and aviation systems – so the capability is part of the technology ecosystem – and those focused on addressing the rapid acceleration of conversations with customers on social media.

Mostly airlines are either working with specialist vendors or

collaborating with academics. JTV has taken a different tack by investing in companies that have the potential to transform the industry. It has five areas of focus, which range from the seamless customer journey to evolving regional transport ecosystems. AI, which is just one of the technologies JTV is looking at, could have applications in all these areas, says Simi.

One of JTV's first strategic investments was in FLYR, a travel and data science start-up. FLYR leverages machine learning and predictive analytics to create price forecasts and offer customers insurance to lock the fare – if the fare goes up, FLYR pays the difference. "That capability could totally transform airline revenue management in the future if you could have a much better way of determining demand and pricing in advance," says Simi.

JTV is investigating the creation of omni-channel communications incorporating chat, messaging, telephone and other channels. As a starting point, the start-up has invested in 30 Seconds To Fly, which is developing an AI-powered virtual travel assistant for small and medium-sized businesses that communicates in natural language. Simi sees the investment as a great way to learn first-hand about the technology. "We invest, we incubate so we bring the technologies in house and learn about them. The reason we invested in 30 Seconds to Fly is to get smart about AI chat as it relates to the travel industry," she says.

CONVERSATION STARTER

Social communications are increasingly putting a massive strain on customer services, according to Colin Lewis, chief marketing officer at OpenJaw, which, in partnership with Ludex, has developed the t-Social chatbot powered by IBM Watson AI. "Airlines that recognise customers are on social [in preference to] their websites... have the capability to enter the conversation with them," says Lewis.

SITA's intelligent check-in kiosk autonomously moves to congested areas of the airport

KLM embedded DigitalGenius AI into its customer relationship management system because users were expecting immediate answers. "If we want to make sure everybody gets an answer in one or two minutes we maybe need 1,000 or 2,000 agents; of course, that is not a sustainable business solution," explains Karlijn Vogel-Meijer, director social, KLM e-commerce.

The airline attracts about 100,000 mentions per week via social media. Naturally, not every one of these is a question, but during one week alone this June it sent out 36,000 answers, of which 11,500 – or about 31% – were sent with the assistance of DigitalGenius.

KLM has trained the AI on 60,000 "Q&As", so that it can suggest responses to the agents, who may refine these as necessary, thereby making the system even smarter. "So it is not

a Q&A that can only answer 60,000 questions, it can answer a lot more questions, based on the training it has had," says Vogel-Meijer.

She explains a conversation between a customer and KLM typically comprises five questions and answers, and AI can be useful in answering the initial request. "We see that we can take about two to three minutes off the conversation, meaning the first answer is very fast, because... of AI, and that also speeds up the remainder of the conversation."

SOPHISTICATED MACHINE

Chatbots are of particular interest to companies with a large customer-facing profile because they provide an opportunity to move from what is effectively a dumb menu of options, in increments, towards a sophisticated communicating machine.

However, Lewis believes AI chatbots and social tools will really take off once you can offer experiences and products personalised to individual customers. Instead of a call with a one-off answer and result, airlines will be able to access personalisation data, removing guesswork about engaging with customers. "It is the difference in terms of transforming business models, operations and culture," he says.

Caravelo has launched a chatbot for Volaris and has them for Finnair, Tigerair Australia, Condor Airlines and Ukraine International Airlines going live in short order. Newman predicts the technology's relationship with the customer will become even more personal over time.

"Ultimately we want to move the chatbot »

Get to grips with AI terminology

■ **Strong AI** is a machine ability to analyse facts on a broad scale, interpret the semantic relevance of those facts and provide useful knowledge as a result. This should not be confused, as it often is, with consciousness.

■ **Narrow AI** functions in a limited field of knowledge; in lieu of global understanding, it is provided with a finite data set on which it operates.

■ **Neural networks** are programming techniques that emulate how a brain works, albeit at a vastly simplified level. A neural network may quickly build up a useful pattern of under-

standing about the world that is both unique and complex. The object is not to provide empirical data, but instead to generate organic responses to stimuli.

■ **Machine learning** has the ability extend its own knowledge base so it gains a deeper or broader semantic understanding. It can collect data and recognises patterns to predict outcomes with increasing levels of accuracy.

■ **Natural language processing** understands and responds to human language inputs in an appropriate manner.

"Not only the offer, but the whole engagement with the customer gets more and more personal"

MATTHIAS GOEHLER
Senior vice-president, head of industries,
SAP Hybris

towards becoming a true assistant for the customer using the airline, not just around providing a booking service, but also assisting them while they are on their journey," says Newman.

"So if a customer is in Barcelona, as an example, there's no reason why an airline cannot be an assistant to enable them to get around or to provide them with offers and notifications about things that might be relevant to them. What that leads to is potential retailing. As an example, having your airline bot assistant recommending a restaurant to you, which might lead to taking further revenue for the airline."

AI tools are also being developed to optimise economy passengers' in-flight experience. Black Swan, an applied prediction marketing specialist, is working to improve seat assignments. Chief executive Steve King explains it uses data about the type of flight and passengers' behaviour – for example, if they want to sleep, or if they frequently pause the in-flight entertainment to get up and down, or if they like to be sociable – to seat them with similar people. This is being tested on beta aircraft. "People don't know why, but the journey is just a bit nicer than it is normally," he says.

SITA has a number of trials ongoing to push the boundaries of AI deeper into the aviation ecosystem to optimise operations. It is using AI with face recognition tools and biometrics in a pilot scheme with JetBlue at Boston's Logan International airport to board passengers without the need to show a boarding pass or a passport. Passengers are photographed in real-time and, after connecting with the US Customs and Border Protection agency to verify the image and identity, the system integrates with the airline's departure control system, all in a matter of seconds.

SITA Lab is also developing specialist autonomous vehicles, last year launching Leo, the baggage-handling robot. In May 2017, SITA unveiled KATE, an intelligent check-in kiosk that will autonomously move to busy or congested areas in the airport as needed.

Another research initiative is to investigate the synergy of AI and neural networks, which emulate the way the brain functions, to predict delays to airline operations 24-72h in advance. The model is trained with a range of airline data – from notices to airmen to air traffic control information – then takes in live data to predict events. SITA Lab chief technology officer Jim Peters expects to have some answers this autumn about the data required to get a good prediction that will also then be actionable.

For Peters, some of the bigger challenges are not around using AI to deliver insight as much as "leveraging insight to a positive outcome". He cautions that it can involve a fairly extensive change management programme. Airlines will need a multidisciplinary team to make it work – data scientists for the maths and algorithms, people who understand the data and business people who are part of the process. "You have to get together a very diverse team of people who don't normally all sit down and work together to make it work," he says.

SIMPLE CHANGES

Elsewhere, business and aviation solutions providers have already augmented systems with AI. The advantage is that airlines can reap the benefit without having to make complicated changes to their existing systems, says Mike Barrera, chief operating officer and chief technology officer for Radixx International.

JetBlue is trialling self-boarding at Boston

Industry faces familiar fight to secure the right skills

Airlines are just one of a host of industries looking to develop AI capabilities, and as Byron Calmonson, director at The Resourcing Hub, acknowledges, demand for data science skills far outstrips supply.

"There is a general shortage of science, technology, engineering and mathematics (STEM) skills in aviation, as in most sectors, and data science and AI skills are no exceptions. AI has the potential to transform the industry and operators will have to recruit more people with these skills in order to stay competitive."

Developing strategic partnerships with academic institutions is one way to bridge the skills gap: Emirates Group, for example, is working with scientists, mathematicians and engineers at Oxford University in the UK and Carnegie Mellon in the USA to test and develop solutions to leverage big data and real-time analytics in order to transform Emirates into what it describes as a "customer-centric, travel experience company".

However, airlines should be forging links with education at other levels as well to foster the skills they need and overcome perceptions that the sector is something of a boys' club, according to Calmonson. "I think it's key for aviation operators to work more closely with the education sector to try and combat the industry's IT skills shortage as well as its image and diversity issues." (*see page 47*)

Working with vendors, be they tech startups or big IT specialists who have the AI capabilities, can also help airlines down the track, but does not get around the need for in-house resources too. Matthias Goehler, senior vice-president, head of industries, SAP Hybris, points out you will need data scientists if you want to create your own algorithms. "You buy the tool set… there are example algorithms that come with it, but I don't know any customer that did not tweak it for themselves, because everybody has a little bit different products, services, bundles, customer segments, operating in different markets."

KLM uses AI to ensure customers get an otherwise-impossible timely response to queries

The company has deployed AI components in its passenger service system, which use self-learning probability tools to identify changes in a reservation made by multiple sources. This has boosted performance and virtually eliminated errors. "It reduces the human interaction with third parties when reservations do not come through properly and increases customer satisfaction, because you don't have passengers that have a service they purchased and they did not receive it," explains Barrera.

Radixx has now turned to utilising AI to enable airlines to provide individual passengers with the right products and services at each touchpoint from call centre to gate. Barrera predicts airlines that have an ecosystem to support AI throughout their operations will have an advantage. "They are going to know their customers and their costs better. Ultimately the cost per customer interaction will be significantly reduced because... a significant percent of the customer interaction should be able to be handled by the AI technology."

CORE OFFERING

Digital commerce specialist SAP Hybris takes the view that AI and machine learning should be included in the core offering. Its travel customers – airlines, tour operators and others – using the Hybris platform are already leveraging the SAP Leonardo digital innovation engine, which includes the internet of things, voice and text recognition, and AI capabilities.

Matthias Goehler, senior vice-president, head of industries, SAP Hybris says this inclusive approach enables the creation of real-time models of customer segments at the moment travel companies interact with them. They can also apply predictive analytics to a customer's profile to forecast behaviour and learn from the interaction. "In the end, not only the offer, but the whole engagement with the customer gets more and more personal".

Hybris is also testing text and image recognition in social media monitoring, combined with AI, to help improve services and operations. A recent proof of concept with a rail customer involved monitoring social posts about train lavatories in poor condition, automati-

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BONNY SIMI
President, JetBlue Technology Ventures

What AI-enabled airlines of the future might look like

"Using AI longer term, airlines will be able to provide much more personalised, customised service to customers... customers will be happier, service [and] pricing will be optimised for the customer and the airline. Revenue will go up, experience will be much more seamless, costs will go down."

BONNY SIMI
President, JetBlue Technology Ventures

"People will get used to getting an answer via AI. However, I also believe that the conversation with the customer is vital for a company like KLM, as this differentiates us from our competitors and therefore we have to make sure we keep track of that conversation, giving the customer a timely, correct and, above all, personal answer that he or she is asking for. Because if you lose that you have no relationship between a customer and an airline anymore. Finding the ultimate combination between human and technology is therefore key."

KARLIJN VOGEL-MEIJER
Director social, KLM e-commerce

"If you ever speak to anyone who owns a Tesla car, they love it... because every two weeks the technology is updated, the screens are better, it parks a little better than it did on its own last time. We will come to expect that of our airline experience very soon. It should be better every time we fly, it should learn how we fly and we should be more comfortable with it, and I think that's where AI can really help."

STEVE KING
Chief executive and co-founder, Black Swan

cally identifying the train and raising a service ticket. Then service agents could decide whether to send someone to the next station stop to fix the problem and potentially respond to the individual who flagged the issue.

For Goehler, the critical issue is having the right mindset. Successful disruptors in the travel space and elsewhere have one attribute in common: they put themselves in the customer's shoes. "I see a lot of big companies tend to think how they optimise themselves and what they can do better. I believe the only way to survive is the complete opposite. Perhaps if you think [about] how a customer would like to be engaged with, you might come up with a different way of engaging with them that could even be a new business model that could disrupt the industry." ∎

Is aviation tech a boys' club?

More air transport businesses need to invest in female students to help them pursue engineering and technology careers, while also supporting them more effectively as they develop into leaders, writes Byron Calmonson, director of The Resourcing Hub

I was thrilled to read about an initiative by Airbus and Bristol University's Faculty of Engineering to encourage young women to consider engineering and technology degrees. A group of school girls were invited to a day of aerospace lectures as well as hands-on lab experiments. The aim was to raise awareness of the many exciting STEM (science, technology, engineering and maths) career opportunities the aviation world offers.

We need more of these schemes. In 2016, fewer than 16% of engineering and technology undergraduates in the UK were female. While the corporate statistics are slightly better, with 24% of directors in FTSE 100 listed STEM companies being women, they still leave much to be desired.

This under-representation is a problem not only from a diversity and inclusion perspective, but also because the UK and many other countries face a serious shortage of skilled STEM professionals. Recruiting, upskilling and retaining a diverse STEM workforce with more women in leadership roles should therefore be a strategic priority.

I spoke to three senior female technology professionals with exposure to the aviation industry about their experiences, asking why there are so few women in this domain.

FEELING EXCLUDED

Ann Cederhall, an aviation IT consultant with vast industry experience, comments: "This might be an unorthodox answer, but I would say partly 'the glam factor' the aviation and transport sector holds for men. Some boys love planes and trains and never stop loving planes and trains. I find it fascinating that you can be working in airline distribution or IT and still come across so many guys who talk endlessly about aircraft models. It's easy to feel excluded at times."

Nasara Mughal, an IT associate at Rainmaker Solutions who previously worked for Emirates Group, says: "There's a stereotype which may hinder, or perhaps a misconception of the opportunities available to women within the aviation tech industry. For example, whenever I'd mention I work for Emirates Group, the default response would always be 'Wow, are you an air hostess?'. Perhaps there is a general lack of knowledge or visibility beyond the typical aviation roles."

Meanwhile, Tricia Williams, an aviation director, doesn't think aviation tech is very different from other tech departments. "We actually have a very strong representation of more senior women in our airport IT department. Interestingly, all of those women have come into the aviation industry fairly recently. At the level below there is also a good balance, but at the frontline there are still very few women and it will take time to achieve diversity."

Williams believes that the industry in general could do more to promote gender diversity. "In IT or engineering departments it is necessary for an organisation to counter the image of it being male-dominated and that will be an ongoing challenge," she says. "My current organisation is introducing initiatives such as unconscious bias training as we believe the recruitment processes are the ones to tackle first."

Nasara adds: "I think it will be key to understand and learn from the hiring processes of some of the biggest tech companies with female chief executives, such as Yahoo and Facebook. You can also generate interest in aviation tech careers through events and talks from successful female role models."

Encouraging female students to study STEM subjects, changing the industry's male-dominated image and ensuring fair hiring processes is a great start. It's vital the industry also provides women in aviation tech with the support, encouragement and opportunities they need in order to develop. There are a number of initiatives the sector can put in place, such as flexible working and support on return from maternity leave.

Cederhall would also introduce more female networking forums. "I recently became a member of IAWA (the International Aviation Women's Association) and am very encouraged by their initiatives. There are so many interesting questions to be discussed, for example: 'How do you handle sexism?'."

While many aviation organisations are acknowledging and dealing with the diversity issue, the sector as a whole still has an image problem. The perception of both the aviation industry and the STEM domain being "macho" and run by aviation/tech geeks is putting many women off. Collaboration between the air transport and education sectors is essential so women are made aware of the many fantastic career paths this booming industry offers, and feel confident to avail themselves of this opportunity. ∎

> ## "Recruiting more women in leadership roles should be a strategic priority"
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> **BYRON CALMONSON**
> Director, The Resourcing Hub

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