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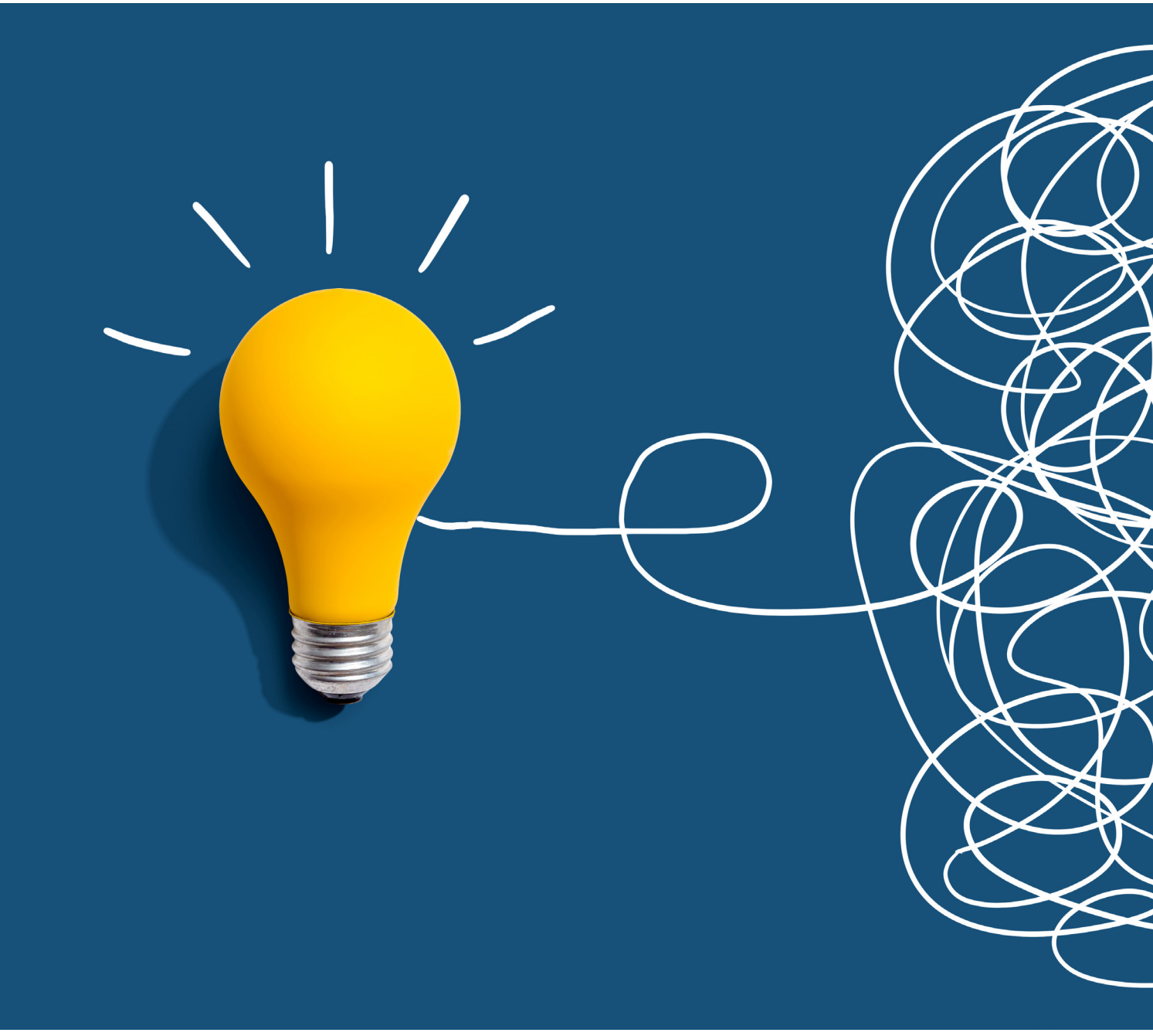

IN THE SPOTLIGHT: **INNOVATION**

Issue 4, 2025

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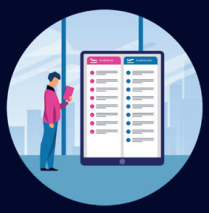

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Open to innovation

Editor, Joe Bates, explains why he feels a strong connection with Incheon International Airport and reflects on the innovation theme of this issue.

When I joined *Airport World* some 25 years ago now, little did I know that less than a week later I would be in South Korea to write a feature about the soon to open Incheon International Airport.

As construction work wasn't quite complete, on my visits to the airport I was kitted out in protective goggles and a hardhat, and Wellington boots often replaced my shoes on journeys to some of the portacabins and huts scattered across muddier areas of the huge site.

It was an incredible experience, and ever since then it has kind of felt like my time at *Airport World* has been inextricably linked to the airport as I have been back there around a dozen times to report on its successes or attend conferences.

I have also been fortunate enough to enjoy a special relationship with every one of its presidents and CEOs over the years, possibly Jae-Hee Lee making the biggest impression on me because of his dynamic leadership and almost uncontained joy at Incheon's success in ACI's annual Airport Service Quality (ASQ) Awards, which still brings a smile to my face today.

My homage to Incheon is because Incheon International Airport is once again the lead airport feature in this issue of *Airport World*, and true to form, current president and CEO, Hag-jae Lee, provides an honest and upbeat account of how ICN is faring.

The must-read article on pages 6-11 of our autumn edition covers everything from the airport's unflinching commitment to customer service excellence and plans to further enhance its passenger and cargo and logistics infrastructure to the goal of operating and developing 10 overseas airports by 2030.

Incheon has also earned itself a reputation for pioneering the use of new technologies, which fits in well with the 'innovation' theme of this issue.

It is, however, often easy to forget that innovation isn't just about new technology, and to prove the point we cover 'innovation' in all its forms, ranging from high tech solutions like robots, automated vehicles and new AI driven communication tools to showcasing artworks and the innovative design and construction of new infrastructure.

We also look at the potential benefits of beverage partnerships; and how Internet of Things (IoT) enabled tracker technology is evolving and the operational advantages it offers to airports.

Elsewhere in the issue, APTRA's Sunil Tuli reflects on the dramatic rise of Indian aviation as a priority market for travel retail in India and beyond; and we learn more about the operational and economic benefits of electric ground support equipment.

How airports are responding to a raft of cyber regulations, addressing legacy systems and bolstering their supply chains; and enhancing airport baggage handling also come under the microscope in this August/September edition of your favourite airport magazine.

We round the issue out with our regular 'people matters' column and airport supplier news in the 'business exchange' section.

Yep, it's been a busy summer in the aviation industry in more ways than one. I look forward to an equally busy and interesting last quarter of the year.

AW

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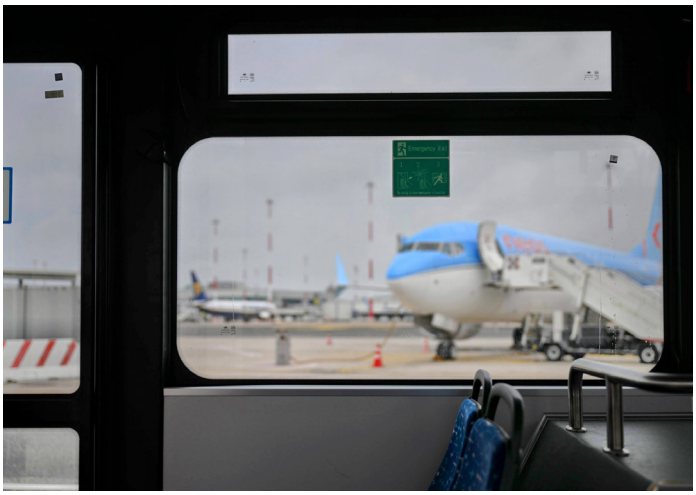
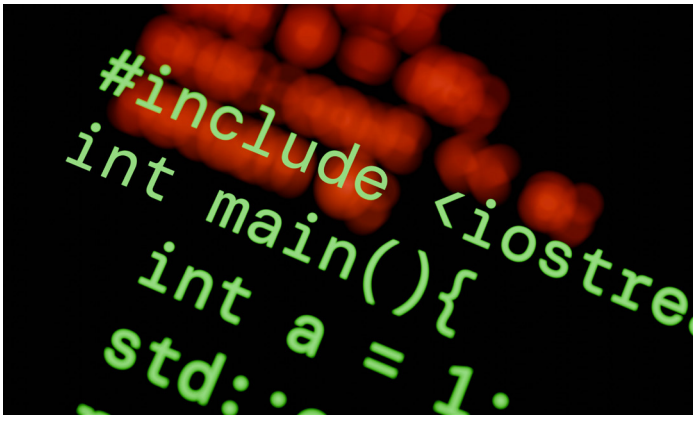




National treasure

President and CEO, Hag-jae Lee, talks to Joe Bates about the success, ambitions and infrastructure development plans of Incheon International Airport.

Arguably, very few new airports have made such an impressive start to life as Incheon International Airport, which within a few years of opening in the Spring of 2001 had earned itself a reputation for being an IT innovator, pioneer in terms of its retail/F&B offerings, and a customer service champion.

All that on top of being an economic powerhouse and South Korea's main international gateway to the world ensured that the airport – built on reclaimed land in Incheon around 60 kilometres from Seoul – quickly became popular with both locals and overseas visitors alike.

Indeed, unique events like the Walk of the Joseon Royal Family – a daily procession through the terminal by performers in traditional costumes from the Joseon Dynasty – and facilities such as its own museums, Hikr Station and K-Culture Zone have earned Incheon International Airport (ICN) a reputation for doing things a little differently.

All played a part in ICN being named the 'Best Airport in the World' in ACI World's annual customer excellence awards for 12 years in a row until the format changed a few years ago and the category was replaced by a more regionalised format.

Incheon also became the first airport in the world to achieve Level 5 status in ACI World's Airport Customer Experience Accreditation programme in Q3 2022.

Its success in ACI's Airport Service Quality (ASQ) programme in particular was a source of much pride to not only the airport but to South Koreans in general, with multi-award winning ICN almost being regarded as something of a national treasure, and that feeling of satisfaction in its success and support for its future growth appears to have continued to this day.

As has its success in aviation's various customer service based award programmes, with Incheon jointly winning the ASQ crown for Best Airport in the Asia-Pacific region for airports handling over 40 million passengers per annum for the last three years.

It is also extremely proud of being recognised as a 5-Star Airport in the annual SKYTRAX World Airport Awards, which praises Incheon for its facilities, comfort, cleanliness, shopping, food & beverages, staff service and security/immigration.

So, from a customer service/excellence point of view, can Incheon actually raise the bar any higher?

Hag-jae Lee, president and CEO of operator Incheon International Airport Corporation (IIAC), is in no doubt that it can, and like all of his predecessors, is committed to making sure that customer service remains a top priority for the gateway.

"To stay ahead, we will continue to develop premium departure services, expand off-airport and embrace new technology, such as Smart Pass and other self-service options," says Lee.

"Moving forward, our aim is to drive a comprehensive digital transformation in airport operations that will provide even more differentiated services and ensure a safer and more convenient airport experience.

"We are also committed to adding elements of culture and the arts to further innovate and differentiate the experience. You can always do more to enhance customer service."

Reflecting specifically on the SKYTRAX award, he noted: "This award represents the hard-earned result of the unified efforts of our 94,000 on-site employees, all committed to making Incheon airport the world's leading service-oriented airport."

TRAFFIC GROWTH BACK ON THE AGENDA

Prior to the COVID pandemic, Incheon International Airport was the sixth busiest airport in Asia-Pacific and the 14th busiest in the world for passenger traffic.

Like many other airports, more than a decade of year-on-year traffic growth culminated in Incheon handling a record-breaking 71.17 million passengers in 2019, and expectations were high for 2020 and the next few years.

The global pandemic, of course, changed all that, but Incheon began to experience the green shoots of recovery in 2023, and in 2024 the airport equalled its previous best total when it once again welcomed an all-time high of 71.17 million passengers.

The total saw it jump from the 20th busiest passenger gateway on the planet to 13th, driven by an incredible 26.7% upturn in international travellers. The huge increase meant that passengers on international flights accounted for 70.6 million of last year's total, elevating ICN into unchartered territory as the third busiest international airport in the world.

While the yearly total of 71.17 million (+26.6%) also meant that it became the fifth busiest airport in Asia-Pacific for passenger traffic after Tokyo Haneda (HND), Indira Gandhi (DEL), Shanghai Pudong (PVG) and Guangzhou Baiyun (CAN). Dubai International Airport (DXB), which is located in ACI's Asia-Pacific & Middle East region, remains the busiest airport on the planet.

And the good news is that last year's steep upward traffic trends have continued into 2025, resulting in the airport recording its best-ever half-year total of 36.3 million passengers (+6.1%) for the six months ending June 30.

The situation has led the airport to project that it will handle between 73 million and 76.3 million passengers this year – the lower figure being the most conservative prediction and the higher one being the most optimistic.

Lee notes that positive factors for growth this year include the temporary visa-free entry policies for Chinese tour groups, although he admits that uncertainties such as continued low economic growth and global conflicts may act as constraints.

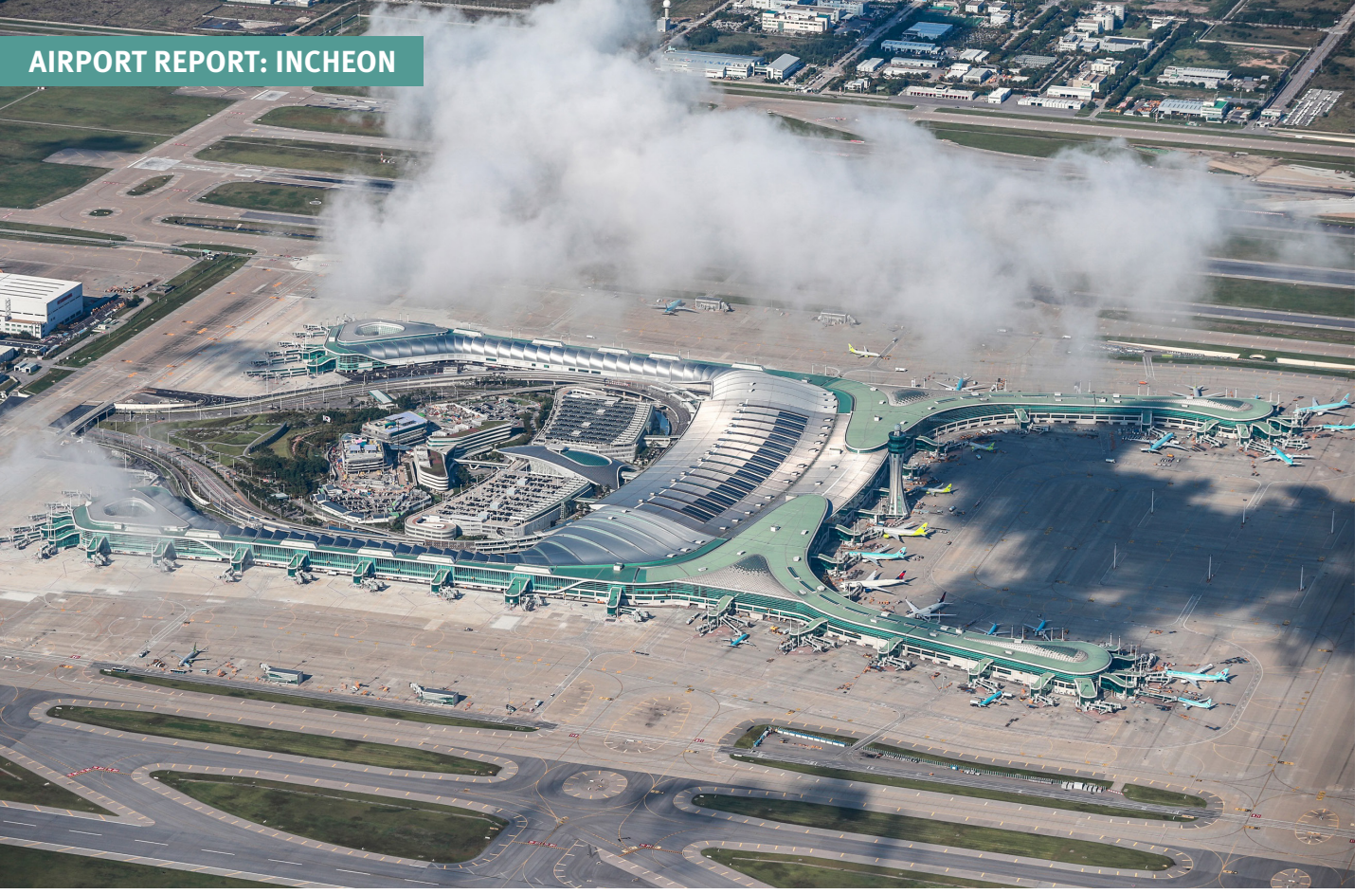
Looking slightly further head, IIAC reveals that over the next five years (2025–2030), the average annual growth rate in passengers is projected to be around 4.3%, driven by increasing outbound Korean travellers and Low-Cost Carrier (LCC) expansion.

This could lead to Incheon reaching around 100 million passengers per annum by 2032, even if slower economic growth than anticipated and demographic shifts reduced the annual growth rate to 3% during this period.

MAKING MILESTONES

Lee believes that the significant rise in passenger numbers, and the unveiling of IIAC's Aviation AI Innovation Hub vision, ensures that the year-to-date has been a "remarkable" one for Incheon International Airport.

He explains: "The first half of 2025 has been remarkable for two main reasons. First, despite persistent currency and oil price volatility, passenger traffic reached 36.36 million – the highest first-half figure in our history, surpassing the previous record of 35.5 million set in 2019.



"Second, we officially announced our 'Aviation AI Innovation Hub' vision in March, which will effectively create new value for Incheon airport beyond traditional airport operations.

"Our goal is to establish an AI industry ecosystem within the airport that seamlessly integrates technology development, demonstration, and advancement in partnership with big tech, startup companies, leading universities, and research institutes."

He is also quick to point out that ICN's IA ambitions have led to it becoming the first airport in Asia to officially join the Airports AI Alliance (AAA), a global co-operative network of leading airports and technology companies.

"This represents international recognition of our leadership and pioneering role in AI-driven airport innovation," states Lee. "We are committed to sharing AI technologies with the global community, furthering our vision of becoming an airport that changes the world.

"Without wishing to overstate things, I believe these milestones mark 2025 as both a record-setting and future-defining year."

INTERNATIONAL ROUTE NETWORK AND AIRLINES

Incheon effectively serves as an international airport with Seoul's former main airport, Gimpo International Airport (GMP), essentially operating as a domestic gateway with the exception of a handful of flights to China, Japan and Taiwan.

As a result of these distinct roles, the most popular routes from ICN are all to international destinations, led by Tokyo, Osaka, Fukuoka, Bangkok and Hong Kong, which between them account for around 26% of Incheon's annual passenger volumes.

The top five airlines today in terms of passenger volumes are Korean Air (KE), Asiana Airlines (OZ), Jeju Air (7C), Jin Air (LJ), and T'way Air (TW). Notably, all five are Korean carriers, and together they account for 60.9% of all passengers passing through the airport.

Among them, the combined market share of Korean Air and Asiana Airlines (both full-service carriers) is 38.7%, while the low-cost carriers make up 22.2%.

INFRASTRUCTURE DEVELOPMENT

Incheon completed its fourth phase expansion in 2024 and is now capable of handling 106 million passengers annually – nearly double its opening capacity of 54mppa.

In addition, the airport is now equipped to accommodate up to 600,000 aircraft movements and 6.3 million tons of cargo annually – increases of 20% and 26% respectively on its opening day capabilities.

However, the development of Incheon International Airport is far from complete, with the construction of a fifth runway and third terminal already factored into its future growth.

"With globalisation and the continued growth in demand for global aviation, current projections indicate our Phase 4 facilities will reach capacity by about 2033," says Lee.

"We are aware of what needs to be done. With competition among Asian hubs continuing to increase, the timely expansion of Incheon's capacity is critical for maintaining our hub competitiveness.

"Delays in expansion could result in congestion, operational inefficiency, higher fares, and the loss of transit traffic, thereby weakening both the airport and Korea's competitiveness in the aviation sector.

"Given that major airport developments typically take 8–10 years from planning to completion, it is essential to begin preparations now to ensure the timely delivery of additional infrastructure that will include a fifth runway, Terminal 3, new apron and aircraft parking areas."

CARGO GROWTH AND DEVELOPMENT

With Incheon being such an important passenger hub for South Korea and the Asia-Pacific region, it is often easy to forget that it is also the world's sixth biggest cargo gateway, handling close to three million tonnes of freight annually.

In 2024, Incheon handled 2.95 million tonnes of air cargo (+7.4%) to retain its status as one of the world's leading cargo hubs alongside Hong Kong (HKG), Shanghai Pudong (PVG), Memphis (MEM), Anchorage (ANC), Louisville (SDF), Miami (MIA) and Hamad (DOH).

Incheon boasts major cargo terminals operated by Korean Air, Asiana and AACT as well as hundreds of cargo, logistics and manufacturing facilities spread across a 3.2 million square metre Free Trade Zone (FTZ) developed and managed by Incheon Airport.

When Lee was appointed president and CEO of IIAC he quickly outlined plans to focus on creating a "smart logistics cluster" and further enhancing ICN's global route network to potentially take cargo operations at the airport to the next level.

The initiative will prioritise several key areas, such as the development of a 'smart cargo terminal', the construction of a 25,400sqm Joint Distribution Centre for Small and Medium-sized Enterprises (SMEs), expansion of the global network, and the attraction of air cargo and logistics specialists, including e-commerce and 3PL companies.

Talking about the smart cargo terminal concept, Lee says: "Smart cargo terminals are a core infrastructure for securing both logistical efficiency and global competitiveness in the era of the Fourth Industrial Revolution.

"Traditional cargo terminals have shown limitations due to labour-intensive environments and aging facilities, particularly in processing speeds and operational stability. Our vision is to completely modernise these terminals through the integration of AI, IoT, robotics, and big data technologies.

"This digital transformation in cargo operations will allow us to proactively meet future aviation logistic demands by increasing cargo throughput and shortening lead times, positioning Incheon Airport as a global smart logistics hub. Furthermore, it will attract global logistics companies, generate employment opportunities, and drive economic growth.

"As a first step, we are implementing a pilot project from this year through 2030 to install advanced automation and unmanned logistics equipment, along with IT systems, within the existing terminal space.

"Based on the outcome of this pilot phase, we plan to launch a second-phase full-scale construction of a new smart cargo terminal. Once we gain experience of operating such a facility, we aim to expand the model to overseas airport projects, thereby diversifying our business and enhancing Incheon's global influence in the logistics sector."

INNOVATION PIONEER

Since its inception the airport has pioneered and adopted new technology that have included security innovations, augmented reality, robotics and more recently developing AI-powered solutions.

So, does Hag-jae Lee consider ICN to be a smart airport in terms of innovation and developing/embracing new technology?

He says: "In my experience, yes. In March 2024, we officially declared a 'Digital Transformation' strategy. This was not merely a technology adoption initiative, but a commitment to shift our entire operational and organisational culture toward a digital-first mindset, marking a pivotal starting point for our transformation into a truly digital global airport.

"Under this strategy, we continue to expand the scope of digital innovation across the entire customer journey. For example, we are gradually introducing autonomous mobility solutions such as self-driving shuttle buses and indoor autonomous vehicles to improve airport accessibility and assist passenger movement.

"Since May 2025, our digital twin-based intelligent traffic control system has greatly improved the efficiency and safety of ground transportation by collecting and analysing real-time traffic data and swiftly responding to incidents.

"The facial recognition-based 'Smart Pass' simplifies departing procedures by enabling passengers to pass through using only their face, boosting both security and convenience and cutting waiting times by approximately 40%.

"Scheduled for launch in late 2025, self-service check-in robots are expected to further reduce passenger wait times and alleviate staff workloads during peak hours.

"Since first introducing 11 robots in 2018 for tasks like guidance and cart transport, we have expanded their roles to include patrols, self-check-in, and docent services.

"Lastly, we are enhancing personalised passenger guidance through initiatives such as a renewed airport information app and the development of an AI-powered integrated customer service management system."

GOING GREEN

As you would expect from one of the world's leading airports, ICN is very much onboard with aviation's net zero emissions goals and the need to develop sustainably to ensure its licence to grow.

It holds Level 4 status in ACI's Airport Carbon Accreditation programme and has been a member of the RE100 global corporate renewable energy initiative since 2022.

Reducing INC's CO_2 footprint and adopting renewable energy sources are certainly two key focuses of the airport's sustainability strategy.

"We are on track to source 15% of our total electricity needs this year from renewable sources, leveraging 39MW of solar and 10MW of geothermal power installed onsite," enthuses Lee.

"We are investing in large-scale green infrastructure – including building a 35MW solar farm this year – to accelerate our journey toward 100% renewable energy by 2040.

"To support the transition to green mobility, we are developing extensive infrastructure, including over 1,000 EV charging stations, equipment electrification facilities for ground handling operations, and the airport's first large-scale liquefied hydrogen fuelling facilities."

Although it is early days, Sustainable Aviation Fuel (SAF) has also been commercially available at Incheon since September last year.

"The SAF initiative is in partnership with the government, airlines, ground handlers, and refiners. To support adoption, we have implemented incentive programmes for SAF users," notes Lee.

SISTER AGREEMENTS

Like the world's biggest airport, Hartsfield-Jackson Atlanta, Incheon favours co-operation or sister agreements with other airports to encourage collaboration and the exchange of knowledge and best practices.

ICN currently maintains co-operation agreements with nine other airports, which according to Lee, form the basis for "various collaborative activities, including staff exchanges, working group meetings, and the sharing of operational know-how and expertise".

"To date, Incheon Airport has signed a total of 12 co-operation agreements with nine major international airport operators, including Schiphol, Vienna, Istanbul, and Airports of Thailand (AOT), among others," he enthuses.

"In particular, we have built strategic partnerships with airports such as Schiphol and Vienna, with whom we carry out secondment programmes for the exchange of staff and hold annual working group meetings focused on areas of mutual interest.

"Furthermore, since 2016, Incheon Airport has been hosting the World Aviation Conference. We will host the 8th World Aviation Conference (WAC) this September. It will bring together aviation experts from around the world to explore innovations in airport services, particularly those driven by emerging technologies, such as AI.

"Through these strategic partnerships, we're able to quickly adopt global best practices, promote joint R&D and digital transformation initiatives, and respond collectively to global challenges.

"These efforts are generating tangible synergies that help us stay competitive and accelerate our transition into the airport of the future."

GLOBAL AIRPORT OPERATOR

In the past, Incheon International Airport Corporation used to be listed in *Airport World's* biennial A to Z of Global Airport Operators listing courtesy of its former 5% stake in Khabarovsk Novy Airport in eastern Russia, backed up by a series of consultancy contracts in Iraq (Erbil), the Philippines (Mactan Cebu), Cambodia (Siem Reap) and elsewhere.

It continues to look for opportunities to export its expertise overseas in terms of non-equity investments, but does last year's award of a $3 billion contract to its New NAIA Infra Corp consortium to modernise and operate Manila's Ninoy Aquino International Airport in the Philippines, and the more recent announcement that it is the preferred bidder for the concession to operate Urgench International Airport in Uzbekistan, signal IIAC's willingness to once again become an operator and investor in airports outside of South Korea?

"Expanding our business overseas by exporting the 'K-Airport Model' is a core priority," states Lee. "Since its opening in 2001, Incheon Airport has undergone four phases of expansion projects, through which it has accumulated world-class expertise in airport construction and operations. We are now once again leveraging this experience to actively pursue international projects.

"Starting with the operational consulting project for Erbil New Airport in Iraq in 2009, IIAC has won 39 contracts across 18 countries, totalling $405 million. Notably, last year we achieved a record performance in overseas business by securing five new projects – including the development and operation of Manila Airport – with combined orders amounting to KRW147.5 billion.

"This year, IIAC is working to participate in public-private partnership (PPP) projects for the operation and development of two airports in Montenegro and is also seeking to win contracts such as the digital transformation of Ethiopia's Bole International Airport. Regarding the Urgench Airport project in Uzbekistan, although the final concession agreement has yet to be signed, IIAC is currently designated as the preferred bidder, and we aim to reach a final agreement through exclusive negotiations over the next three months.

"We are focusing our capabilities on directly developing and operating more than ten overseas airports by 2030. We plan to actively pursue contracts for large-scale, long-term, high value-added projects."

You heard it here first! Watch this space for further developments. AW

Test beds for IT innovation

SITA Europe president Sergio Colella explains why he believes smart airports embracing AI and connected data will be at the forefront of industry growth in the coming years.

Airports across the world are entering a new stage of extraordinary transformation. With demand for air travel surging, governments and operators are stepping up with major infrastructure projects.

In Asia, Singapore Changi and Incheon continue to expand with digitally driven terminals, while in the United States airports like Hartsfield-Jackson Atlanta and Dallas Fort Worth are embedding new technologies into large-scale modernisation plans.

In the UK, ministers have backed the expansion of Heathrow and Gatwick and fast-tracked a redesign of London's airspace. Amsterdam's Schiphol Airport has announced a €6 billion development programme stretching to 2029.

These efforts are crucial, but they won't be enough on their own. Runways, terminals, and taxiways matter, but building our way out of congestion is no longer a sustainable strategy.

The real opportunity lies in pairing infrastructure investment with smarter, scalable technologies, with AI as a cornerstone. The stage is set for a more seamless, efficient passenger experience, if airports can harness the full potential of digital innovation.

MEETING COMPLEXITY WITH INTELLIGENCE

Airport operators are being asked to do more with less. Managing increased operational complexity without adding infrastructure or huge cost increases is no small feat.

AI offers a powerful way forward. Already, 45% of airports are integrating data and a further 13% are exploring ways to organise it to support AI initiatives.

Almost one in ten are actively training AI with collected data, though just 2% have gone as far as implementing Large Language Models (LLMs) within their systems.

Despite being at an early stage, AI is already delivering tangible results. In passenger-facing areas, it is being deployed in customer service (42% of airports) and passenger processing and flow management (40%). Over a third (36%) are now using AI for aircraft turnaround, driving faster gate assignments and improved on-time performance. Cybersecurity is another leading use case, with just over half of airports applying AI to detect and respond to evolving threats in real-time.

More advanced applications are beginning to take shape. Predictive baggage routing, dynamic resource allocation, and the use of AI in energy-efficient airside vehicle management are just a few of the innovations moving from concept to practice.

Together they show how airports can evolve from reactive hubs into intelligent ecosystems capable of anticipating needs and responding in real-time.

This shift is especially critical as travel patterns grow more unpredictable and pressure mounts to deliver seamless, personalised experiences at scale. New generations of travellers expect speed, convenience, and reliability as standard. To meet these expectations, airports need more than traditional tools.

THE NEXT FRONTIER OF AI

Looking ahead, airports are preparing to adopt a broader spectrum of AI. Generative AI will play a role in areas such as flight schedule optimisation, terminal design, and personalised communication to passengers.

Assistive AI will support operations centres, predictive maintenance, and multilingual assistance. Agentive AI will bring the next leap in automation, from improving autonomous baggage handling to reducing fuel consumption in self-driving vehicles.

Governments are also exploring agentive AI for enhanced security screening and more accurate threat detection.

It is telling that a third of airports surveyed say AI is a key IT resource focus for 2025, with one in six identifying it as their number one priority.

This level of commitment underlines the industry's recognition that AI is not optional — it is becoming the foundation for how airports will operate.

Growth opportunities are significant. Autonomous AI optimisation will enable automated decisions and task allocation, alongside continuous simulation and prediction across the airport environment.

Autonomous common-use ground service equipment will improve utilisation of assets, boost return on investment, and accelerate the shift to autonomous operations across the wider airport ecosystem.

TURNING POTENTIAL INTO PERFORMANCE

To move from pilot projects to airport-wide transformation, a stronger foundation is needed. That starts with breaking down data silos and improving integration across the travel ecosystem, from airport systems to airline operations and border control.

When data flows securely across the ecosystem, AI shifts from a siloed tool to a real-time decision engine, unlocking new levels of efficiency and resilience.

Optimisation is the next frontier. As operations grow more complex, airports need a unified view of activity across landside, terminal, and airside domains.

When AI brings together passenger flow, baggage, aircraft turnaround, and resource allocation into a single operational picture, airports gain the insight to make smarter decisions, faster.

This level of visibility and co-ordination will be essential to keeping pace with demand.

Success also depends on people. AI needs to be woven into everyday processes, not layered on top. This requires not just new tools but also new ways of working.

Staff need the training and confidence to work alongside AI, and leaders need to embed these capabilities into strategy and culture.

The payoff isn't just operational, it's personal. Passengers benefit from shorter queues, more accurate information, and a smoother, more personalised experience.

LOOKING AHEAD

Airports everywhere face the same challenge: growth is accelerating faster than physical infrastructure can keep up.

Whether in Europe, Asia, the Middle East, or the Americas, the ability to absorb rising demand without compromising passenger experience or safety will ultimately hinge on how effectively airports embrace AI and connected data.

Tomorrow's airports will be defined not by their size, but by their intelligence. That vision depends on systems, people, and partners working in concert.

The foundations are being laid today, and those who harness AI and data will shape the future of air travel.

Airports are more than gateways to cities; they are global test beds for innovation and collaboration. With the right investments in AI, data, and skills, we can create smarter, more sustainable airports that redefine what's possible in air travel worldwide.

Europe, with its talent and infrastructure, has a chance to lead – but the opportunity is truly global, and the winners will be those that act fastest to embed intelligence into every part of the journey.

AW

Cutting edge

New technology, facilities and services continue to enhance the passenger experience and operational efficiency of airports, writes Joe Bates.

ACI's upcoming Airports Innovate conference in Busan, South Korea, will once again highlight the hugely impressive number of ways airports continue to pioneer new technologies and consider innovation a key priority as they strive to make aviation more efficient and enhance the passenger experience.

In terms of efficiency, adopting new technology, equipment and facilities as well as introducing new processes and procedures can reduce an airport's CO_2 footprint and lower running costs that help reduce operational expenditure (OPEX).

And with technology, in particular, often providing airports with potential new revenue streams, going forward, nothing should be off the table for airports when it comes to future innovation.

This article includes a host of examples of airport innovation that covers everything from the use of robots, multimedia and retail initiatives in the terminal; the introduction of exoskeletons on the ramp; the continued implementation of automated vehicles and AI technology on the airfield; to TAV Technologies' AI-human hybrid spokesperson; and Vantage Airports creating a new subsidiary to drive the development and sale of new transport related technology.

TAV'S AI-HUMAN HYBRID SPOKESPERSON

TAV Technologies, the 100% owned IT subsidiary of TAV Airports, has its own AI-human hybrid spokesperson, AeRona (pictured above).

Launched at the recent PTE Expo in Madrid, AeRona's role is to interactively share the benefits of the company's services and products with aviation stakeholders.

And TAV Technologies recently used her to host a YouTube video – *https://www.youtube.com/watch?v=QclknSsa6mk&ab_channel=TAVTechnologies* – where she interacted with Aykut Kullap to explore the stories behind the company's sustainability innovations.

Part of TAV Technologies' series of 'Sustainability Talks!' videos, the latest one specifically discussed how IoT is transforming air quality and energy use at airports.

ROBOTS ON PATROL AT HALIFAX INTERNATIONAL AIRPORT

Halifax Stanfield International Airport (YHZ) in Canada has become the latest gateway to introduce robotic technology in the terminal environment.

In partnership with Halifax-based start-up Maritime Robotics, Halifax International Airport Authority (HIAA) has launched two custom-built passenger experience robots at Halifax Stanfield.

The project is part of HIAA's ongoing commitment to advancing the Stanfield experience by leveraging technology that improves wayfinding and helps support a seamless journey for travellers and airport visitors.

The airport's director of marketing, communications and customer experience, Tiffany Chase, says: "This collaboration marks an exciting step toward enhancing wayfinding and elevating the passenger experience.

"By embracing technology solutions like these, we are prioritising airport efficiency and innovation, with a touch of fun in the terminal. Think WALL·E with a map — and they're pretty adorable, too."

The custom-built robots, which are currently being pilot tested at the airport, are equipped with voice recognition and touchscreen interfaces. Users can access information on flights, weather, airport amenities, and more.

When requested, the robots will physically guide users to select locations within a programmed perimeter. For destinations outside of that range, a static wayfinding map is available.

"Bringing this kind of innovation to our local airport is especially meaningful," comments Huijing He, director of Maritime Robotics.

"It's not just about introducing new technology – it's about enhancing the travel experience for our community and taking a significant step toward the future of travel, powered by the people who make it possible."

Both robots are positioned pre-security in the Centre Court and Arrivals areas of the terminal building, complementing traveller resources already provided by airport employees and volunteers.

According to HIAA, the robots offer an additional layer of support for people navigating the terminal, particularly during peak times when in-person assistance may be limited.

MOBILITY CART TRACKING SOLUTION AT JFK TERMINAL 4

JFKIAT, the operator of Terminal 4 at John F Kennedy International Airport, is piloting what is believed to be the world's first mobility cart tracking solution, which it claims is already delivering measurable improvements to the passenger experience.

For this initiative, it is enhancing the complimentary mobility cart service at T4 by providing real-time tracking, pick-up locations, and support to potentially expand the service across the terminal in the future.

The pilot service is available for passengers in need of assistance, with carts servicing designated stops throughout T4.

The new solution, developed in collaboration with JFKIAT's partners at micro-location leader *Volan Technology* and AI crowd management analytics expert *Beonic*, offers real-time tracking of passenger carts enabling travellers to view exact cart locations and estimated wait times.

JFKIAT CEO, Roel Huinink, enthuses: "Giving passengers real-time information helps to support a smoother airport experience.

"By enabling live tracking of our cart service at Terminal 4, we're helping our travellers who prefer or need assistance over longer distances, make more informed choices. As the transformation of T4 continues, we are pleased to work with our partners to introduce this innovative technology to advance passenger accessibility and operational efficiency."

Airport general manager, Teresa Rizzuto, notes: "As we continue to modernise and reimagine JFK into a world-class global gateway, passenger-focused innovations like this mobility cart tracking system are key to enhancing accessibility and improving the travel experience for all."

According Beonic CEO, Billy Tucker, the ongoing pilot represents "a significant leap forward in how airports can enhance accessibility and operational efficiency".

He says: "By integrating real-time cart tracking, we're not just improving the passenger experience, we're setting a new standard for intelligent, data-driven airport services."

IMMERSIVE 3D EXPERIENCE IN ORLANDO

The Greater Orlando Aviation Authority (GOAA) and Synect have launched an immersive 3D experience at Orlando International Airport's security checkpoint that it hopes will turn wait times into engaging, informative moments for passengers.

The experience stars Annie the Astronaut, a digital ambassador created by GOAA and Synect, in a fully animated 3D journey that mirrors the passenger journey at MCO.

In Annie's Airport Journey, the intrepid astronaut strolls through a 3D replica of Terminals A and B, complete with check-in counters, plants, a food court, and other elements modelled directly from the facility.

The content shares real-time TSA wait times, 3-1-1 reminders, divestment tips such as bin reminders, post-security concession highlights via QR code, and themed 'Easter Eggs' like a digital version of MCO's much-loved carpet.

Developed by Synect's Orlando-based studio, the immersive content plays on identical LED video walls at the airport's West Checkpoint and features eight custom scenes based on MCO's terminal architecture; over 1,000 animated elements; and more than 7,200 rendered frames built in Maya, Cinema 4D, and After Effects.

This project supports GOAA's commitment to creating engaging, guest-centric airport moments and builds on years of content-first collaboration with Synect.

"Annie's Journey is informative, uplifting, and unmistakably MCO," says Lance Lyttle, CEO of the Greater Orlando Aviation Authority. "In partnership with Synect, we're transforming the checkpoint into an interesting, fast, branded experience using a content-first strategy and our Passenger360 platform, which connects guests with real-time information and a host of airport amenities."

DXB'S SMART NEW ARRIVALS SERVICE

Dubai Airports has launched DXB Greet & Go, a new smart pick-up service at Dubai International Airport's Terminal 3.

Designed for guests arriving in Dubai with pre-booked hotel, limousine, or tour operator services, this new solution replaces traditional guest paging with a seamless, technology-enabled experience.

According to the airport operator, with DXB Greet & Go, guests arriving at Terminal 3 can simply scan a unique QR code at the designated kiosk to view details of their assigned driver and vehicle, including parking location and car registration number.

They are then guided by multilingual employees directly to their assigned driver and vehicle, ensuring a smooth and stress-free pick-up.

Essa Al Shamsi, senior vice president of terminal operations at Dubai Airports, said: "DXB Greet & Go is part of our continued efforts to make every step of the journey at DXB more efficient and enjoyable.

"By modernising the way guests are received in the Arrivals area, we are helping our partners deliver a smarter and more personalised welcome, while easing footfall and improving operational flow within the terminal."

HELPING TRAVELLERS FIND LOST BELONGINGS

The recovery of a missing diamond from an engagement ring and reuniting a little girl with her favourite stuffed toy are a few of the more heart warming lost and found stories at Pittsburgh International Airport (PIT) this year.

Now, PIT believes it has made recovering missing items even easier with its recently launched Lost and Found system.

The airport's 'We Got You' initiative offers 24/7 online claims submission and real-time tracking, which means no more waiting on hold during business hours. Passengers can submit and monitor claims anytime from any device.

This solution is the result of extensive research with passengers and staff conducted by PIT's Experience and Design team and arguably reflects PIT's commitment to creating world-class services that address actual needs – and building tools that restore confidence during inevitable travel disruptions.

"We understand how stressful it can be to lose something while travelling, and our goal is to make the recovery process as easy as possible," said Elise Gomez, manager for customer experience at the Allegheny County Airport Authority.

"This new software ensures that passengers can quickly and easily connect with our team, helping us reunite more people with their lost belongings."

INNOVATION ON THE RAMP

Nuremberg Airport has come up with a high-tech solution to make the job of its baggage handlers safer and easier – robotic exoskeletons from German Bionic.

Following a successful test phase, the smart, AI-based exosuits are now in regular use, helping employees handle heavy passenger baggage.

Support is provided while lifting and lowering baggage, up to the full weight of the suitcases being moved. This ensures that the strain placed on the lower back of its baggage handling workforce is significantly reduced, improving the health and wellbeing of workers while simultaneously improving their effectiveness.

A typical flight at Nuremberg Airport carries up to 200 pieces of luggage, which on average weigh between 15kg-20kg, meaning that baggage handlers at the gateway can easily lift, carry and load up to a ton or more of luggage every day.

The AI-based power suits were developed specifically for repetitive lifting tasks that place heavy strain on the lower back.

They learn movement patterns, adapt to the wearer's motions, and amplify these without interfering with the work environment.

Nuremberg Airport's head of baggage delivery, Matthias Reubel, says: "Our acquisition of the exoskeletons is testimony to how great they are, not only for colleagues who are a little older and have been doing the job for a long time, but also for young employees who are just starting out in this profession."

PORSCHE COMES TO SINGAPORE CHANGI

Porsche has opened a new lifestyle-led brand space in Singapore Changi's Jewel that aims to give visitors an expansive and immersive multi-sensory experience.

Located close to the Arrivals Hall at Changi Airport's Terminal 1 and adjacent to the entrance to Jewel's iconic indoor forest and waterfall, the new attraction boasts four different zones – Café Carrera by Baker & Cook, the Culture Garage, the Porsche Lifestyle Boutique, and coming soon, a reception and welcome area for the upcoming Porsche Experience Centre Singapore.

The Culture Garage is described as a periodically changing space for showcasing extraordinary cars from throughout Porsche's current and historic line-up.

INNOVATION ON THE AIRFIELD

In Germany, Munich Airport (MUC) has selected Assaia's ApronAI solution to optimise turnaround operations and enhance ramp efficiency across 150 gates, with plans for further expansion.

Serving nearly 42 million passengers in 2024, Munich is Germany's second-busiest airport and a critical European hub.

The rollout is part of MUC's broader strategy to improve operational performance and sustainability by leveraging real-time data and automation.

Assaia's ApronAI uses advanced video analytics, computer vision, and machine learning to continuously monitor aircraft turnaround processes, detect key milestones, and generate actionable alerts.

This, says MUC, enables its operations teams to proactively address issues that could impact on-time performance (OTP), resource efficiency, and passenger satisfaction.

MUC's chief operating officer, Thomas Hoff Andersson, says: "For Munich Airport, it's a critical step towards enhancing our operations using data and artificial intelligence.

"With this technology, we're able to better understand what's happening on the apron in real-time, allowing us to streamline processes and improve decision-making, ultimately delivering a better experience for our passengers."

Elsewhere on the airfield, Teeside International Airport in the UK has signed a near £1 million deal with Aurrigo to develop an autonomous baggage and passenger moving system that will improve operational efficiencies, reduce the gateway's carbon footprint and provide an improved passenger experience.

Starting in mid-October, Aurrigo's eight-seat Auto-Shuttle will kick-off work to transport passengers directly from the aircraft steps to the terminal building. In early January 2026, Aurrigo will follow this by introducing the Auto-DollyTug – a fully driverless vehicle designed to move cargo and baggage around airports.

Initially, the groundbreaking technology will start landside at the new Connected Autonomous Mobility Test centre on the airport campus, where it will be put through a rigorous testing regime before moving airside early next year.

The work will include integrating into bulk-loaded operations, providing the ability for bulk baggage to be transported right to the aircraft hold loading team.

David Keene, CEO of Aurrigo International plc, enthuses: "There is no escaping the fact that the aviation world is accelerating its desire to reduce its environmental impact in line with net zero guidelines.

"Our driverless vehicles present a real-world 'ready' opportunity to not only take significant amount of carbon out of operations but also boost the speed and efficiency in which you can move passengers and bags airside in the process."

Airport managing director, Phil Forster, notes: "To have this technology in place early next year will mean bags will travel from check-in to plane even more seamlessly, and in an even greener way.

"It will also help us shape how we move passengers around Teesside in the future – and will likely have an impact on the whole aviation industry. We were first in the UK to install new security scanners to allow passengers to keep liquids and electronics in bags, and now we're leading the world in driverless cargo and bag systems with the expertise of Aurrigo."

BIG PICTURE THINKING

Vantage Group has launched Vantage Futures, a corporate venture initiative, to transform the future of aviation and transportation infrastructure.

According to Vantage Group, the new subsidiary seeks to invest in and partner with early-stage, seed, through Series B companies driving groundbreaking solutions in three key focus areas:

– Sustainability: Innovative technologies and business models that drive carbon neutrality, forging a greener and more sustainable future for aviation and transportation.

– Connected Infrastructure: Groundbreaking technologies that streamline operations, enhance safety and security, and pioneer a future-ready ecosystem in the transportation sector.

– Future of Mobility: Innovative ventures and technologies that are shaping the future of transportation and mobility, revolutionising how people and goods move around the world.

Matthew Handford, executive managing director of Vantage Futures, explains: "With Vantage Futures, we are expanding on Vantage Group's decades-long mission to create ideas that go places and transform transportation.

"We've seen incredible opportunities in our three verticals and look forward to partnering with bold thinkers to help fund groundbreaking solutions with the potential to accelerate sustainability, efficiency, and mobility in transportation infrastructure."

Vantage is confident that its global reach, combined with deep industry connections and expertise, offers a compelling launch pad for early-stage companies.

Between them its current network of airports and transportation hubs across North America, the Caribbean and Europe served more than 80 million passengers in 2024.

As part of the launch, Vantage Futures has made its first investment in Opfyx, an AI-enabled software suite for airport, airline, and ground handler communications and operations.

Vantage participated in a funding round led by New York-based Zero Infinity Partners (ZIP) to support Opfyx's development of an integrated digital communications platform.

The platform will be piloted at John f Kennedy International Airport's Terminal 7, with opportunities for expanded use at the new Terminal 6, under development now by Vantage-led JFK Millennium Partners.

Ben Sehovic, founder and CEO of Opfyx and former chief transformation officer at British Airways, says: "We are thrilled to partner with ZIP and Vantage Futures on our mission to transform aviation operations.

"The aviation industry has long relied on outdated, unreliable and siloed operational software tools. At Opfyx, our team leverages deep expertise in both aviation and technology to deliver and embed solutions that streamline operations from long-term planning to real-time execution."

Ambitious Vantage Futures will also look to partner with venture capital firms, syndicates, and corporate venture capital funds to amplify its efforts.

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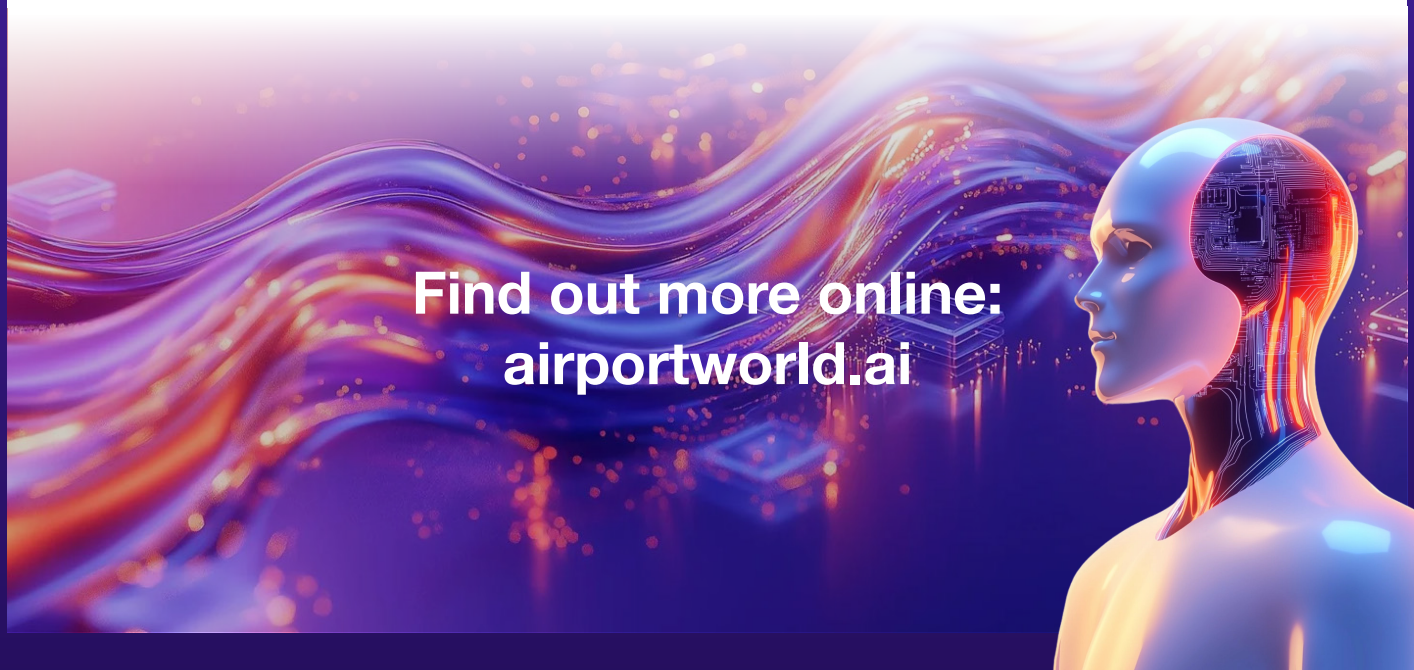

The Hangar by Pepsi at Reagan National (DCA) in Washington DC.

Boosting beverage revenues

Enliven CEO, Tim Harms, considers the strategic power of beverage partnerships and how they can potentially transform retail revenues at airports.

Airports are in the midst of a commercial transformation. As traditional revenue streams fluctuate, leaders are reimagining how every square foot and every touchpoint can contribute to non-aeronautical revenue and world-class passenger experiences.

From biometric screening to boutique retail, change is everywhere – but one of the most impactful, and sometimes overlooked levers is the humble beverage partnership, commonly known as 'pouring rights'.

Once the domain of universities and sports venues, these agreements are now gaining traction at airports, delivering significant gains for all stakeholders – travellers, concessionaires, and airport operators alike.

WHAT ARE POURING RIGHTS AND BEVERAGE PARTNERSHIPS?

Pouring rights agreements are exclusive or semi-exclusive partnerships between airports and major beverage companies such as Coca-Cola, PepsiCo, or Keurig Dr Pepper.

These comprehensive contracts grant beverage companies the right to be the primary or semi-exclusive supplier of their product categories across an airport's entire commercial ecosystem, including restaurants, cafes, retail outlets and vending machines.

The establishment and management of these partnerships involve sophisticated negotiations that consider multiple factors: guaranteed minimum payments, volume-based incentives, marketing support, equipment provision, and sustainability commitments.

Effective management requires ongoing co-ordination between airport management, beverage company representatives, and concessionaires, including monitoring compliance across all outlets and co-ordinating promotional campaigns.

THE CURRENT MARKET SHIFT

The adoption of strategic beverage partnerships at US airports is accelerating, driven by compelling financial incentives and operational benefits. Since the first US airport deal in 1995 (DFW), nearly 20% of the top 40 US airports have formal pouring rights agreements in place.

Additional airports have signalled their intention by incorporating pouring rights language within their leases.

The results are contributing to the spread. Industry data indicates that airports implementing comprehensive pouring rights agreements typically see revenue increases of 15-30% from their beverage-related commercial activities, with total programme values often reaching several million dollars annually for major airports.

TODAY'S MARKET DRIVERS

These include new streams of non-aeronautical revenue; the desire for an enhanced customer experience; cost savings and operational efficiency; and sustainability and environmental initiatives.

The imperative to diversify revenue streams has never been more critical for airports. Non-aeronautical revenue, including commercial partnerships, has dropped since the pandemic to 35-40% of total

airport revenue for major international hubs. Beverage partnerships excel in this context because they generate multiple revenue streams simultaneously through direct payments from beverage companies, increased concession sales, and enhanced overall commercial performance.

Modern travellers expect airport experiences that rival high-end retail and dining destinations. Beverage partnerships enable airports to deliver this elevated experience by ensuring consistent product availability and quality across all outlets, enabling co-ordinated marketing activities, and facilitating the introduction of premium beverage options and new, innovative products that appeal to diverse passenger preferences.

Beverage partnerships deliver significant operational benefits beyond direct revenue generation. By standardising beverage supply chains across the airport, these agreements reduce procurement complexity for concessionaires while ensuring competitive pricing through volume purchasing power. The beverage companies typically provide equipment, training, and ongoing support that reduces operational costs for individual outlets.

Environmental responsibility has become a central concern for airports worldwide. Beverage partnerships increasingly incorporate sustainability commitments including recyclable packaging, funding to implement closed loop recycling programmes, and commitments to phase out plastic bottles.

TRUE PARTNERSHIPS: CREATING VALUE FOR ALL STAKEHOLDERS

In essence, this means the concessionaires, ACDBE tenants and boosting volumes and performance.

The most successful beverage partnerships provide concessionaires with several key advantages: strategic airport-wide marketing campaigns to drive up beverage sales, preferential pricing through volume purchasing (or the ability to continue purchasing through their existing agreements), dedicated onsite service reps, and equipment provision that reduces capital requirements.

Airport Concessions Disadvantaged Business Enterprise (ACDBE) programmes are essential components of airport commercial strategies, and beverage partnerships can be structured to provide additional support for these important tenants. This includes access to favourable pricing, dedicated training programmes, and mentorship opportunities that help these businesses succeed in the competitive airport environment.

Effective beverage partnerships create positive feedback loops that benefit all participants. Higher passenger satisfaction leads to increased dwell time and spending, which benefits concessionaires and generates higher volume incentives for beverage companies.

The data sharing and analytics capabilities built into modern partnership agreements provide valuable insights that help all stakeholders optimise their strategies.

BRAND BUILDING AND MARKETING SYNERGIES

Partnerships can bring added value to beverage companies and lead to more co-ordinated marketing programmes.

For beverage companies, airport partnerships offer unique brand building opportunities that extend far beyond traditional retail channels. Airports provide access to affluent, diverse, and internationally-minded consumer segments that are difficult to reach through other channels. The high-traffic environment and extended dwell times create multiple touchpoints for brand engagement and product trial.

The most successful beverage partnerships include sophisticated marketing components that benefit all stakeholders.

These programmes can include seasonal campaigns, co-branded promotional materials, digital marketing initiatives, geo-tagged social media buys, and experiential activations that create memorable passenger experiences.

The partnerships also enable co-ordinated product launches and promotional campaigns that maximise the impact of marketing investments across all airport touchpoints.

PASSENGER EXPERIENCE ENHANCEMENT

Beverage partnerships at airports can enhance the overall airport experience and encourage innovation.

From the passenger perspective, well-executed beverage partnerships deliver tangible benefits that enhance the overall travel experience. These include consistent product availability across all outlets, competitive pricing through volume purchasing, and access to premium products that might not be available in other travel retail environments.

Modern beverage partnerships extend beyond traditional retail transactions to create experiential touchpoints that differentiate airports from competitors.

This includes interactive displays, product sampling programmes, and themed retail environments that reflect local culture and preferences. The partnerships can also support unique dining and retail concepts that wouldn't be economically viable without the guaranteed volume and support provided by exclusive agreements.

AN OPPORTUNITY FOR EVOLVING AIRPORTS

The strategic implementation of beverage partnerships represents a unique opportunity in how airports approach commercial operations and revenue generation.

These partnerships offer a proven pathway – refined in other industry verticals – to enhanced non-aeronautical revenue, improved passenger experiences, and operational efficiency that benefits all stakeholders in the airport ecosystem.

As passenger volumes continue to grow and expectations for airport experiences continue to rise, pouring rights deliver.

The key to success lies in approaching these partnerships as strategic alliances rather than traditional vendor relationships, with careful attention to stakeholder alignment, performance measurement, and continuous optimisation.

AW

Asset control

IoT tracker technology is evolving and offers operational advantages to airports that embrace the solution, writes Andy Thomas, UK & Ireland lead at Sensolus.

Amongst many other extraordinary predictions, 100 years ago and more than half a century before the internet, Nikolas Tesla said "every home will be connected to a central office".

This was based on his idea that information and energy would be transmitted wirelessly.

In 1982, just as the internet was coming to life, a Coke machine became one of the first 'smart appliances' by reporting its inventory status over Carnegie Mellon University's network.

It was only 26 years ago that the term 'Internet of Things' (IoT) was coined. Today, there are over 18.8 billion IoT devices connected to the internet, according to IoT Analytics.

This incredible story is built on multiple, independent (and inter-dependent) developments in key technologies, including wireless data transmission, batteries, sensors, and the internet itself.

The opportunities appear to be limitless, but how can airport operators take advantage, and what are the challenges they might face when seeking to deploy IoT solutions?

In this article, we look at how IoT tracker technology is evolving, review current applications in airports, and consider future developments that could transform asset tracking and management.

INDUSTRIAL REVOLUTION

The term Industrial IoT (IIoT), referring to applications of core IoT technology in industrial environments, was coined just 13 years ago, but the tech has been used since the very start to gather and transmit information from individual trackers to some sort of central management platform.

Trackers typically collect and transmit the following types of data – Positional, Environmental and Operational.

Combinations of this data can trigger alerts, or cause plans to change, or be used to make predictions (for example, potential resource shortages or schedule clashes).

In short, the IIoT simply enshrines the old adage that what can be measured can be managed.

In the IIoT, asset tracking has in recent years improved dramatically, with lower cost devices, longer battery life, more and better sensors, and smaller form factors, combining to widen the number of applications and to make total solutions much more cost-effective.

When you think about the alternative to this advanced asset tracking, basically manual searching, it is immediately obvious where time and cost-savings can be made.

But beyond that, the inconvenience, delay, and general frustration that arises when stuff isn't in the right place at the right time, can cause reputational damage – which is always much harder to repair. But challenges remain.

CHECKING IN

Tracking assets around complex sites like airports is uniquely challenging; key data needs to be measured accurately, at high speed, indoors and out.

The locations of Ground Services Equipment (GSE) like towbars, stairs, and loaders, need to be known so they can be deployed optimally, and loading and unloading aircraft relies on knowing where dollies are parked and whether or not they are loaded.

Engineering equipment like engine washers and oxygen trollies may be required at very short notice, so knowing their location and operational status is vital.

Trackers on non-powered assets need a battery to power all on-board functions, and it is here that good design, which comes from experience plus expertise, is absolutely vital.

Tracking GSE on the airfield is slightly simpler as it's outdoors where GPS is available. Wheelchairs present a trickier problem, but they can also be tracked – inside the terminal building, across the airport, and out to neighbouring locations like car parks and hotels.

Knowing where all the different types of chairs are makes planning so much more efficient since you are only as fast as your slowest passenger.

Passenger Service teams already have a live feed of inbound aircraft and passenger numbers, while wheelchair tracking allows them to cater for all their passengers.

Inside the airport, we're not yet quite at the level of tracking every luggage cart, but that day is approaching.

CONSIDER THIS

Batteries are central to everything in an IoT tracker, because everything it does 'costs' battery power.

Design is everything. Modern batteries can last for many years on a single charge – if the functions they support are well designed. The biggest challenge with tracking GSE (or indeed any fast-moving asset) is update frequency.

You can't have an asset permanently connected – a tracker needs to 'know' what data to send when, to maximise its battery life.

Of all industry sectors, GSE is probably the most punishing on batteries, so experience and design expertise counts here more than anywhere.

Connectivity is of course a primary function. IoT trackers connect via the cloud to a management system, typically using low-power wide-area networks, which transmit small data packets over a long range, using very little battery.

IOT ENABLED SMART TROLLEYS AT HYDERABAD AIRPORT

Hyderabad's Rajiv Gandhi International Airport (HYD) hasn't looked back with the Internet of Things (IoT) since becoming the first gateway in India to embrace it for the real-time tracking and deployment of baggage trolleys across the airport since nearly five years ago.

HYD operator, GMR Hyderabad International Airport Ltd (GHIAL), believes that its decision to take the "digital leap" and implement an IoT platform has allowed it to augment its services and operational excellence, paving the way for a "truly Smart Airport City in Hyderabad".

The airport has deployed a LoRa (Long Range) IOT platform for the airport baggage trolley project, which has allowed it to significantly reduce the time passengers have to wait for any of its 3,000 baggage trolleys.

Discussing the benefits of IoT, GHIAL says: "Our Smart Trolley Management system has the capability to plan baggage trolleys according to the predictive analyses of estimated departure and arrival passenger loads.

"It preps the operations team with proactive planning with real-time dashboards/information on the availability of the number of baggage trolleys in different airport areas, ensuring their availability for the passengers at right place and right time."

This connectivity – examples include NB-IoT and LTE-M networks – allows data transmission costs to be minimised, enabling industrialisation of smart devices like trackers.

Critically, a management system is the central point where all the data coming from trackers is captured, making it easy to visualise the location and status of assets.

Having gathered all the data, the management system can use pre-defined thresholds to trigger alerts or detect dormant assets or even highlight when an asset enters a restricted area.

Ground operations systems tend to have their own interface for managing airfield-wide operations, so the management platform should have an open API for easy integration.

Modern platforms let asset managers know the utilisation of their assets, generate audit trails and service histories. They can also offer an app for operators in the field or the terminal – who can then find the closest asset or even mark it for service/cleaning.

LEADING BY EXAMPLE

All of the above is fine in theory, but are there real-world examples of where and how IoT trackers are delivering real-world benefits at airports?

TCR is a global leader in GSE, with systems in use at nearly 250 airports worldwide, handling over 5,000 flights per day from over 300 airlines.

They have deployed over 8,500 of our IoT trackers at multiple airports; each airport location uses cloud-based management system.

So, everything is possible today, at scale, and GSE equipment manufacturers can realise the benefits almost immediately. It takes very little time to install, integrate, and commission a fully managed IoT asset-tracking solution.

Such a solution for GSE gives full visibility of the asset estate, any time and from anywhere. It gives early detection of anomalies and operational inefficiencies and a fully automated inventory across multiple locations.

To take another example, aircraft maintenance is a time-critical process. However, long distances can cost valuable minutes, especially at a major airport like Frankfurt: Condor Technik has a hangar located on the opposite side of the airport to the terminals – a distance as the crow flies of nearly four kilometres. Going around the runway can be as much as ten kilometres.

Condor relies on an IoT-based tracking solution to optimise the routes to be covered when using its GSE, saving important time and increasing overall efficiency in daily operations.

From tyre change carts for various types of aircraft, to oxygen and nitrogen carts, a fuel drain cart, cargo stairs, an engine washer, and a mobile toilet emptying cart – the GSE is only moved via external vehicles.

For this reason, it was almost impossible to localise the equipment. Since the beginning of 2025, the Condor assets have been equipped with IoT trackers and can be precisely localised on the huge airport grounds and displayed on the management system map.

The precise tracking data now helps the technical teams to plan the deployment of GSE and optimise routes. With this newly gained visibility, many trips from one side of the airport site to the other can now be eliminated.

THE SKY'S NOT THE LIMIT

As in many sectors, AI will significantly enhance asset tracking IoT systems by improving data analysis, enabling predictive maintenance, and automating processes.

AI algorithms can process the vast amounts of data from IoT sensors in real-time and can analyse historical data to predict potential equipment failures, maintenance needs, and optimise resource allocation.

With the powerful ability to identify patterns and anomalies, AI tools are perfectly suited to the overall optimisation of an asset estate.

For example, by monitoring inventory levels and leveraging demand patterns, resource restocking can be optimised to reduce waste.

In short summary, AI systems will improve asset tracking and management and push it to become more predictive, driven by insights arising from the analysis of vast amounts of data, ultimately making significant cost savings and improving operational performance. AW

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Moving forward

We report on the innovative design of Hollywood Burbank Airport's new terminal and pioneering modular construction at Dallas Fort Worth International Airport.

When the Burbank-Glendale-Pasadena Airport Authority (BGPAA) decided to build a new, state-of-the-art 355,000 square feet terminal at Hollywood Burbank Airport (BUR), Corgan, in association with CannonDesign, was enlisted as the designer of the facility, with the former serving as architect of record for the project.

Inspired by old Hollywood glamour, the modern facility will feature dramatic, sweeping lines with hints of art deco and Mid-Century design — intended to honour the past while embracing the future.

Notable details of the new terminal include a sweeping roof supported by V-shaped columns intended to resemble red-carpet spotlights, exuding elegance and grandeur.

The interior features bronze and champagne-coloured accents, complimenting the openness of the design aesthetic.

With 14 new replacement gates, the terminal will offer localised amenities/retail, centralised check in and security checkpoint, streamlined baggage and kerbside flows, a new airline support facility, and a new six-level parking garage.

BUR will be fully electric – only the second airport in the US to do so –and will pursue LEED Gold. Solar technology will supplement power generation and help to maintain thermal comfort and reduce energy dependency.

An outdoor plaza will minimise water use with native plantings and reuse grey water for irrigation.

Commenting on the terminal's interior, Corgan says: "Attention to natural light and biophilic elements create a more pleasant experience for passengers while supporting larger sustainability goals for the project.

Full height windows fill the corridors and gate lounges with natural light and frame the Verdugo Mountains, while solar control technology manages heat gain to maintain thermal comfort and reduce energy use.

"Designed for flexibility in passenger and operational needs, the new terminal adds much-needed functionality and safety for the airport while also elevating the design and experience for travellers to the area – balancing a vision for the future with a celebration of its history, technology with human-scale design, and beauty with efficiency."

To enhance safety, the terminal will be moved away from the runway. The terminal will meet restrictive Risk Category III seismic building codes.

The project broke ground in January 2024, topped out in January 2025, and the anticipated opening is October 2026.

INNOVATIVE MODULE-BASED CONSTRUCTION AT DFW

Elsewhere in the US, Dallas Fort Worth International Airport (DFW) has completed its latest construction milestone by moving six prefabricated

module structures that have come together to create the framework for the first phase of the airport's new Terminal F.

On August 8, the airport completed the last of six module moves that make up the structure for Terminal F.

The modules, some nearly as large as a US football field, were moved overnight during a two-week period using self-propelled modular transporters along one of DFW's airside taxiways.

The structures were then placed onto the foundations constructed at the Terminal F site, where the facility will now proceed to the next stage of construction.

This is DFW's third project to deploy the innovative module-based method to reconstruct or expand its terminal facilities, with the most recent moves being the largest modules for a terminal expansion at any airport.

The modules for Terminal F are approximately four times larger than the structures moved earlier this year for the ongoing Terminal C expansion. The largest of the six modules measured 278 feet long by 136 feet wide and weighed 3,320 tons – about as heavy as 12 Boeing 787-9 Dreamliner widebody aircraft.

"By embracing modular construction, we are finding smarter ways to deliver results faster, with less impact on travellers," noted DFW's CEO Chris McLaughlin.

"Together with our partners, we are delivering infrastructure through innovation and collaboration that will serve the growing needs of North Texas while setting the stage for the next era of DFW's development."

DFW's executive vice president of infrastructure and development, Mohamed Charkas, added: "DFW is at the forefront of innovation in terminal construction, continually redefining what's possible.

"The time we save using modular construction techniques is crucial for fostering the growth of our community and supporting our airline partners. We are steadfast in our commitment to being an economic engine for North Texas."

In May, DFW and American Airlines announced the decision to expand the scope and accelerate the phasing of the new Terminal F.

With the first phase of construction already underway, DFW has been hard at work designing the subsequent phases while concurrently construction the modules offsite.

The first phase of the $4 billion Terminal F expansion programme is anticipated to open with 15 gates in 2027.

It will ultimately deliver a total of 31 gates to be serviced entirely by American Airlines, expanding capacity for international operations and widebody aircraft, and include areas to facilitate parking, ticketing, check-in, security screening and baggage operations.

In addition to a new centralised Skylink Station, which is included with the first phase of construction, the final configuration will provide a walking connection with Terminal D.

The design-build team for the first phase of Terminal F is Innovation Next+, a joint venture comprised Archer Western Construction, Turner Construction Company, Phillips May Corporation, HJ Russell & Company and CARCON Industries, with PGAL, Gensler and Muller2 as design team members.

Hartsfield-Jackson Atlanta International Airport used the same modular construction method for the expansion of Concourse D, moving prefabricated sections into place overnight.

AW

Works of **art**

Airport artwork continues to innovate, win awards and surprise and delight travellers, and so much more is to come, writes Joe Bates.

AEROPLANE CHESS IN HONG KONG

An iconic Chinese board game, 'Aeroplane Chess' has come to life in Terminal 1 at Hong Kong International Airport courtesy of the transformation of a public seating area into an engaging new art installation.

For the uninitiated like me, Aeroplane Chess or Fei Xing Qi is a popular Chinese cross-and-circle board game similar to Ludo and Pachisi, where players race their aeroplane pieces around the board to reach the centre first.

Designed by local creative studio *STICKYLINE* in collaboration with the Hong Kong Arts Centre, the immersive artwork at HKG has reinvented the seating area between check-in aisles D & E on Departures Level (L7) into a playful, oversized version of the popular board game.

According to Airport Authority Hong Kong, the new addition features the game's iconic colourful patterns and builds a vibrant, geometric 3D landscape that invites travellers to embark on a journey shaped by movement, connection and discovery.

It states: "Aeroplane Chess, an iconic board game in Hong Kong, is a cherished part of our childhood memories and shapes our earliest impressions of flight.

"The airport serves as a hub for countless travellers embarking on their journeys – some are ready to depart, while others are returning home. "Here, their paths may intersect or diverge, creating a vibrant and dynamic scene."

GLOBAL DESIGN AWARD FOR INCHEON'S KINETIC ARTWORK

The impressive kinetic art installation in the newly expanded Terminal 2 at Incheon International Airport is beginning to get noticed and win awards!

Indeed, it has won three major awards to date from Red Dot and iF Design (both German based) and another from IDEA in the United States.

Called 'The Eternal Sky', the kinetic artwork was created using advanced digital technology, with its movements said to be designed to represent the movements of endangered animals.

Powered by artificial intelligence and deep learning, the installation integrates real-time data on elements like the sun, clouds, and weather into its visual performance.

Its ceiling-mounted structure moves using advanced robotics, merging art and technology into an immersive digital experience that has captivated audiences and critics alike.

THE ART OF NOISE AT LONDON'S HEATHROW AIRPORT

Grammy-nominated Jordan Rakei has launched what is believed to be the world's first track created entirely with sounds of an airport.

Rakei was given unprecedented access to the airport to create the seminal new summer soundtrack that features rhythms ranging from the beats of baggage belts to the hum of escalators.

The track is designed to give passengers a mood-matching mix to kick start their journeys and has been played on a loop throughout the terminals this summer.

The UK hub says the initiative is an ode to Brian Eno's iconic Music for Airports, credited with launching the ambient music genre.

For the record, the percussion part of the tune was made from the sounds of passports being stamped and bags hitting the belt, a water fountain provided ambience and ASMR, a jet taking off was transformed into a synth and a baggage control siren was transformed into a soft synthesiser.

Also included are sounds from famous movie scenes, such as the tapping of passengers' feet as they wait at a gate in Terminal 2 (featured in Bend It Like Beckham), the beeps of Terminal 3's security scanner that Sam runs through to catch Joanna in Love Actually, and the engines whirling on the tarmac where Die Another Day was filmed.

Rakei enthuses: "Having travelled all over the world for my music and spent a huge amount of time in airports, I've always loved that buzz that comes with the excitement and anticipation of travel. So, getting the chance to turn Heathrow's many sounds into music was an honour."

NEW SETTING AT PIT FOR CLASSIC ARTWORK

Alexander Calder's iconic kinetic mobile is being relocated to the landside atrium of Pittsburgh International Airport's new terminal where it will be displayed as the centrepiece of its art collection, offering a warm and inspiring welcome to every traveller.

First installed at PIT in 1959, the 600lb mobile has been almost ever present at the gateway for 70 years with the notable exception of a short stint at Carnegie Museum of Art and the last two years it has spent in storage in preparation for its move to the new terminal.

"People just expect to see the Calder at the airport," says Keny Marshall, PIT's manager of arts and culture.

And while the new landside terminal was not designed around the sculpture, its "place of prominence" was determined in collaboration with the architects – luis vidal + architects in association with Gensler + HDR – to highlight the piece and to give the public a better view of it, notes Marshall.

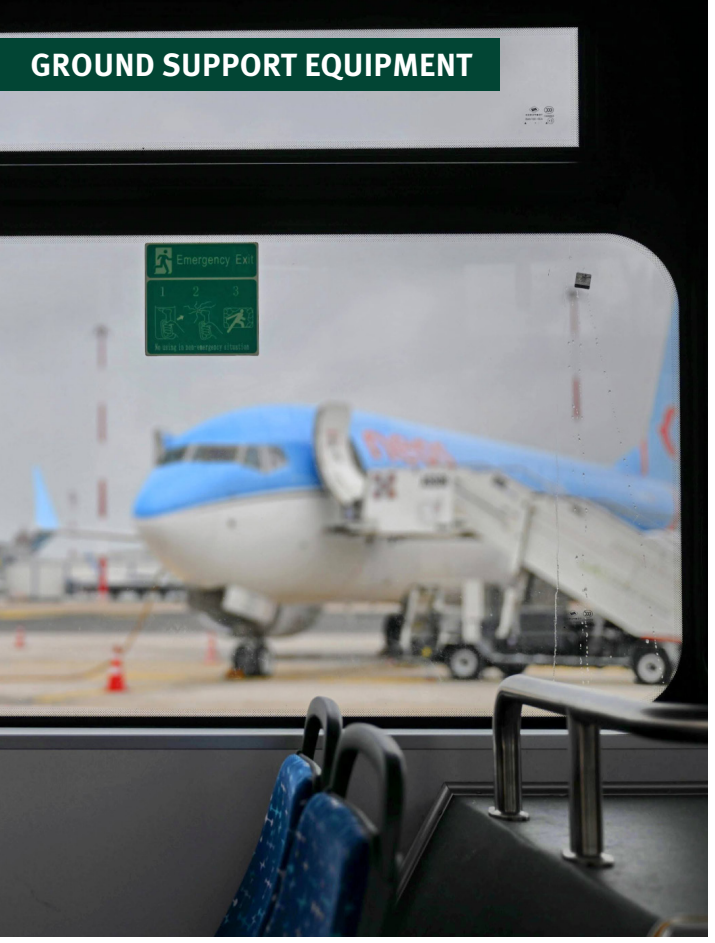
Called 'Pittsburgh', the mobile is made of black steel rods and white aluminium paddles and is balanced so that the elements move with just the slightest breeze to allow the activation of the mobile.

BIG PLANS FOR JFK'S NEW TERMINAL 6

The new Terminal 6 at John F Kennedy International Airport (JFK) will boast an International Arrivals corridor that feels like a New York arts district within the airport, according to its developers.

The Port Authority of New York and New Jersey (PANYNJ) and JFK Millennium Partners (JMP), the company selected to build and operate the highly anticipated $4.2 billion Terminal 6, have announced a landmark collaboration with four premier New York City cultural institutions – the American Museum of Natural History, Lincoln Center for the Performing Arts, the Metropolitan Museum of Art, and the Museum of Modern Art – to make the dream a reality.

PANYNJ's executive director, Rick Cotton, said: "For a region that is renowned for its museums and performing arts centres, it is more than fitting that visitors arriving at Terminal 6 will be greeted by vibrant displays from four of our most popular cultural institutions." AW



The green mile

The operational and economic benefits of electric ground support equipment is not to be underestimated, writes Paulina Gustov, marketing strategist and market analyst at DINOBUS.

Electricity is the through-line as airports in every continent begin to rewrite the rules for ground support operations. Baggage tractors, pushbacks, GPUs, pre-conditioned air units, catering trucks, maintenance lifts, and apron buses are a few instances of electric ground support equipment (eGSE), which started out as a few pilot projects to replace the traditional use of diesel-powered equipment.

Besides leading to reduced emissions, the outcome includes a safer, less hectic ramp, fewer moving parts that might lead to malfunction, improved asset visibility, and fresh approaches for planning turnarounds.

To put it another way, electrification is altering the way the terminal operates on a daily basis as aviation looks for alternatives to conventional diesel equipment, which is now considered outdated because of the noise, heat and a mixture of CO_2, NOx, and particulate emissions associated with its use.

At the stand is where the change is particularly noticeable. Diesel GPUs are being replaced by eGPUs and fixed electrical ground power, which also minimises the need for auxiliary power units (APUs) and lessens noise and emissions.

According to one supplier, trading out a single diesel GPU for a contemporary battery eGPU can substantially decrease NOx and ramp noise while conserving about 50,000 kg (110,000 lb) of CO_2 annually, which is equivalent to the annual footprint of dozens of households.

As part of the initiative to make all non-aircraft ground traffic free of airside emissions by 2030, European airports have begun integrating these developments into infrastructure-level plans.

For instance, Amsterdam Schiphol is implementing eGPUs and scaling fixed gate power and Preconditioned Air Units (PCAs).

Noise is often an operational problem just as much as it is a comfort one. When marshalling at a remote stand or during pushback, quieter loaders, GPUs, and tugs can better assist communication and co-ordination.

Near silent eGPUs, according to ramp crews, allow employees to communicate effortlessly next to the unit, strengthening situational awareness and preventing possible misunderstandings.

Additionally, a decrease in vibration results in fewer wear and tear on parts over time; seemingly minor advancements that gradually build up over hundreds of daily shifts.

Another important factor is the total cost of ownership (TCO). On a per-kilometre or per-hour rate, electrical power is generally more economical than diesel, and e-drive trains demand fewer consumables (fewer filters, no oil changes).

Indeed, according to analyses of eGSE deployments, longer equipment life and lowered fuel and maintenance costs result in annual operating-cost savings of several thousand dollars per vehicle. That is without considering the avoided carbon fees or the costs that many airports incur for local air quality compliance.

Charging is the new logistics if power is the new fuel. Instead of addressing charging as a mere afterthought, hubs in North America and Europe are starting to integrate it into gate designs and roadways.

Back in 2014, with the objective of electrifying their fleets, Seattle-Tacoma International Airport installed hundreds of airside charging stations for new electric vehicles. This was a landmark effort that instantly allowed for a more intelligent dispatch.

Elsewhere, Vancouver International Airport has reported having more than 100 airside charging ports to accommodate eGSE and EV fleets. This network is combined with ground power to guarantee that vehicles can plug in, and crews can power down at the gate.

The transformation has been stimulated by funding and policy. In the United States, airports have the option to buy ZEVs and the necessary charging infrastructure with Airport Improvement Program (AIP) funds. Meanwhile, the companion VALE programme permits Passenger Facility Charges (PFCs) and AIP funds for gate electrification, recharging stations, and low-emission automobiles. These efforts have collectively benefited dozens of airports as they scale up their fleets.

In Europe, airside fleets are being encouraged to embrace zero-emission technologies by roadmaps and airport-operator agreements, which are commonly linked to ACI's Airport Carbon Accreditation programme and wider 2030 climate objectives.

Early adopters are using eGSE to make immediate, quantifiable reductions in stand emissions.

Of course, airport buses that run on batteries are no longer an unusual concept. They are now a prevalent tool for shorter down times, cutting local pollutants in areas with high passenger traffic, and improving peak-hour flows to remote stands.

DINOBUS and COBUS Industries offer fully electric apron buses for airports evaluating their eGSE options. The capacity (typically up to around 110 passengers), charging strategy (fast opportunity charging vs. longer overnight stretches), climate control in extreme climates, and software integrations are the main factors in choosing between models.

The durability and cold-weather challenges that hindered early demonstrations have already been tackled. Most airside-use buses benefit from reliable Lithium-ion Phosphate batteries. At the same time, dependable HVAC, pre-heating, and intelligent charge management can preserve range throughout the winter without sacrificing turnaround times.

Because of these manufacturing decisions, electric apron buses are now deemed dependable not just in 'friendly' climates but even in those harsher summers and Arctic winters. Electrification can also affect how airport teams function. For example, training emphasises more on consistency and ease of use than making up for gear changes or throttle lag. Electric tugs and loaders deliver precise, controllable torque.

Duty managers have new tools thanks to telematics from the chargers and automobiles: they can even identify underperforming units in advance, and sequence operations so as to keep state-of-charge within a specific, battery-healthy window. A handy reference is emerging for airports and ground handlers thinking about their first significant eGSE wave:

1. Where power achieves the most operational gain, begin there. PCA and eGPUs rapidly enhance the stand's working conditions. Impressive stand emissions reductions and lower levels in ground-level noise have already been reported by European projects that migrated from diesel GPUs to battery eGPUs.

2. Build and choose your charging as a core infrastructure element. Install airside chargers at the gates, baggage halls, and de-icing pads where the bulk of the work is done. Compared to airports that rely on a small number of fuel depot locations, those that disperse a number of charging stations closer to places of employment frequently experience higher utilisation and simpler fleet scheduling.

3. Take full advantage of funding for the initial stages of your transition. Airside electrification is frequently supported by national clean-transport and airport-modernisation programmes in Europe as part of climate-action plans. ZEV grants in the United States can also co-fund vehicles and their adjacent infrastructure.

Electric GSE will connect to larger energy systems in the years to come. Airports will serve as micro-hubs as solar panels, battery storage, and smart building controls are incorporated.

Of course, electrification is not an all-encompassing solution for aviation's environmental issues, but it is one of the swiftest and least disruptive solutions currently available to the sector.

Airports that move early can benefit from a cleaner, quieter, and easier to co-ordinate terminal, as well as new tools for their teams to ensure safer, faster operations every day. AW

Mind the **automation gap**

Rising passenger numbers are creating new logistical challenges for baggage handling operations at airports. Solving these challenges requires a new approach to data, writes Schneider Electric's Melaine Ortola.

The latest traffic figures from ACI World and IATA show that the air travel industry has very much recovered from, and is now exceeding, pre-pandemic levels.

This is excellent news for the sector, but it is introducing challenges for baggage handling operations. The situation is driving the need for a new approach to automation that can be applied to assets old and new.

Airports have always had to contend with meeting customer expectations, and carefully adopting new technologies to manage rising pressures, while applying strict security procedures. This has created gaps in automation, with baggage-handling systems and applications varying widely across the sector.

Even though there are multiple examples of cutting-edge smart baggage technology, there are still challenges in overcoming legacy systems to create a digital thread that runs through IT and OT.

UNIVERSAL AUTOMATION

Applying the concept of a shared automation layer based on the *IEC 61499* standard, can make logistical sense for baggage handling.

Universal Automation is an example of open software-defined automation. The initiative represents a community of automation users, technology vendors and academics and organised by an independent non-profit association.

Its goal is to solve the integration challenge by removing the barriers between proprietary systems.

What open software-defined automation means in practice is integrating conveyors, scanners, robotics, and smart assets into one cohesive system, with operators able to access real-time data from across their full suite of new and legacy systems.

Some airports also face the additional challenge of operating 24/7, meaning any technology deployment must limit disruption for passengers. Again, this highlights the need for the seamless integration offered by universal automation.

CUSTOMER EXPECTATIONS

Baggage mishandling represents a significant risk for airports in terms of costs, staff time, and customer satisfaction. It creates additional logistics challenge such as handling and storing misplaced luggage which then must re-enter the system to reach its destination.

The industry has shown great strides in this area, with the number of bags mishandled falling from *6.9 to 6.3 per 1,000 passengers in 2024*.

This has improved year-on-year but was still higher than the 5.6 bags per 1,000 reported in pre-pandemic 2019.

Customers must trust airports with their baggage and to support that goal, airports are using digitalisation with RFID tracking, automated baggage handling systems, autonomous baggage vehicles, and AI.

These technologies all share a crucial requirement: a constant stream of data from all assets.

For example, an AI-driven monitoring system needs to communicate with autonomous baggage vehicles, while monitoring legacy conveyors to ensure no bags are delayed.

Open software-defined automation is a technology-enabler that advanced baggage capabilities can be built on. As software components are independent from the hardware, airports are free to deploy best-in-class solutions based on current and future needs.

Airports will then be able to integrate new technology seamlessly, minimising disruption to passengers and airlines. By removing the integration challenge, new technology can be trialled in single terminals before being rolled out to the entire airport without compromising any of the systems currently in place.

AUTOMATION GAPS

Closing the automation gaps in baggage handling will reduce the cost of modernisation, while creating a digital foundation for future proofing.

Older systems often rely on manual inputs or siloed software that won't communicate with modern equipment. For example, a baggage scanner that cannot communicate with a conveyor or autonomous vehicle downstream will cause delays that require human intervention.

Not only does this add operational costs but it increases the risk of lost luggage, which leads to unhappy customers and compensation fines.

Universal automation means that rip and replacing older systems is not the only option. Airports can upgrade incrementally to meet growing demand while retaining existing infrastructure.

Looking at the example of the baggage scanner again, the single digital thread in Universal Automation will instantly share information with sorters, conveyors, and autonomous vehicles, even if the assets have been in operation for a long time.

On the customer side this means if a bag is lost, the system can track its exact journey. On the operator side, a single digital thread offers value beyond just the single asset.

Having the data in place means that maintenance professionals can adopt predictive maintenance and avoid downtime. By opening the flow of data, airports can create a single automation layer covering new and legacy assets and gain access to advanced capabilities that are normally associated with new equipment.

Operators can also close automation gaps in a cost-effective and low risk way, shining light on blind spots that could lead to delays or lost luggage. This builds a digital foundation for so that any new equipment added to the system in future will offer the same level of insight.

SUSTAINABILITY AND SECURITY

Airports are under pressure to reduce their carbon emissions, but they're struggling to do so while adhering to strict security protocols. Open software-defined automation has the power to contribute to sustainability improvements without compromising passengers' safety.

Small improvements across assets like conveyors or opting for electric-powered autonomous vehicles will reduce an airport's carbon footprint. No matter how small sustainability improvements may seem, they will add up quickly in the hard-to-decarbonise industry.

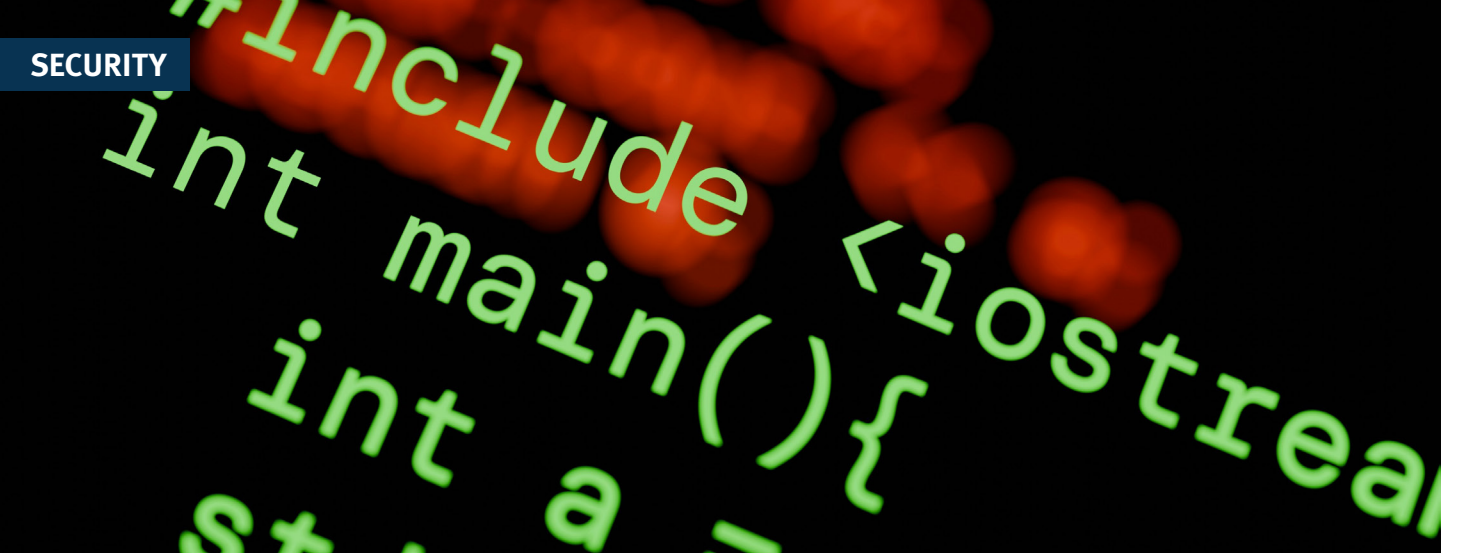
It is also worth noting that no matter how tech-advanced an airport is, it can benefit from universal automation. Baggage handling represents a large piece of the logistics puzzle, and with growing passenger numbers, building a digital foundation is now crucial.

Operators need real-time insights across their entire estate, whether they're using autonomous options with the latest AI, or they're simply seeking improvements with their legacy assets.

An open automation platform like *Schneider Electric's EcoStruxure Automation Expert* is ideal to underpin and future-proof operations. AW

About the author

Melaine Ortola is Schneider Electric's segment marketing manager for power grid and transportation.



Navigating cyber threats

Natalie Forrestill from AtkinsRéalis outlines how airports are responding to a raft of cyber regulations globally, addressing legacy systems and bolstering their supply chains.

Airports worldwide are under mounting pressure to boost their cyber resilience as governments sharpen regulations on critical infrastructure.

In fact, since 2022 there has been a surge of new cybersecurity mandates for the aviation sector in major jurisdictions.

In the United States, authorities rolled out mandatory cyber measures for airports – from faster incident reporting to isolating critical systems – via Transportation Security Administration (TSA) directives.

Australia likewise expanded its security laws to include aviation, requiring airports to implement cyber risk management and incident reporting as part of operating critical infrastructure.

In Europe, the EU's Network and Information System Directive 2 (NIS2) compels airports to establish comprehensive cyber risk programmes, adhere to strict 24-hour and 72-hour breach notifications, and enforce stronger supply chain security controls.

These obligations are mirrored in the UK's forthcoming UK Cyber Security & Resilience Bill. In many cases, these rules broaden scope to smaller airports and threaten heftier fines for non-compliance.

This global regulatory momentum is reinforced by international aviation bodies (ICAO, ACI, IATA), which are simultaneously urging stronger cyber defences in aviation.

All these efforts reflect heightened concern for cyber threats to critical airport systems – especially operational technology (OT) and complex supply chains that keep airports running.

AtkinsRéalis frequently carries out formal cyber assessments of OT systems for several global airports – including baggage, traffic, lighting and heating systems – and these have revealed a number of common themes that highlight the unique challenges airports face in managing legacy infrastructure and evolving cyber threats.

OPERATIONAL TECHNOLOGY: CRITICALLY OVERLOOKED?

Despite growing preparedness for cyber threats, many airports are still evolving their understanding of which systems should be considered 'critical' from a cyber resilience perspective.

This is often shaped by legacy regulatory frameworks and a historical emphasis on IT systems, which has inadvertently led to OT being under-prioritised.

Often, organisations begin by assessing systems already known to fall under existing regulations, then gradually expand their scope to apply lessons learned and extend good practices across other systems.

Some of the recurring themes we saw in our assessments suggest that OT systems are not always formally recognised as 'critical'. Not due to neglect, but because OT systems are 'part of the furniture'.

These systems – often decades old – may lack current documentation, and essential knowledge about them is frequently held by just a few individuals.

The impact of COVID-19 and broader economic shifts have also contributed to the loss of in-house expertise, while some suppliers may have potentially ceased operations or no longer support the equipment.

This makes it challenging to build a picture of these systems: how they work and what they are connected to.

OT systems in situ tend to be older or specialist systems that have fewer security measures designed in, or do not support the newer security features of modern software and firmware.

This leaves airport operators with the choice of either replacing vast swathes of infrastructure at enormous expense; or managing the risk and implementing other controls, such as restricted physical access, or stronger incident response and recovery procedures to mitigate damage.

Although the IT sector has made significant strides in cybersecurity controls and their widespread application, translating these principles to OT environments remains complex.

We've seen organisational policies and cyber teams attempt to apply IT-centric approaches to OT with limited success. Take patching, for example, IT undertakes this frequently but this is not always feasible in OT due to high availability requirements, and the need for rigorous testing before deployment.

RISKS AND CONSEQUENCES

These challenges give rise to several recurring risks across OT environments, such as:

– Limited asset visibility: Without a comprehensive view of assets and their vulnerabilities, unknown assets and vulnerabilities may remain on the network, creating exploitable gaps.

– Unclear network boundaries: Poor understanding of how systems interconnect can allow attackers to move laterally across other systems, escalating the impact of the breach.

– Supply chain exposure: Legacy contracts and unmanaged supplier relationships often lack modern security provisions, leaving systems vulnerable to third-party compromise.

The consequences are far more than theoretical. A cyber breach could lead to wide-scale disruption – extinguishing runway lights, halting baggage flow, or interfering with boarding pass scanners.

In 2024, Seattle-Tacoma International Airport suffered a cyber attack that affected its internet connectivity, display systems and baggage sorting operations, resulting in over 400 delays and cancelled flights.

Although UK airports have not faced a comparable cyber attack, incidents such as the power outage at Heathrow and IT disruption at Stansted in 2025 are a reminder of the consequences when critical systems are disrupted.

A HELICOPTER VIEW

To stay ahead of both regulatory developments and evolving cyber threats, airports must adopt a strategic, integrated approach to securing OT and supply chain systems.

As opposed to a system-by-system basis, where dependencies are often overlooked, operators should focus on understanding their collective systems and their interactions.

Adopting a cross-cutting, 'systems of systems' approach will enable airports to gain better insight of their cybersecurity posture and identify their highest and commonly shared risks across their estate which can be tackled holistically.

This not only improves resilience but also delivers greater value for investment.

A robust OT cybersecurity strategy must be developed alongside the IT security frameworks, ensuring alignment while recognising the distinct requirements of each domain.

This includes processes to manage the supply chain throughout the life of any asset – from procurement to decommissioning.

Embedding this approach into organisational policies, standards, and cybersecurity training is essential.

Upskilling operational teams about cybersecurity and conversely, IT professionals on the nuances of OT, will help to bridge the gap and foster a cyber resilience culture and reap long-term benefits.

By proactively addressing the cyber risks associated with legacy OT systems and supply chain dependencies, operators can strengthen their defences, reduce exposure to regulatory penalties, and safeguard the continuity of operations and passenger safety. AW

About the author

Natalie Forrestill is a senior cybersecurity consultant at AtkinsRéalis.

In the fast lane

Sunil Tuli, president of the Asia Pacific Travel Retail Association (APTRA) and group chief executive of King Power Group (Hong Kong), reflects on the dramatic rise of Indian aviation as a priority market for travel retail in India and beyond.

The world's fastest-growing major economy has an aviation sector that is battling to keep pace with the demands of India's rising middle class and the world's largest Gen Z population.

With 40,000 new passports issued every day and plans for up to 200 new or expanded airports, India's aviation sector is on a remarkable growth path.

Prime Minister Modi's government has set its ambition for India to become a high-income, developed economy by 2047 with a GDP forecast of up to $35 trillion, potentially overtaking the US economy in GDP.

While the targeted focus on 2047, the centenary year of India's independence may seem a little contrived, the progress seen over the past few years demonstrates that India is certainly in the fast lane, delivering the world's fastest-growing major economy (UN data) and the potential to become the world's largest economy.

With GDP growth rates of between 7.2% and 8.4% over the past four years, India's economy is about to pass the $4 trillion per year mark, making it the world's fifth-largest economy.

It is set to overtake Japan later this year and, if it maintains its growth path, it will overtake third-placed Germany in 2027, and PwC projections suggest its GDP could even exceed that of the United States by 2060.

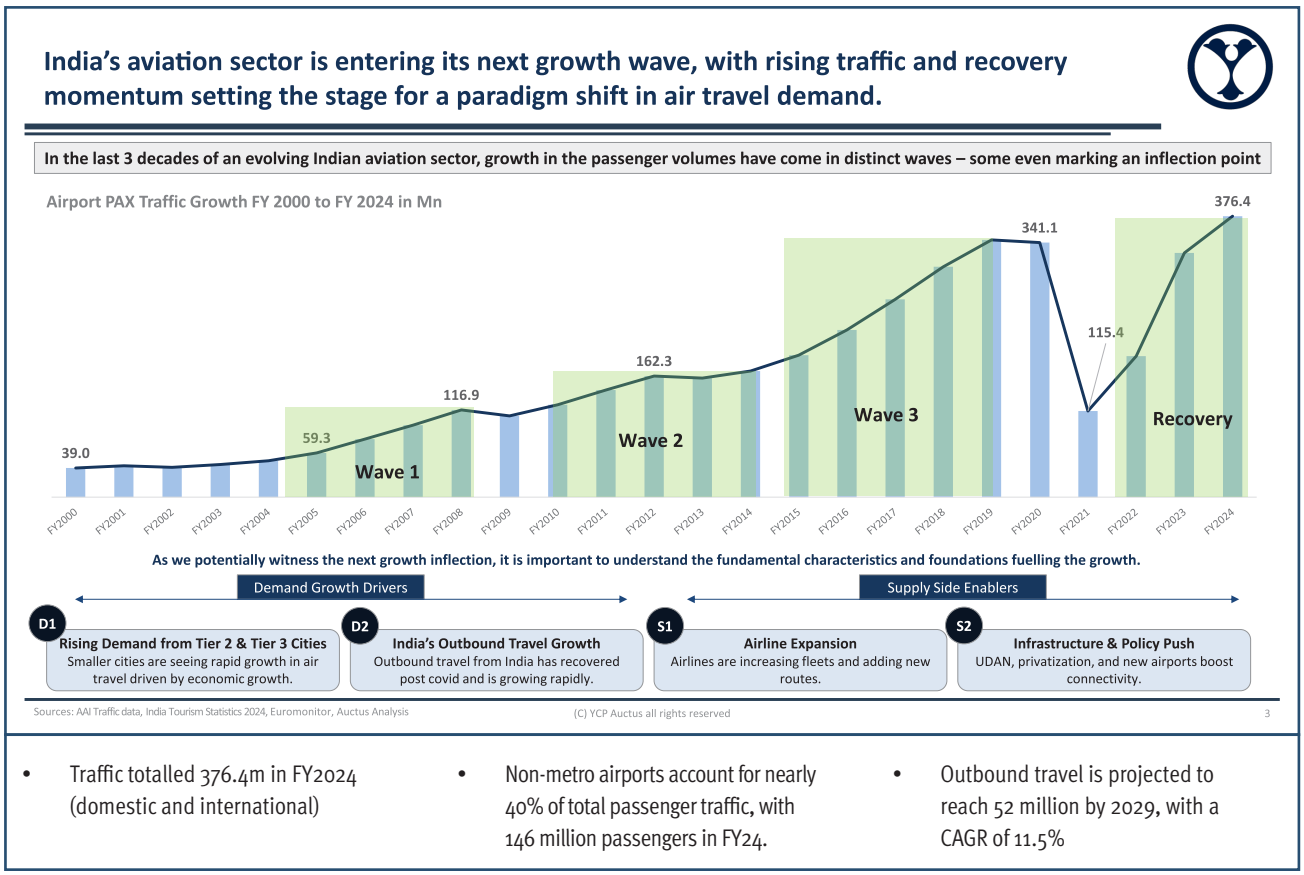
India's population, reaching 1.47 billion this year, has overtaken China's and, alongside a rapidly growing middle class, its Gen Z population is the foundation for further long-term growth, creating a remarkably powerful and appealing consumer target base for everyone from luxury brands to airlines and airports.

With a rising economy comes a surge in demand for air travel from Indian consumers keen to travel the world.

Figures from the Airports Authority of India show that the number of operational airports in the country has more than doubled from 74 in 2014 to 157 in 2024, and the government claims that this could increase to almost 400 by 2047.

A forecast by Indian aviation consultancy YCP Auctus, presented at the APTRA India Conference 2025, suggests a lower figure of around 288, but still an extraordinary scale of development.

Source: YCP Auctus



- Traffic totalled 376.4m in FY2024 (domestic and international)
- Non-metro airports account for nearly 40% of total passenger traffic, with 146 million passengers in FY24.
- Outbound travel is projected to reach 52 million by 2029, with a CAGR of 11.5%

India's Public-Private Partnership (PPP) model is further expanding the number of new airports and airport expansions, with over a dozen currently operating this model, and the Ministry of Civil Aviation is developing PPP modalities for the privatisation of 25 airports under the National Monetization Pipeline plan.

The Indian government's long-term strategic planning programme is a comprehensive, joined-up approach that aims to develop the country's transport infrastructure by recognising the interdependence of air, road, rail and water transport infrastructure.

Aviation is a key priority and is founded on the UDAN policy, meaning "Let the common citizen of the country fly", rapidly expanding domestic air travel accessibility to the wider population.

Building on the successful expansion of India's major airports, this policy has significantly increased connectivity to smaller cities (Tier 2 and 3) and remote areas, making flying an everyday convenience accessible to a much larger proportion of India's surging population.

The ambition to provide financially viable regional flight routes with capped airfares is inevitably complex in its influence on the market, but these routes aim to connect over 100 smaller airports in towns to India's major cities.

This also includes seaplanes and helicopter services. Similarly, the National Air Cargo Policy has aided the development and expansion of the country's cargo operations, strengthening India's position as a logistics powerhouse and, linking with the huge focus placed on the technology sector and education – especially in expanding the female workforce – is facilitating the rapid growth of e-commerce.

One remarkable example of the success of the strategy is the fact that the comprehensive planning and new thinking behind India's growth of its aviation system has resulted in 15% of India's pilots being female, far above the global average of around 5%.

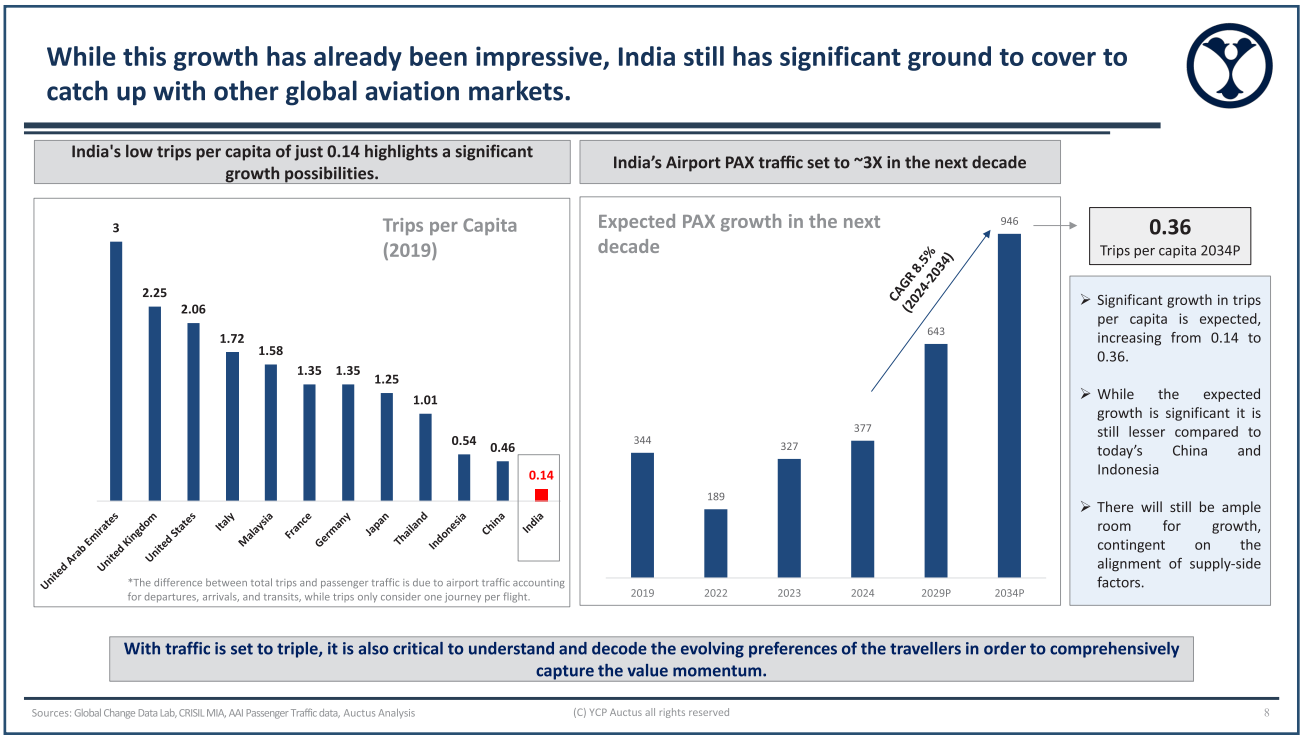
Government initiatives like UDAN and regional airport privatisation are unlocking new markets, with non-metro airports now accounting for nearly 40% of total passenger traffic.

Outbound travel is also surging, with international departures expected to reach 52 million by 2029, positioning India as the fastest-growing market in South Asia.

The expansion is unlocking new market access and bringing emerging traveller segments into the market and influencing retail trends from Dubai to Denpasar.

While India's growth is clearly impressive, it is rising from a relatively low base and, in everything from earnings per capita to annual passenger numbers and flights per capita, the country still has far to go to overtake China, for example, but it is a huge country with an increasingly affluent, young population that prioritises international travel and discovery.

Source: YCP Auctus



INDIA'S AIRPORTS – TRANSFORMING CAPACITY AND THE PASSENGER EXPERIENCE

Central to the country's aviation focus is the positioning of India's major airports as hubs connecting the East and the West.

The international airport experience has been transformed in India, led by stunning locations such as Delhi Indira Gandhi International Airport, where operator Delhi International Airport Limited (DIAL) has developed what it describes as 'a bigger, better, smarter, and future-ready' airport by blending a capacity of 100 million per annum (with the potential to rise to 140 million) with quality in its ASQ award-winning passenger experience.

The airport has a continuing programme of major developments planned for the next decade to strengthen its role as India's 'flagship hub'.

Similarly, Bengaluru's Kempegowda International Airport has created an even more expansive transformation, setting a global benchmark with new levels of customer service in the remarkable T2 – the 'terminal in a garden' – that shares a stunning celebration of the city's culture, heritage and people.

Major investment developments at Mumbai, Chennai, Bengaluru, Kolkata, and Hyderabad are also strengthening India's ambition to be a competitive hub to the GCC.

Leading the way for infrastructure essential to achieve India's growth ambition is Navi Mumbai, the largest of seven major new population centre developments, supported by a new airport, Navi Mumbai International Airport, that will start operating commercial flights in the next few months following its official inauguration in June.

With an initial capacity of 20 million passengers, it will expand to 50 million by mid-2029 following the addition of another terminal and runway. Subsequent planned phases will reach an eventual goal of 90 million passengers per annum by 2036.

Jewar Airport, Noida, with six runways planned, is envisaged to become India's largest airport and, though delayed, the first phase is scheduled to open soon and will help ease the pressures on capacity at Delhi Indira Gandhi International Airport.

AIRLINE GROWTH

In tandem with the country's transport policy, India's airlines are leading the global industry in aircraft orders to utilise those airports, collectively placing orders for approximately 1,700 aircraft to be delivered by 2030.

Last December, Air India augmented its existing mandate of 470 planes by an additional 100, reflecting its confidence in the long-term market. With new airports and new aircraft come new travellers – including an anticipated year-on-year growth rate of 5-6% in passenger traffic.

NON-AERONAUTICAL REVENUE OPPORTUNITIES

With those 40,000 new passports expanding the potential travel market every single day, Indians are passionate about international travel, and this desire for new experiences brings them right to travel retail's shop window.

India's middle classes have a passion – and the wallet – to travel the world. Consumer spending abroad has reached record levels, and the good news for the aviation and travel retail sectors is that their spending priority is foreign travel, increasing from 37% of spend in 2020 to 53.6% in 2024, a rise of almost 25% year-on-year to more than $17 billion in 2024.

Image of Delhi Indira Gandhi International Airport courtesy of Zoshua Colah on Unsplash.

The dynamic landscape of travel retail in India is undergoing a significant transformation. With Arrivals stores accounting for approximately 80% of travel retail income generation in the country, the product assortment is rapidly expanding beyond traditional categories such as spirits and tobacco.

Beauty is emerging as a strong contender for the leading category, while confectionery, wellness, toys and tech are steadily gaining retail prominence at major airports.

Indian travellers are increasingly drawn to luxury brands that offer personalisation, immersive experiences and contemporary cultural relevance. To meet these evolving consumer expectations, retailers are elevating their offerings, ensuring they stand out from other retail channels to deliver a differentiated shopping experience.

EVOLVING CONSUMER BEHAVIOUR

- Rising incomes and aspirations are reshaping travel and retail consumption patterns in India.
- Gen Z and Millennials are key influencers, prioritising experiential and ethical consumption.
- The affluent class is expected to double, driving demand for luxury and discretionary spending.
- Consumers are shifting from price-driven to brand-conscious and experience-oriented purchasing behaviours.
- Digital convenience and sustainability are becoming essential for engaging modern travellers.

India's Gen Z, already numbering 380 million – surpassing the entire population of the USA – is rapidly gaining influence.

By 2035, this demographic is projected to become the largest of its kind globally and is expected to drive 50% of consumer spending decisions in India.

This is a perfect expression of the new India. A new mindset among its middle-class consumers and a signal of their determination to not only enjoy new travel and consumption experiences but also to celebrate an exciting, more global citizenship.

Among India's new middle class, there's surging interest in brands, especially international icons. Just as those middle-class consumers are fuelling India's economic rise, so too will they play a lead role in driving the future success of India's aviation sector. AW

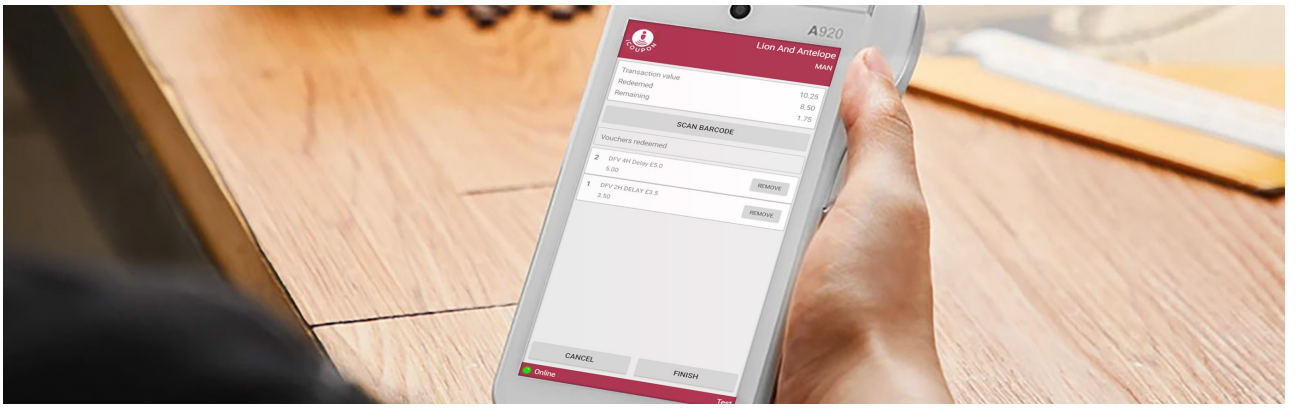
MORE ABOUT APTRA

APTRA (www.aptra.asia) represents the travel retail industry across over 45 markets in Asia Pacific with advocacy and regulatory services, networking, knowledge and research.

The next APTRA India conference is scheduled for Q1 2026 and the APTRA North Asia Forum in Hong Kong will take place on December 3-5, 2025.

Business exchange

We provide a snapshot of the latest news stories and features from some of the companies that support the growth and development of the world's airports.



INTEGRATED DIGITAL VOUCHER PLATFORMS

Richard Bye, CEO of iCoupon, exlains how digital vouchering can help airports manage disruption in their terminals.

Disruption is now an unavoidable part of airport life. Whether caused by weather events, staffing shortages, air traffic control issues or technical faults, today's airports must be ready to respond quickly, calmly and effectively.

For airport operators, how these moments are handled can define the passenger experience, and the airport's reputation.

Even when disruption is outside their control, airports still feel the impact. Passengers judge the experience by what they see and feel in the terminal – placing pressure on airports to manage disruption they didn't cause. It's a tough spot to be in without the right tools in place.

Modern airports are increasingly recognising that disruption management must be seamless, digital and empathetic. A well-managed response not only supports passengers but also maintains order, protects operational flow and unlocks commercial benefits.

When entitlements like food vouchers are issued quickly and redeemed easily, passengers are less likely to crowd help desks or congregate in confusion. Instead, they have the freedom and time to move about the terminal, feel cared for, and even spend in the shops.

Critically, it's not just about issuing compensation, it's about delivering it in a way that's smooth for everyone involved – passengers, airport teams, airlines and retailers. This is where airports benefit most from integrated digital voucher platforms that handle the full journey from issuance to redemption to billing.

iCoupon is one such platform. It provides a centralised infrastructure that simplifies disruption response. By integrating with airline systems, retail outlets and airport stakeholders, iCoupon allows vouchers to be issued directly to boarding passes without passengers needing to download apps or collect anything physically.

This reduces bottlenecks and operational strain while enhancing the passenger experience and enabling full use of the voucher window during delays, resulting in higher retail spend.

On average, passengers using iCoupon spend around 25% more than the value of their voucher. Because 100% of eligible passengers receive a digital voucher, compared to roughly 75% with paper-based systems, this creates a significantly greater revenue opportunity for airport retailers, and by extension, for the airport itself.

An increasingly important part of the disruption response is financial flow, particularly when it comes to how and when airports get paid. iCoupon's Autopay feature addresses a long-standing friction point: the delays and resource burden of chasing airline reimbursements for vouchers redeemed at airport retailers.

With Autopay, airports can ensure that their retail partners are paid on time, protecting liquidity and maintaining strong commercial relationships. In an environment where margins are tight and operational costs are rising, having confidence in timely payments is no small benefit. It also reduces the administrative load on finance teams, freeing up resources during already pressured periods.

Importantly, disruption doesn't just affect passengers. Airport and airline crews are often required to work beyond their scheduled hours. Some airports are now extending digital entitlements to staff too, whether for meals or lounge access, as a practical form of support and recognition during extended operations.

Turning the moment of disruption into a loyalty building and revenue opportunity. As disruptions become more frequent, the ability to manage them well becomes a key part of what defines an exceptional airport.

SEAMLESS BY DESIGN

Airport Dimensions CEO, Mignon Buckingham, considers how blending digital and physical will transform the airport experience.

As complex operational hubs, a defining challenge for airports is how seamlessly they can blend physical spaces with digital touchpoints to shape the traveller journey.

Our latest edition of the Airport Experience (AX25) research, based on insights from over 10,000 regular travellers across 16 countries, shows that while traveller satisfaction is increasing, clear friction points remain. Crowding, disconnected services, and concerns about value persist, especially among affluent leisure travellers, a smaller share of passengers but the group that drives the bulk of spending.

Global passenger volumes are set to more than double in the coming decades, and crowding is already a pressing concern, with 66% of passengers saying airports feel busier than ever.

When speaking with 100 airport leaders for our 'Explore the Experience Era' research, 82% acknowledged that the real opportunity lies not in expansion but in optimising the space they already have.

Lounges, fast track access, and curated retail are no longer optional extras but have become strategic levers to manage congestion, meet rising passenger expectations, and unlock new revenue streams.

Digital integration can no longer be overlooked. Some 56% of global travellers told us they increasingly expect a single, seamless interface for wayfinding, purchases, and services. Yet nearly 40% of airports still struggle with fragmented apps and disconnected systems.

At Airport Dimensions, our response is Connecta+, a unifying platform that links lounges, concessions, and services into a single ecosystem, transforming fragmented touchpoints into seamless journeys, empowering airports with real-time insights, and unlocking new opportunities to enhance both experience and revenue.

Equally important is how airports use the data generated by these platforms. For leaders, the challenge is no longer access to information, but converting it into actions that both delight passengers and maximise commercial value.

Real-time passenger insights allow airports to optimise layouts, make better use of concessions, and tailor offerings to respond to shifting behaviours with precision. The modular nature of the Connecta+ platform allows airports, lounges, and concessionaires to gather continuous feedback and enhance the traveller experience, providing the personal touch passengers expect.

Building a shared ecosystem creates a multiplier effect across the airport. By enabling lounge guests to order directly from food and beverage concessions, airports unlock new revenue streams for partners while giving travellers more choice with less friction.

Extending this connectivity to retail encourages discovery and spend beyond the lounge, creating value that might otherwise be missed.

For concessionaires, the prize is access to affluent travellers, a group that AX25 research shows spend 85% more per visit than non-lounge users.

The airports that thrive will be those that work smarter, not just bigger, turning every touchpoint into both a commercial and experiential opportunity. The winners will be airports that can connect the journey end to end, creating ecosystems that delight passengers while driving sustainable growth for their partners.

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PEOPLE matters

People still needed for creative innovation

Terri Morrissey and Richard Plenty reflect on whether machines can ever completely replace humans in the workplace.

In January 2009, Captain Chesley Sullenberger succeeded in landing US Airways Flight 1549 on the Hudson River in New York following the failure of both engines after take-off from LaGuardia Airport. The decision to land on the river saved the lives of all on board. Trying to land at nearby Teterboro Airport or attempting a return to LaGuardia would have been disastrous.

Many people celebrate this story. The courage, skill and creative thinking exhibited by the pilots in such a high stress situation was so striking that it was made into a film 'The Miracle on the Hudson' which was an international box office success.

But that was 16 years ago. Is there any possibility that developments in AI could soon make this kind of story sound like ancient history? We asked Google and Chat GPT if AI could have landed the plane on the Hudson as Sullenberger did. The answers we got were illuminating.

The consensus was that this event was a triumph of human intuition, experience and judgement, and whilst AI was advancing, it was difficult to imagine artificially intelligent systems replicating the nuanced decision making required in such high stress, complex and critical situations anytime soon.

An AI system trained on airport landings would not consider the Hudson as a likely landing strip. A former US Air Force and glider pilot did.

This story makes us think more generally about the future of work and the role AI might play in replacing humans.

Many pundits are of the view that AI will end up taking over nearly all jobs as 'cost effective problem solvers' and that we humans will have a limited time span in terms of our contribution to the workplace. We are not convinced of this argument.

Let's take large language models as an example. These add value through analysing vast amounts of data, searching the internet for the consensus view on complex topics, and looking at potential solutions through the lens of current ways of thinking. They focus on the past, searching the web for knowledge that already exists and summarising what is found.

Whilst the outcomes produced need to be treated with caution, the systems generally work well for sharing information about what is already known. They are being widely adopted.

Still, this approach has limitations when it comes to creative thinking in a fast-changing world. It is obvious that technology, geopolitics, societal norms and environmental considerations are changing at pace. Yet we have known for years from disclaimers in investment funds that 'past performance is not a guide to future performance, nor a reliable indicator of future results.'

The risk is we end up with detailed debate about data and the best way of managing the past rather than focusing on the step changes needed to move us into the future.

This is where the human qualities of intuition, critical thinking and a capacity for empathy come into their own.

Radical innovation and change often comes from those who are relatively new to an area; from the younger generations; from those who think differently and feel things passionately; from those who understand the underlying issues; from people who exhibit courage, determination and resolve and from those who collaborate with like-minded others on issues of real importance.

AI can help, but not replace, the human quest for innovation, the key here is not to overplay its role. It is an augmenter and facilitator – but not a substitute – for creative human thought.

ARRIVALS AND DEPARTURES

Clark County Department of Aviation has a new aviation director after **James Chrisley** replaced the retiring **Rosemary Vassiliadis**. The department operates Harry Reid International Airport in Las Vegas

After more than nine years in the hotseat **Jonas Abrahamsson** will voluntarily leave his position as CEO of Swedavia at the end of February 2026 to take up a position outside of the industry.

Elsewhere in Sweden, **Pontus Tagesson** will become the new airport manager of Ronneby Airport, succeeding Arri Kallonen, on November 3.

In the UK, Leeds Bradford Airport has appointed **Declan Maguire** as its new aviation director.

Airport Authority Hong Kong (AAHK) has appointed **William Ho** as its new executive director for corporate development.

Ray O'Driscoll is the new interim CEO of The Shannon Airport Group after **Mary Considine's** departure to Irish Rail.

Prince George Airport Authority (PGAA) in Canada has named **Geoff Ritchie** as its new president and chief executive officer.

About the authors

Terri Morrissey and Dr Richard Plenty run ACI's Human Resources training. They received a Presidential Citation from the American Psychological Association in June 2022 for their leadership in advancing global psychology. Contact them at info@thisis.eu

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