MAY 2022

Pioneering Change in the Airport World

iSG Research™

Table of Contents

About ISG Research™

ISG Research™ provides subscription research, advisory consulting and executive event services focused on market trends and disruptive technologies driving change in business computing. ISG Research™ delivers guidance that helps businesses accelerate growth and create more value.

For more information about ISG Research™ subscriptions, please email contact@isg one.com, call +1.203.454.3900 or visit research.isg-one.com.

Airports Become Fit for the Future

Because of frequent flight delays and cancellations, many travellers spend more time than expected in airports, where they are often subjected to hard metal seats, blaring television and scarce charging or power outlets. Nevertheless, through these times of COVID-19, we have all dreamed of visiting far-flung tourist destinations, something many of us took for granted pre-pandemic. During the outbreak, travel restrictions contributed to the number of passengers at the world's airports decreasing by 5.9B in 2020.[1]

With the pandemic ebbing, the industry is looking for a significant rebound. In 2022, air tourism is expected to recover to more than 85 percent by December[2] compared to its 2019 levels. And travellers are forecast to spend $626B,[3] which is 74 percent[4] of what it was before the crisis in 2020 – 2021. As the world loosens restrictions and shifts from the "at-home" culture demanded by the pandemic, the travel industry is expected to roar back to life. As airports emerge from the downturn, we expect a shift toward high preparedness that prioritizes the following areas, and outsourcing will play a role.

- **Focusing on hygiene and customer experience.** Airports will install contact-free, automated biometrics-based solutions to accommodate customer hygiene and other needs.

- **Resizing the available infrastructure to the changing demand.** Airport infrastructure will need to adapt dynamically in real time based on passenger needs and changing travel schedules.

- **Diversifying revenue generation.** Airports must chart out other avenues of revenue generation that depend on factors like passenger flow, airline routes, size and capacity, including aeronautical and non-aeronautical income.

- **Automating and digitalizing processes and systems.** Converging smart technologies and automation is essential for the airport industry's present and future development. The gradual steps to digital identity are driving progress to Airport 4.0.

- **Re-evaluating solutions and opportunities with service providers.** Through outsourcing and collaboration, airports can identify the right fit of solutions for addressing immediate challenges, instead of force-fitting.

- **Advancing sustainability.** Based on growing passenger and compliance needs, airports will take considerable measures to reduce emissions, decrease noise pollution, reduce light and visual pollution, and lower electricity and water consumption through technology.

Current Outsourcing Patterns in the Airport Industry

The Runway Post-pandemic

As the airport industry pivoted to adapt to the post-pandemic business climate, most airports began implementing business recovery plans and strategizing on the continuity that will be needed in a similar uncalled crisis. Contract signings in 2021 were mostly attributed to airport authorities re-evaluating their normal business and operational processes and rethinking their outsourcing patterns. Out of $495M worth of transactions signed in 2021, ITO made up 71 percent and BPO deals contributed 29 percent. As travel slowly picks up, it's hard for the airports to continue their investment. The 2021 trend shows a rather moderate progression, with enterprises investing in smaller contracts of an average annual value of $2M.

Changing Industry Dynamics

The Europe, Middle East and Africa region accounted for 51 percent of all outsourcing spending by airports (see Figure 1) in 2021, when there was a partial but sustained recovery in Europe. In January 2021, outsourcing spending was 64 percent below the 2019 level,[5] but the deficit improved to -22 percent of 2019 levels in December. Although Europe is estimated to record airport losses of $24.3B,[6] a significant recovery by Europe is foreseen during the year. ISG observes that more than 100 contracts are due to expire by the end of 2025.

The Middle East will remain the most impacted region due to its dependence on international and transit passengers.

Airports are one of the primary drivers of the Americas' economy, supporting $1.4T in annual economic output and 11.5M jobs per year.[7] Slowing revenues due to COVID-19 have shifted the airport industry's focus. The Americas contributed 26 percent of the overall annualized spend in 2021 and has more than 50 contracts in the pipeline to be renewed or expire in the next four years. With 23 percent of overall spend and more than 60 deals having a renewal scope by 2025, the Asia Pacific region has sustained deal momentum.

Airports have been forced to prioritize short-term needs to improve infrastructure, such as installing new air filtration systems, adding security monitors, increasing gate capacities, integrating controls and applying automation to develop next-generation airline standards.

Figure 1: Regional Airport Outsourcing Spend in 2021
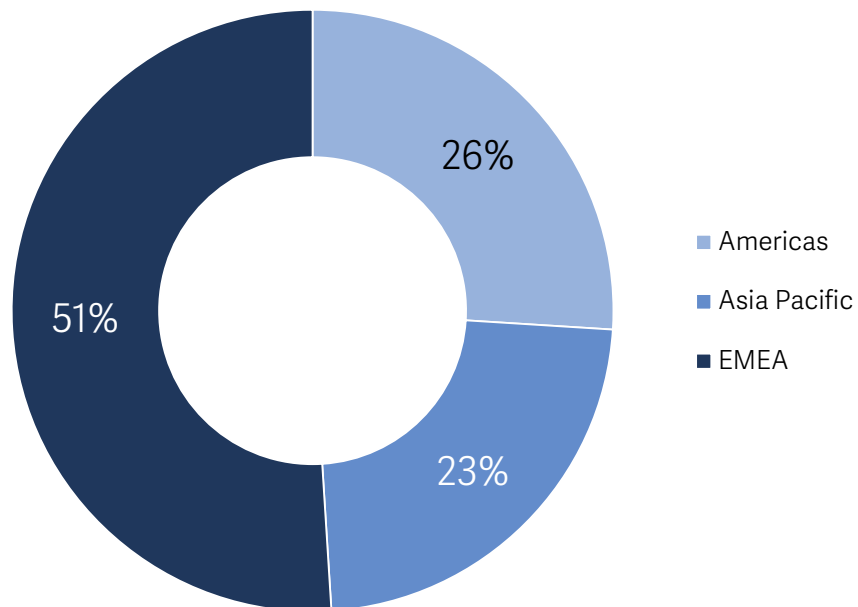
Source: ISG Contract Knowledgebase

Case

Asheville Regional Airport (AVL), a small hub located in North Carolina that serves more than 4,000 passengers per day, was one of the fastest- growing airports in the country until COVID-19 hit.

Challenge

The airport was already packed with passengers and now the opening of a $150M terminal intended to accommodate the increasing passenger traffic has been delayed due to the pandemic.

Solution

By learning from other disasters or uncalled crisis like COVID-19, the airport has already begun to incorporate disaster-related design thinking into the infrastructure while building the new terminal.

Not all air transportation segments were equally affected. The all-cargo market segment in Europe doubled its market share from 3 percent to 6 percent after being impacted by the increased demand for medical supplies, food and other essentials. The manufacturing sector has been one of the primary driving factors for the air transport industry. The value of international trade shipped by air is forecast to rise by 7.2 percent in 2022[8] from $7.5T in 2021, with a particular boost from the components industry.

Modernizing airport infrastructure is important to ensure economic recovery. Each dollar invested in airport infrastructure produces up to $2.50 in economic growth.[9] For 2021 – 2025, it's estimated that airports' infrastructure needs will amount to $115.4B,[10] or on average $23.1B per year. Considering IT infrastructure, ISG observes that IT outsourcing in 2021 is primarily driven by $180M worth of the annualized spend in standalone ADM contracts.

To keep up with the growing transportation demands, enterprises have been focusing more on applications that strengthen the infrastructure and other management systems, including assets, buildings, electrical grids and environmental systems.

Losses Decrease as Industry Challenges Continue – Provider Opportunities

As the industry addressed the fallout of COVID-19, it sought out opportunities to face several challenges. Although there was a weaker start to this year for the passenger business, the global revenue passenger kilometre (RPK) is forecast to improve by 51 percent in 2022,[11] reaching 61 percent of pre-crisis levels. However, there are still concerns about the aftermath of the pandemic and uncertainties regarding vaccine progress in some markets, and the immediate concern for the industry is to resize the infrastructure to the new demand.

In the long run, the rising passenger traffic will outpace available infrastructure. According to ISG's analysis of more than 65 global airports, 55 percent of them were focusing on refactoring airport infrastructure, including network services, in 2021.

Recovery during 2022 is expected to follow the upward trend in global passenger traffic seen in Figure 2 for the second half of 2021.

Figure 2: Global passenger traffic: Estimated losses and recovery

(Billion passengers)

Legend: 2019 | 2020 | 2021 | 2022 | Lost traffic
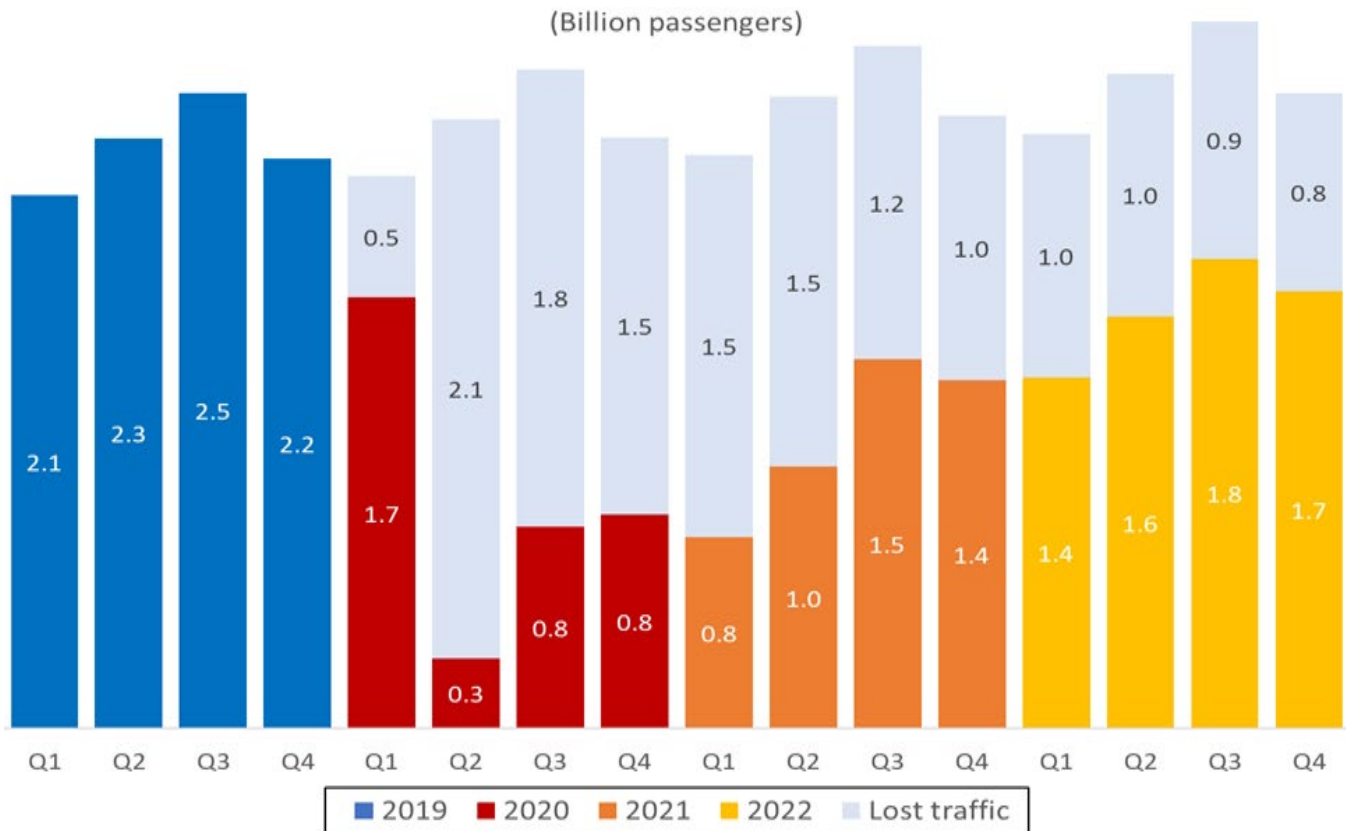
Source: ACI World

This optimistic prediction of a surge in travel in 2022 is dependent on operational factors like capacity issues, which may require faster solutions. An airport is a highly complex ecosystem that aims to meet varied challenges pertaining to factors like passengers, flight schedules, capacity management, security, altering markets and changing customer dynamics. Optimizing airport capacities is both a necessity and a difficult endeavour. For example, with one-third of the world's passenger kilometres,[12] Asia Pacific has become the leading region in air traffic in recent years. Asian hubs are expected to exceed their capacity limits once the industry recovers from the pandemic, so the concern is to find solutions to increase capacity utilization. Simultaneously, global air cargo growth is also impacted by inefficient capacity

utilization. Some airports are still facing insufficient storage space and processing backlogs. Let's navigate the unique challenges of the airport industry and size up these concerns under diminished revenue environments.

Infrastructure

Numerous airports are experiencing aging infrastructure issues. On July 3, 2021, New York's John F. Kennedy International Airport had a water leak in its main control tower, delaying departures for approximately 300 flights. The disruption occurred on Independence Day weekend, one of the busiest times in the United States for travel since the COVID-19 pandemic. Airports face challenges in infrastructure design and continuous modernization

to keep up with the growing demands of air travel planning around the assumption that every flight will depart on time and there will not be any delays because of weather or other hindrances.

Ground Operations and Customer Experience

The pandemic has accelerated thinking on how to reduce congestion and confusion on the ground, for example by conveying messages to passengers about wearing masks and social distancing from time to time. Denver International Airport's gate expansion project replaced talking screens with large screens that silently flashed messages about wearing masks along with intermittent advertisements when the COVID-19 rules were implied across the industry. On the other hand, there has not been much innovation to mitigate bad weather. Fog-bound airports are coming up against the task of reducing the number of flights taking off and landing every hour. This is impacting the aircrafts that are backed up at the gates, while other aircrafts are seen to be holding in the air, waiting for their turn to land. A similar concern is observed in the management of winter runway conditions, which relies on local forecasts that may not have accurate precipitation estimates because they are based on accumulation on the ground and not the airport pavement.

Kevin Murphy, a director in the Aviation Products and Major Claims Unit at Allianz Global Corporate & Specialty (AGCS), a centre of expertise for global business insurance, corporate and specialty risks, says, "Today, airlines tend to be very savvy about getting aircraft out of the way from bad weather such as hurricanes and snowstorms a couple of days in advance. It is when you can't reactivate an airplane fast enough to move it away that they become sitting ducks."

Changes in flight schedules are on the rise as the industry gradually comes to terms with the pandemic shock and flights begin to increase to pre-crisis levels. The high

Case

The winter action plan for the Ute Invernal Barajas Madrid relies on local forecasts that may not have accurate precipitation estimates and does not highlight the lowest runway surface temperatures and the type of precipitation, such as black ice or snow.

Challenge

Failing to treat runways during adverse weather led to unforeseen costs and a damaged reputation. Unnecessary runway treatments are a waste of financial and other resources.

Solution

The solution was built on thermal mapping data measurements collected by DTN over the period of two years, in addition to historical data to optimize the configuration of its weather solution. These insights helped airport operators make confident decisions based on the accuracy of the forecasts.

variance of flight schedules is disrupting the passenger handling capability in airports. In response, airports are now focusing more on passenger forecasting and planning. Adapting to the new normal and refactoring airport infrastructure has also called the availability of staffing into question, for example to enforce physical distancing including the queue areas for check-in, security, immigration and other operational areas of the airport. One of the significant challenges revolves around access to data that impacts the outbound experience of the airlines resulting in issues with passenger flow and runway space, delays, and overlap of flight schedules. Ground handling companies are failing to leverage real-time data on route network of airlines for uninterrupted arrivals.

Cybersecurity

Cybersecurity remains a fundamental challenge. The aviation industry's spontaneous response to cyberthreats has been backbreaking and demanding. According to a recent survey of more than 100 airports,[13] approximately 62 percent of respondents had been targeted by cyberattacks in 2020. San Francisco International Airport was hacked in March 2020, affecting two login portals reserved for employees and service providers. Malicious code was injected into these two sites to harvest the usernames and passwords used at the time of login. Similarly, Vaclav Havel Airport in Prague was the target of multiple

cyberattacks against its systems in April 2020. SITA, which develops software and solutions used by thousands of players in the air transport industry, was a victim of cyberattack in March 2021. The airport sector is forecast to be the fastest-growing critical infrastructure market area for cybersecurity investment on a global scale, reaching $1.9B by 2030.[14]

Fundamentally, airports will remain an infrastructure-intensive business and the above-mentioned challenges require immediate solutions so that facilities can become fit for the future.

Technology Helps Unlock Airport Innovation

ISG observes that cloud computing has been playing a crucial role in the airport industry, with 60 percent of the outsourced contracts in 2021 including cloud mentions. This indicates the industry's growing interest in using the cloud to respond to changing business needs with speed and agility, and to increase airport revenues. Often with an onsite IT model, a patch or a system update related to airport's passenger services becomes difficult due to airport operations working in silos. For example, while many of the airports offer contactless or touchless self-service and off-terminal check-in, many experienced difficulties in the rollout due to the constraints of legacy IT infrastructure. A cloud infrastructure facilitates updating the data centre and rolling out the software change at scale across different passenger touchpoints.

As we enter the post-pandemic future and beyond, we come across three key areas of cloud implementation: addressing (I) Legacy IT infrastructure challenges, (II) Optimizing ground operations and customer experience (III) Countering cybersecurity threats.

ISG's analysis on the contracting trends identified a few of the cloud use cases that could be implemented

at scale in the next few years:
- Cloud-based passenger processing solutions with low-touch mobile and biometric-enabled check-in experience to transform the passenger experience and create new revenue opportunities.
- Airport payment solutions deployed through the cloud, allowing passengers to pay for ancillary services such as extra baggage, lounge access or other miscellaneous payments conveniently and in a contactless manner.
- Cloud-based network connectivity for sharing data about baggage, passengers and aircraft across the terminal.
- Cloud capabilities that are used in less visible ways to help move from siloed processes to centralized networks, which is increasing dependency on cloud migrations more than ever.

More ready-to-go cloud-based (SaaS) airport management capabilities will be set up to help optimize resources. The advanced scope of cloud technologies in the airport industry is slowly unfolding, with more than 40 deals due to be renewed or replaced from 2022 through 2024.

There has also been an uptick in the frequency of automation and robotics adoption in the industry. In fact, automation of processes and infrastructure at airports was included in approximately 70 percent of outsourcing contracts in 2021. With the impact of COVID-19 and lockdowns on the travel world, airports are seeking ways to address their losses. They have made significant changes through automation and digitalization that have taken place in the last few years of airport operations with the check-in, bag drop, security and boarding checks. However, the immediate concern is to integrate all available data into one big data lake, interpret insights and implement changes based on those insights in daily operations. Airports will continue to look to collaborate on automation in the next few years to address the dynamics of the flight schedules, changing passenger demands and the lack of sufficient resources at the security checkpoints.

According to ISG's analysis on the airport industry, about 38 percent of the total expiring contracts have a scope of renewal in 2022, which indicates the rising focus on solution integration and partnership opportunities.

Varied industry concerns like the issue of sanitization as a routine protocol has gained importance due to the pandemic and requires enough availability of staff to perform routine cleaning tasks. Also, with the risk of contracting COVID-19 when traveling through an airport, the safety and welfare of passengers is of utmost concern. Globally, airports are pivoting their focus on enabling touchless and self-service solutions. Many airports are reaching out in partnering with service providers to install touchless and contactless processes from self-service check-in and bag drops to self-boarding gates and mobile payments. Furthermore, low-traffic airports that are facing the risk of closure are relying on remote digital tower installations with decreased cost and increased safety benefits. These smaller airports are figuring out how to collaborate with partners on the remote tower concept to combine tower and approach that allows to operate at an easily accessible site, reducing staff issues. Automation could be the panacea for the airport industry to address three major challenges: maximizing

Case

Nonaeronautical revenue from vendors is crucial for the airport industry.

Challenge

Airports have been slow to adopt modern technology that could both enhance the traveller experience and increase revenue.

Solution

MAGO, established by Manchester Airports Group (MAG) to increase business-to-consumer airport revenues, developed a range of products and services built exclusively on Amazon Web Services. This SaaS solution completely digitizes and centralizes fragmented airport data sources, increasing revenue earning potential, improving traveller experience and strengthening an airport's resilience.

operational efficiency, enhancing customer experience and optimizing passenger safety and security.

Based on recent contracting trends, ISG expects the following automation use cases to be implemented at scale:

- Modernizing air traffic control system through an automated control centre, control towers and simulators for the purpose of safety and efficient operation.
- Future-oriented navigation aid systems, including ground-based augmentation systems providing competent, accurate and safe trajectory for landings and passenger movement.
- Automating airport facilities and logistics to ensure efficient cargo handling and storage and to maximize revenue.

Automation has been a buzzword within the industry. However, it was only after the pandemic that we began to see initiatives being executed on a broader scale.

Preserving Some of the Gains and Blending Sustainability

The airport industry plays a pivotal role in sustainability. However, sustainability is just the tip of the iceberg when we see the bigger role it has as climate change and global trends related to environment, social and governance (ESG) emerge. For example, as the travel restrictions imposed across the world produced a slowdown in the aviation sector, the silver lining was a huge drop in the sector's carbon emissions. Now, when passengers are again flocking to travel, there is a question about how to balance ways to revive business while lowering emissions in the long term.

With the airport industry adapting to rapidly changing regulations and travel requirements, maintaining sustainability goes hand-in-hand with those adaptations. There is a lot on the plate for airport authorities and operators who have to balance leaner operations with driving ancillary revenue, handling the fluctuating passenger numbers and promoting sustainability. About 235 airports across Europe have already committed to net-zero by 2050 and more than 90 airports are now set to achieve net-zero carbon emission by 2030. Furthermore, Dallas-Fort Worth International Airport in the U.S. has made progress toward becoming the first airport to merit the new 4+ level in the Airport Council International's global Airport Carbon Accreditation program. The U.S. government has targeted 2050 for net-zero emissions by

launching the Zero Emission Vehicle Program and the Energy Efficiency Program to identify and implement energy reduction measures at airports. In 2021, approximately 17 airports in the Asia-Pacific region pledged to achieve net-zero carbon emissions by 2030 or 2050. Other airports are in sync and are seeking service providers with solutions that would help them optimize airport operations and reduce local emissions while improving infrastructure-related energy consumption.

Airports have a sharp focus on reducing Scope 1 and Scope 2 emissions, and to execute this aim many entities are looking to build greener spaces that use natural light and renewable energy. The Jewar Noida International Airport, which is currently under construction, will be India's first net-zero emissions airport. Other airports are showing continued interest in IT that supports more sustainable printing practices, enables end-of-life recycling of IT equipment and promotes energy savings.

> "Sustainability is at the centre of our recovery plan and long-term development vision. We aim to make HKIA a more sustainable airport."
>
> – Fred Lam, CEO of Hong Kong Airport

Finding the Right Frequency – The 5G Impact

Fifth generation (5G) wireless telecommunications networks will have a diverse impact on the aviation sector, touching every facet of the aviation lifecycle. 5G will transform the sector in four essential areas: airlines, manufacturing, airports and the overall passenger experience (Figure 3).

The rollout of 5G networks has been delayed over fear that 5G signals transmitted on nearby frequencies could

potentially interfere with radio altimeters in some regions, especially if high-powered 5G base stations are placed close to runways. Once the problem is resolved, airport operators and authorities will want to take advantage of 5G to optimize ground operations and address immediate bottlenecks. Public health measures introduced during the pandemic imposed new requirements for the flow of passengers in airports, turnaround operations, baggage
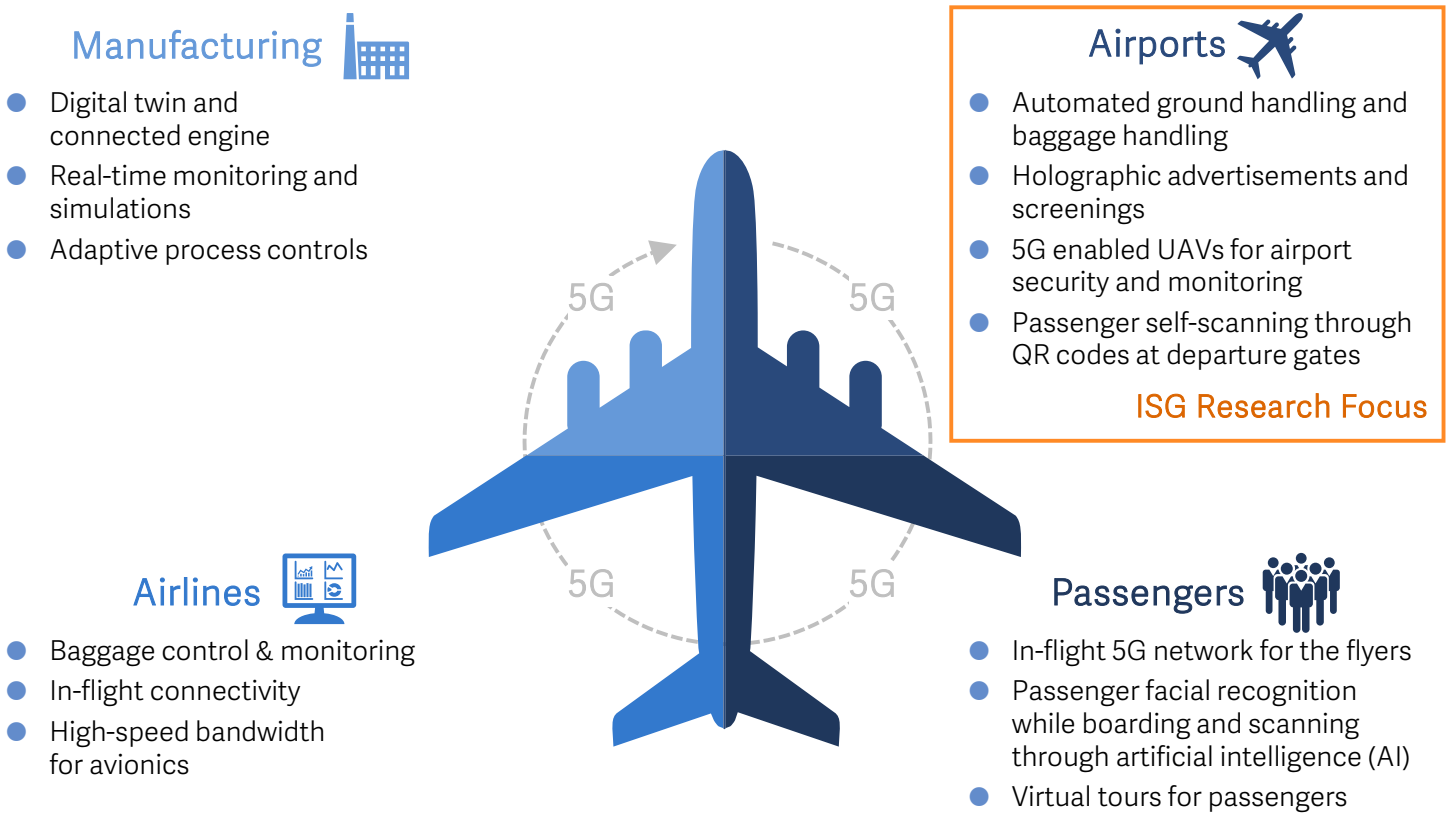
flows and other relevant airport operational hazards. Two other areas of operational concern are security and weather-related tasks. The entire value chain can be reshaped to increase operational excellence through 5G's ability to transform the industry. The deployment of 5G technology would be a game-changer in addressing pandemic risks and optimize hygiene processes, reducing congestion.

> "It is imperative to evaluate how new technologies can benefit airports and how these technologies can be smoothly integrated into airport processes so that a high level of safety, security and passenger experience is guaranteed."
>
> – Dr. Ralf Gaffal, Managing Director of Munich Airport International's Business Division

Figure 3: Role of 5G on the aviation lifecycle

Manufacturing
- Digital twin and connected engine
- Real-time monitoring and simulations
- Adaptive process controls

Airports
- Automated ground handling and baggage handling
- Holographic advertisements and screenings
- 5G enabled UAVs for airport security and monitoring
- Passenger self-scanning through QR codes at departure gates

ISG Research Focus

Airlines
- Baggage control & monitoring
- In-flight connectivity
- High-speed bandwidth for avionics

Passengers
- In-flight 5G network for the flyers
- Passenger facial recognition while boarding and scanning through artificial intelligence (AI)
- Virtual tours for passengers

Source: ISG Research

Some of the varied challenges the airport industry is looking to solve through 5G-enabled IoT devices include enhanced security, traffic control, biometrics services for boarding, predictive maintenance and utilities consumption monitoring. Monitoring and optimizing every vehicle at the airport would ensure that each one runs efficiently.

"Leveraging 5G for speed and data density will enable better monitoring and analysis of assets in and around the airport."

– Gilles Bloch-Morhange, Vice President, Communication and Data Exchange, SITA

Regardless of its size, any airport can benefit from a more efficient and reliable baggage delivery system. A scalable, affordable baggage reconciliation system helps reduce the number of mishandled bags by up to 20 percent and reduces the average cost of approximately $100 to return a mishandled bag to its owner.[15] A 5G network can boost baggage tracking due to its low latency and its capacity to transmit data faster. Additional capabilities include network slicing and multi-access edge computing (MEC) that enable connectivity excellence and network management that supports both the passenger journey and airport ground operations without a hitch.

Innovation Through Collaboration – Elevating Customer Experience

With the airport industry keener than ever to optimize efficiency, while concurrently shaping up the end-to-end operational processes, identifying the best solutions and selecting the right service provider or vendor are of utmost concern today. Rapid innovation is happening in this field, and stakeholders are willing to work together to realize the improvements that will benefit the airport. The industry is moving from working in silos to collaborating for innovative solutions and faster turnarounds. Start-ups and scaleups have a vital role to play in helping the air

transport industry respond to diverse challenges, including unprecedented events like the pandemic. A perfect example to showcase how a small company can work with larger authorities or enterprises to deliver great products is the retail tech start-up The New Shop, a 24-hour convenience store chain in India that signed a landmark partnership with Adani Airports. To provide excellent customer experience, the transit retail store will cater to both Indian and international consumers.

Case

Vienna International Airport (VIE) had a strong focus on innovation during the COVID-19 crisis. It partnered with the Japanese start-up Bespoke to provide AI-powered chatbot solutions to optimize customer service at the airport, the adjacent AirportCity Vienna and the Health Centre.

Challenge

The high number of individual inquiries received via telephone and email and the overloaded customer service desk needed to be optimized. VIE wanted to understand the customer dynamics of accepting an innovative chatbot. It believed gathering valuable information and insights would help to understand the issues that customers face and the topics they are interested in.

Solution

VIE collaborated with Bespoke to test the validity of using Bebot as a virtual assistant. Bebot provided visitors with transportation, restaurant, café and shop suggestions. At the same time, it helped as a crisis management tool by updating visitors on COVID-19 news and available facilities. The chatbot also helped gather insights and detect relevant trends.

The New Shop combines a diverse mix of products; a self-built, real-time, cloud-based inventory management system; an ecommerce-like POS system for quick checkouts; and robust backend tech and data support. The company has managed to reduce pilferage to 0.8 percent, parallelly managing completely updated inventory lists and helping in minimising wastage.

Etihad Airways has also partnered with a start-up, automation technology solutions provider Elenium, to install voice-activated self-service kiosks, bag drops and boarding gate facilities that use facial recognition technology. Passengers register their biometric data on their mobile device before arriving at the airport, where unique baggage drop counters are scanned through a camera system powered by artificial intelligence. The biometric-enabled boarding gate, which welcomes registered passengers to go through, is a whole new concept of what travel can look like by deploying innovative solutions.

In another use case, autonomous parking robots by Stanley Robotics can be found in Lyon-Saint Exupéry Airport and at Gatwick Airport. Passengers simply leave their car in a parking station close to Gatwick Airport's South Terminal entrance, and without handing over keys, the driverless robot gently lifts the car and transports it for storage in a secure car park. Since the system is also connected to real-time flight information, the robot diligently returns the vehicle to the parking station at the correct time. When everything from ordering a latte to hailing a cab is being supported by a suite of advanced tech applications, the airport industry cannot be left behind. Working with start-ups to find breakthrough technologies is increasingly becoming the norm in the industry.

The Future is Passenger Obsession

The passenger plays the pivotal role in the future of the airport industry. As a testament to this, the industry is gearing up to embrace Airport 4.0, airport digitalization that puts travellers at the centre of a personalized experience driven by technology and innovation. It focuses on real-time platforms seamlessly connecting passengers to the infrastructure, applications and operations. Ground-breaking developments like Fraport's new-self driving YAPE robot for luggage transportation, automated vehicles on the airfield and baggage-related robots are gaining traction. Another interesting concept is having avatars that would connect people, things, ideas and visions. Digital twins are gradually enabling smarter airport operations. SITA Lab is working on a fully functional digital twin that's being tested at a U.S. East Coast airport. The 3D interface installed on an 86-inch touchscreen in the operations room will drive improved decision-making, based on a holistic view of the airport operations.

The airport industry has begun to realize the full potential of AI and machine learning for many use cases including passenger benefits like minimizing the impact of disruptions through real-time updates, personalizing customer information and reducing baggage delays. Virtual reality also had strong momentum in 2021 when it came to airport industry hiring patterns, ranking 12th in 2021 among the top driving forces in recruitment, deal making and innovation. Among 23 industries surveyed.[16] Airport 4.0 is set to increase operational effectiveness and awareness, reduce cost, and drive varied forms of non-aeronautical revenues.

Modern airports are more than just places to take off for a journey. They are sprawling complexes that act as gateways to cities, regions, countries and connect millions of travellers. While the urge to adapt a digitally smarter system remains undisputed for airports, a greater focus on tackling climate change is driving diverse projects to support sustainable airports. As the airport industry recovers and draws on its resilience, attaining zero emissions and the greening of airports remain priorities because a sustainable airport will help restore optimum passenger experience.

Case

Changi Airport in Singapore has a clear mission to become the world's leading digital air hub and is transforming its operations efficiently and securely to deliver a seamless travel experience for passengers. This transformation to Airport 4.0 relies on secure and powerful networks that can connect thousands of devices.

Challenge

Changi Airport has been experiencing challenges with existing CCTV operations and intelligent subsystems, data security and passenger experience.

Solution

The airport partnered with Nokia and Beaqon to upgrade its network infrastructure to connect applications and meet the rising data demands. In addition to lowering CapEx and OpEx, the Nokia Optical LAN solution offers benefits including cutting energy consumption and HVAC investment and reducing the total cost of ownership.

Reference

[1]Airports Council International, "The impact of COVID-19 on the airport business and the path to recovery," July 14, 2021.

https://aci.aero/2021/07/14/the-impact-of-covid-19-on-the-airport-business-and-the-path-to-recovery-2

[2]Uniting aviation report, 2021.

[3]IATA publication, 2021.

[4]IATA Airport Infrastructure Report, 2021.

[5]Eurocontrol think paper, 2021.

[6]Ibid.

[7]Airport Council Infrastructure report, 2021.

[8]IATA publication, 2021

[9]Airport Council Infrastructure report, 2021

[10]Ibid

[11]IATA publication, 2021s

[12]Munich airport key challenges report

[13]Osprey Flight Solutions cyber security report

[14]Ibid.

[15]SITA aero press room

[16]Airport-Technology.com, "Revealed: Emerging airport industry environment themes to watch in 2022." https://www.airport-technology.com/dashboards/revealed-emerging-airport-industry-investment-themes-to-watch-in-2022

Note: The outsourcing data has been sourced from ISG Contract Knowledgebase.

Meet the Team

Titli Chatterjee
Author, Assistant Manager & Senior Lead Analyst

Titli is part of ISG Research working as a Senior Lead. With 12 years of experience her focus has been in the areas of Manufacturing and Industry 4.0. She also analyses various technology and next generation trends across various verticals. In her current role, she has been closely working with ISG internal stakeholders, ISG partners and advisors in identifying upcoming trends, developing hypothesis, authoring reports and thought leadership papers for the service provider community, along with custom engagements.

Sagnik Biswas
Manager & Principal Analyst

Sagnik is a Research Manager & Principal Analyst in ISG and has more than 11 years of experience in conducting in depth research and data analysis to identify upcoming industry trends. He is actively involved in developing thought leadership and opportunity analysis papers on next generation themes in the global sourcing market focused on the Banking & Financials, Travel & Transportation and Application Development & Maintenance space. Sagnik has also led multiple location optimization client engagements covering location selection, cost/talent benchmarking, and identifying talent hotspots with future skills.

Pratibha Salwan
Director and Practice Leader – Consumer Services

Pratibha Salwan is based in Atlanta and leads the Travel, Transportation, Hospitality and Logistics (TTHL) sector for ISG. With more than 28 years of experience working across the globe, she has spent the past 20 years in the U.S. incubating, growing and expanding her work with digital technologies across the TTHL vertical. She has worked with clients in the Airline, Travel, Transportation, Hospitality, Logistics and Retail industries, and has been responsible for leading the digital charge for multiple organizations, enabling domain-led technology solutions.

Paul Reynolds
Provider Services Practice Lead
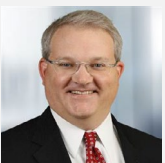
Paul leads the ISG Provider Services group, which offers a variety of subscription-based research and project-based consulting services to the outsourcing service provider community. ISG Provider Services provides research and strategy guidance as well as helps service providers better target, win and retain clients.

Acknowledgements

14

*ISG®

ISG (Information Services Group) (Nasdaq: III) is a leading global technology research and advisory firm. A trusted business partner to more than 800 clients, including more than 75 of the top 100 enterprises in the world, ISG is committed to helping corporations, public sector organizations, and service and technology providers achieve operational excellence and faster growth. The firm specializes in digital transformation services, including automation, cloud and data analytics; sourcing advisory; managed governance and risk services; network carrier services; strategy and operations design; change management; market intelligence and technology research and analysis. Founded in 2006, and based in Stamford, Conn., ISG employs more than 1,300 digital-ready professionals operating in more than 20 countries—a global team known for its innovative thinking, market influence, deep industry and technology expertise, and world-class research and analytical capabilities based on the industry's most comprehensive marketplace data.

For more information, www.isg-one.com.