Next-Generation Airlines and Airports Serving Smart and Sustainable Destinations of the Future

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Introduction

The Gulf region's aviation industry has become an example of global excellence. In less than 20 years, cities like Dubai, Abu Dhabi, Doha, and Riyadh have moved away from their roles as centers of the oil and gas industry and become business hubs that attract global talent and tourists. These cities are now served by state-of-the-art airports and steadily growing airlines that connect the Gulf region with the entire world.

In November 2023, the overall traffic handled by Middle Eastern carriers surpassed pre-pandemic levels for the first time.[1] Global airlines such as Emirates, Saudia, Qatar Airways, and Etihad were strategic drivers of this growth. Low-cost airlines such as flynas, flydubai, Air Arabia, and Wizz Air Abu Dhabi also witnessed substantial passenger and operational growth, making the regional air travel ecosystem even more dynamic and competitive.

Technology innovation has been the strategic engine for this accelerated transformation. Through technology, airports and airlines in the Gulf have been able to deliver excellent passenger services and in-flight experiences. Airports and airlines have also powered operational excellence by optimizing asset, capacity, and revenue management. Airports and airlines have further ensured safe and secure customer and employee experiences — for example, through cutting-edge investments in biometrics at airports in Dubai,[2] Abu Dhabi,[3] and Riyadh[4].

Ambitious national strategies, such as Saudi Vision 2030, are also accelerating regional growth. Giga projects[5] like NEOM, the Red Sea Project, and Diriyah are being developed to not only increase the national capacity to host new residents, visitors, and global events but also to redefine next-generation business and tourist destinations. Such destinations align with and

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The Perfect Storm for the Aviation Industry in the Middle East

KEY HIGHLIGHTS

» In less than 20 years, the Gulf region has become a global hub for business and tourism, with elevated levels of air traffic. In 2023, airlines in the Middle East grew 33% year on year.

» Airlines and airports in the Gulf region are doubling down on investments in technology-enabled innovation, driven by ambitious national visions for smart destinations, new competitors, regulatory and policy transformations, and elevated customer expectations.

» Best practices from the region and beyond demonstrate that technology enables seamless passenger experiences, smart operations, intelligent asset management, and sustainability.

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[1] www.iata.org/en/iata-repository/publications/economic-reports/air-passenger-market-analysis---november-2023/; www.zawya.com/en/business/aviation/middle-east-air-traffic-jumped-333-in-2023-iata-nb7xbh0q

[2] www.emirates.com/media-centre/emirates-and-the-general-directorate-of-residency-and-foreigners-affairs-sign-landmark-biometric-data-agreement-to-fast-track-international-visitor-processing-at-dubai-airport/

[3] www.abudhabiairport.ae/en/Innovation

[4] www.arabianbusiness.com/industries/transport/riyadh-airports-scraps-boarding-passes-in-saudi-arabia

[5] www.pif.gov.sa/en/Pages/OurInvestments-GigaProjects.aspx

increasingly re-imagine global gold standards for quality of life, cultural heritage, leisure experiences, environmental sustainability, and innovation.

Government funding, regulations, and policies are coming together with private investments to empower the Gulf aviation industry to play a critical role in this road map to the future. For instance, the Saudi Aviation Strategy is supported by $100 billion investments from both the government and private sectors. The Saudi General Authority of Civil Aviation has similarly introduced new regulations in multiple domains, including:[6]

- Regulations to enable airport authorities to diversify their revenue streams by expanding non-aeronautical earnings
- Ground service rules to create a competitive sector and boost productivity and service quality
- Reforms covering passenger protection, marketing agreements, traffic rights allocation, rules for wet leasing, and charter flights that aim to cut airline costs, boost transparency, and improve customer experience and product innovation
- Sustainability policies, such as the Civil Aviation Environmental Sustainability Plan, that align with global environmental sustainability commitments like the Paris Climate Agreement

These investments and reforms will accelerate the achievement of Saudi Vision 2030's aviation goals, which include handling 300 million passengers annually, connecting over 250 destinations, and delivering 4.5 million tons of freight capacity.[7] King Salman International Airport alone aims to accommodate 120 million travelers by 2030 and process 3.5 million tons of cargo by 2050.[8] Riyadh Air, under the ownership of the Public Investment Fund, aims to start operations in 2025 and service over 100 destinations, contribute $20 billion to non-oil gross domestic product each year, and generate more than 200,000 job opportunities.

These ambitions will only be achievable with technology at the core of airline and airport business and operations. Investments in technologies such as the Internet of Things (IoT), digital twins, immersive reality, AI, and generative AI (GenAI)[9] will enable airlines and airports to re-invent customer and employee experiences, product innovation, operational excellence, and sustainability. For instance, Riyadh Air's vision statement is to "be the first digital-native airline, enabling digital innovation at every guest touchpoint for a seamless travel experience."[10] IT will converge with operational and green technologies (greentech) — such as sustainable aviation fuel — to deliver on the promise of next-generation air travel in the Gulf region.

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[6] saudigazette.com.sa/article/637226; https://aviationweek.com/air-transport/safety-ops-regulation/saudi-arabia-introduces-new-passenger-rights; www.aviationpros.com/ground-handling/news/53076811/saudi-arabia-adopts-new-aviation-policy-to-improve-sectors-performance; www.arabnews.com/node/2410726/business-economy

[7] www.arabnews.com/node/2354166/business-economy; futureaviationforum.storage.googleapis.com/media/documents/SAS_FAF_Brochure_V3.pdf

[8] www.arabnews.com/node/2375931/business-economy

[9] innovation-runway.lufthansagroup.com/en/focus-areas-projects/projects/openai.html

[10] www.riyadhair.com/en/

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Strategic Lines of Action

The convergence of ambitious economic and social development visions and strategies, evolving regulations, opportunities brought about by the rapid pace of technology innovation, and elevated customer expectations require Gulf Cooperation Council (GCC) airports and airlines to make strategic investments in five areas:

1. Seamless passenger experiences
2. Smart operations
3. Intelligent asset management
4. Sustainability
5. Digital core

Seamless Passenger Experiences

The increased availability of granular data about customers, the power of AI to personalize services, and the emergence of immersive, mixed-reality capabilities are enabling airlines and airports to create seamless experiences that drive loyalty and increase revenue. Airlines are integrating data from their direct channels and partners (like global distribution systems and online travel agencies) to build a true 360-degree view of customers. A holistic understanding of customer needs enables airlines to maximize interactions through their direct digital channels, rather than those of travel intermediaries, increasing their profitability and enhancing customer engagements in the process.

> **Passenger Experience Best Practice**
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> A leading carrier in the U.K. improved the self-service capabilities of 80% of customers, thereby reducing costs at the contact center and improving customer satisfaction scores.

A seamless passenger experience also inspires customers to book flights or pay for ancillary services. Moreover, airlines and airports are addressing security concerns via these personalized and immersive experiences. For example, Gulf airlines and airports[11] are increasingly using biometrics for payment processes, health checks, lounge access, and priority boarding.

The enhancement of customer experiences is closely related to product and revenue innovation. When airlines and airports can engage customers through digital and physical touch points, they have more opportunities to explore product, service, and pricing innovations such as continuous pricing models.[12] They can nudge business travelers to book tickets that they can change and cancel ahead of time; they can also encourage travelers to buy tickets closer to the time of departure (which translates into higher yields for the same seats) or consider ancillary products (like onboard Wi-Fi, extra baggage, priority boarding, fixed price upgrades). In addition, airports with more granular insights about movement patterns and customer preferences can reconcile operational procedures and commercial opportunities to maximize the value of dwell time.[13]

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[11] www.internationalairportreview.com/news/163755/emirates-accelerates-digital-innovation-for-passengers/

[12] www.iata.org/contentassets/0688c780d9ad4a4fadb461b479d64e0d/dynamic-pricing_continuous-pricing_dynamic-bundling.pdf

[13] www.sciencedirect.com/science/article/pii/S096969972100048X

They can partner with retailers to offer personalized recommendations and discounts and deliver just-in-time boarding information to reduce waiting times at gates.

Smart Operations

Airlines and airports must optimize operational flexibility to reduce costs and accommodate demand fluctuations. They need to connect operations across the whole value chain, from booking to revenue management, scheduling and dispatch to capacity planning, and landside and airside to inflight management. Airports are at the center of this transformation, with many aiming to achieve a total airport management[14] vision through collaborative decision making. Instead of operating in a reactive manner and managing flights on a first-come, first-serve basis, airports are using data and technology to collaborate with airlines, air traffic controllers, weather services, and other entities. Such collaboration enables them to predict and respond to potential disruptions in schedules, reduce layovers, and make quick decisions about delaying, re-routing, or canceling flights.

> ### Smart Operations Best Practice
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> One of the largest hub airports in Europe is deploying a next-generation airport operations database that will enable it to realize its 'Total Airport Management' strategy. The solution will integrate with 50+ internal and external systems, including airline and air traffic controller systems. It will process data from various sources (including IoT devices) to deliver a single source of truth for efficient airport operations.

Total airport management represents a technology revolution because of the technical transformation required to scale data sharing platforms in an efficient and secure manner. Operationally, total airport management will impact an airport's ability to deliver evidence-based insights for informed decision making daily, weekly, or 30, 90, and 180 days in advance. Total airport management also supports organizational change as it necessitates collaboration between

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[14] www.sesarju.eu/projects/tam

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stakeholders with diverse strategic and operational key performance indicators (KPIs) and establishes links between siloed processes and systems.

Intelligent Asset Management

Thousands of IoT sensors that make condition-based and predictive maintenance possible are being incorporated into all new generations of airplanes and airport equipment.[15] Drones will also be increasingly used to perform aircraft and airport infrastructure checks, thereby providing engineers with the quick and accurate data needed to make critical decisions.[16] According to IDC's 2023 *EMEA Cross-Industry Acceleration Survey*, 14% of transportation organizations in the region are already using robots and drones, and an additional 30% are planning to start using such devices in the next two years. The use of GenAI to streamline maintenance documentation processing and ensure regulatory compliance will also become more widespread.[17]

The combination of the above technologies will enable new intelligent maintenance processes that will lower costs and extend the life cycle of critical assets, increasing the yield of strategic capital investments in the process. Such combinations will also reduce mistakes and delays in maintenance, inspections, and other operational processes that can negatively affect punctuality and safety.

> ### Intelligent Asset Management Best Practice
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> One of the largest hubs in the U.K. improved the performance of its baggage management system via an intelligent asset management and reporting solution. With over 200,000 bags passing through its facilities every day, the airport had to minimize baggage mishandling, particularly as lost bags negatively impact customer satisfaction and impose costs for settling claims and repatriating baggage. The asset management solution was compliant with IATA753 and the EU's General Data Protection Regulation, providing accurate baggage tracking and predictive capabilities for baggage operations at the airport.

Sustainability

Air travel executives know that policymakers, investors, and passengers expect them to be more proactive about their environmental sustainability targets.[18] Innovative technology will play a strategic role in accelerating their journey toward net-zero targets.

In the long term, electric and hybrid electric propulsion aircraft will drastically reduce carbon emissions and noise pollution. Although air taxis are already technically possible, long-haul electric flight remains at the research stage.[19]

In the medium term, alternative fuels will reduce (but not eliminate) emissions, and by 2030, they will account for only about 10% of all energy consumption in the aviation industry.[20]

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[15] connect.qrdi.org.qa/innovation/p/opportunities/p/42

[16] www.theairportshow.com/en-gb/industry-insights/drones-coming-into-their-own-for-runway-safety-checks.html

[17] arc.aiaa.org/doi/abs/10.2514/6.2024-1528?download=true

[18] www.iata.org/en/programs/environment/flynetzero/

[19] www1.grc.nasa.gov/aeronautics/eap/

[20] www.iea.org/commentaries/are-aviation-biofuels-ready-for-take-off

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In the short term, ICT will be essential for making air travel more sustainable. ICT will be instrumental for designing and operating more fuel-efficient routes and integrating traffic control systems. For example, the collective European aviation ecosystem is undertaking the Single European Sky ATM Research (SESAR) project. Via this project, the ecosystem aims to reduce air holding times at airports by better managing the 'Target Time of Arrivals' (TTA).[21] The overarching goal is to leverage data and AI to cut carbon emissions by around 10% per year. As part of the SESAR project, airports in Europe will develop more sophisticated data collection and analysis capabilities to produce more accurate reports on Scope 1, 2, and 3 emissions. The airports can thereafter find methods for offsetting these emissions and reducing their energy consumption.

In addition, data sharing among airlines, global distribution systems, online travel agencies, and brick-and-mortar travel agencies will enable passengers to buy environmentally sustainable products and packages. The intelligent use of data will also help hubs establish partnerships with railways to replace short-haul flights[22] or better connect airports[23] with final destinations.

Digital Core

Data and intelligence are becoming strategic levers of customer retention, revenue growth, and profitability. Indeed, legacy databases, data warehouses, and applications are not future proof. They were not engineered to handle the scale and complexity of AI and GenAI training and inferencing workloads, which are becoming increasingly strategic for airlines and airports. In fact, according to IDC's 2023 *EMEA Cross-Industry Acceleration Survey*, 33% of transportation organizations in the region are already using AI, and an additional 37% are planning to start using it in the next two years.

Investments will be directed toward platforms that can ingest and analyze data from various sources across the air travel ecosystem as well as apply appropriate

> ### Digital Core Best Practice
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> Two major airlines, one in Europe and one in the Middle East, incorporated AI/GenAI capabilities into enterprise customer service and sales applications to improve time performance, net promoter scores, and employee engagement. The airlines are leveraging large language models provided by hyperscalers to query data using natural language, identify relationships between data, and conduct root cause analysis. Moreover, intelligent chat assistants are being developed that improve employee engagement and efficiency by providing relevant, accurate, and contextual information that supports day-to-day activities.

governance policies for security and compliance purposes. These platforms leverage data and AI-powered cognitive capabilities to support core processes such as revenue management, customer service, asset management, ground operations, crew management, scheduling, and dispatch. These platforms further embed aviation industry open standards to share data in an open and secure manner. Standards, such as New Distribution Capability (NDC)[24] and ONE Order,[25] increase convenience and transparency as they enable passengers, travel agencies, and

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[21] www.sesarju.eu/sesar-solutions/target-time-arrival-tta-management-seamless-integration-out-area-arrival-flights
[22] trains.klm.be/en
[23] www.oebb.at/en/regionale-angebote/ueberregionale-angebote/anreise-zum-flughafen/austrian-airail
[24] www.iata.org/en/programs/airline-distribution/retailing/ndc/
[25] www.iata.org/en/programs/airline-distribution/retailing/one-order/

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intermediaries to book flights and buy/create products without having to interface with multiple systems.

To accelerate the transformation of platforms and applications, airlines and airports are leveraging the power of hybrid cloud environments. Transactional and analytical applications must be developed and evolved quickly through cloud. Moreover, the cloud must be connected to applications deployable at the edge — for instance, baggage handling, refueling, and asset inspection capabilities should be accessible at low latencies to personnel on the move. Cloud computing and the underlying containerized microservices architectures will enable agile development and deployment cycles, optimize scalability, and automate IT operations. They will further decrease IT operational expenditure while increasing flexibility via the re-allocation of workloads during unexpected operational events.

Benefits of Technology-Enabled Business and Operational Innovation

Airlines and airports in the Gulf region that make strategic investments in IT, operational technology, and greentech will gain a competitive advantage by disrupting business and operating models:

- They will **improve customer engagement and increase revenues** by offering personalized, value-added products and experiences. Technology will help them boost conversion rates, wallet share per customer, net promoter scores, and customer satisfaction indices.
- The technologies will **enhance operational efficiency and resilience.** Airports in the Gulf region that are aiming to implement total airport management can look at international best practices.

Customer Experience Value Realization

A major U.S. carrier deployed a new ecommerce platform that led to a 10% year-on-year increase in sales through digital channels.

Operational Efficiency Value Realization

A leading hub in the U.K. improved on-time performance by 5% by delivering a total airport management road map.

Schiphol Airport's approach toward total airport management allowed it and its partners (airlines, ground service providers, traffic controllers) to move away from siloed methods of responding to incidents. All stakeholders now use an operating model that allows them to anticipate and avoid problems, automate tasks, and collaborate to match capacity and demand.

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"I think the biggest shift that the operations center triggered is that before, we were all driven by incidents. Everybody was just waiting for something to happen. So, we were all firefighters. Now, we do not wait for something to happen. We can predict whether something will happen and solve it in advance. This is a change of mentality and a different way of working because you have to be able to look ahead and understand how it affects all the different processes. For instance, how is a certain decision in the baggage system affecting the passenger system, the planning of stands, and what is happening in the air? And you have to be able to take actions to solve problems in advance instead of addressing them in a crisis mode."

Said Suzan van Zutphen (Program Manager, Airport Operations Center, Schiphol Group)

- Technology can help organizations to **attract and retain talent.** Convenient, affordable, sustainable, and safe air travel relies on the orchestration of maintenance personnel, ground crew, pilots, flight attendants, and gate agents. Automated operations, innovative products, and immersive customer experiences will enable the industry to optimize turnaround times, reduce personnel's need to carry out repetitive manual tasks, and eliminate risky activities (such as refueling and inspections). Accordingly, the productivity of personnel — alongside their safety, wellbeing, and ability to focus on creative tasks and emphatic customer interactions — will increase.

- Different technologies can **amplify the "branding" of GCC countries as innovation hubs,** particularly as they can enable the regional ecosystem to develop multimodal passenger experiences. For example, airlines and airports are investigating opportunities to integrate their services with mobility-as-a-service providers and air taxis[26] that can seamlessly connect passengers to their final destinations.

- Technology-enabled innovation can help **achieve environmental sustainability** targets. For instance, Saudi aviation company AviLease intends to "bundle" sustainable aviation fuel with its aircraft leases, thereby supporting Saudi Vision 2030 and contributing to the global drive to cut carbon emissions in aviation.[27]

Considerations

Aviation ecosystem players that want to accelerate technology-enabled business and operational innovation must tackle critical issues. According to IDC's 2023 *EMEA Cross-Industry Acceleration Survey*, the top challenges that transportation industry executives face when investing in technology innovation are:

- **Skills shortages, particularly technology skills:** Approximately 48% of transportation senior leaders across Europe, the Middle East, and Africa (EMEA), and over 65% in the Middle

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[26] evtolinsights.com/2023/12/eve-air-mobility-flynas-sign-mou-to-propel-evtol-advancements-in-saudi-arabia/

[27] www.ainonline.com/aviation-news/air-transport/2023-06-13/saudi-arabias-avilease-bundle-saf-leases

East, Türkiye, and Africa region, identify skills shortages as the number-one challenge negatively impacting their organizations.

- **Lack of planning and alignment for adopting technology as a strategic lever of business innovation:** The absence of a strategic focus, combined with organizational resistance to change, can result in the lack of an enterprise-wide digital and data strategy and siloed ways of working that lead to inefficiencies and cost increases.
- **Geopolitical volatility:** The aviation industry has experienced a period of constant uncertainty over the last five years, both in terms of demand and costs, which has put greater pressure on mastering operational efficiency and flexibility.
- **Aging and outdated IT:** Legacy applications tend to be spread over a large IT ecosystem, with limited ownership for operational efficiency and innovation. The customization of products to meet specific business requirements has increased the complexity of maintaining and managing applications. Customization has led to siloed data stores that are difficult to integrate, clean, and feed into decision support tools and AI/GenAI tools that are becoming increasingly strategic. Legacy systems are also exposed to data protection and security risks that negatively impact customer trust and hinder collaboration with ecosystem partners.

Trends: Critical Success Factors for the Aviation Ecosystem

Airline and airport executives in the Gulf region that want to realize the benefits of technology-enabled innovation should invest in:

- **Developing an enterprise-wide strategy aligned to business objectives and KPIs that are tracked against business goals:** A holistic approach toward data consolidation will allow enterprises and ecosystem partners to leverage the power of AI/GenAI. It will strengthen the business case for the modernization of core applications with cloud, edge, and IoT technologies.
- **Transforming the organization:** Establishing a digital-first mindset across the enterprise is critical for transforming technology from a cost center into a business enabler. Technology and business leaders need to collaborate and work iteratively in digital and data factories to understand how innovation will positively impact the overall business. They will have to map out how long-established processes, procedures, and services need to change. By tying these changes to KPIs, they can incentivize new behaviors and communicate the successful achievement of strategic goals.
- **Boosting regulatory compliance and cybersecurity:** The proliferation of systems that contain passenger personal data, the increased sharing of data across ecosystems, and the "datafication" of operational systems such as aircraft engines and refueling equipment have created numerous cyber-vulnerabilities that present serious safety, financial, and reputational risks. Airlines and airports must adopt leading-edge security tools, comprehensive governance approaches, and cybersecurity monitoring platforms to maintain data quality, security, and resilient operations.

- **Partnering with the technology ecosystem:** The fast-paced evolution of technology, compounded by skill shortages, prevents individual airlines and airports from spurring innovation. Airlines and airports will need to work with partners that offer:
  - End-to-end services that enable them to support complex transformational programs rather than drive ad hoc project implementations and staff augmentation projects
  - Cost-effective service delivery founded on a global network of technology experts and alliances
  - Industry-specific business expertise that can advise on the "art of the possible" while understanding the organizational, industry and regulatory challenges at hand

Conclusion

Airline and airport executives in the Gulf region that want to gain a competitive advantage on the global stage and set a gold standard for smart destinations should embrace technology-enabled innovation.

These executives can improve customer engagement and increase revenues by using technology to create personalized, value-added products and experiences. Technology will not only boost operational efficiency and resilience but also help organizations attract and retain talent and progress toward their net-zero targets.

Airport and airline executives should work with technology partners that can help them through their perpetual innovation journeys. By doing so, they can re-imagine data and application architectures, leverage the power of cloud computing, guard against cybersecurity risks, and transform their organizations.

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Massimiliano (Max) Claps serves as research director within the IDC EMEA Government Insights team. His research empowers technology suppliers and professionals to embrace disruptive technologies such as AI, 5G/6G, edge computing, and cloud. He advises stakeholders across the public sector transportation ecosystem on strategic initiatives like digital twins, mobility as a service, and intelligent traffic management.

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