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Amadeus Insights

Travel Technology Investment Trends 2024

Airports

Contents

Airports

Foreword

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As aviation continues its recovery, we're seeing a noticeable shift in mindset among senior airport leaders. In general, airports are moving from a 'firefighting' stance adopted during the pandemic and the subsequent recovery, to now focus on both short- and medium-term priorities.

The operating environment has been challenging and airports are now stepping back to reflect on the experience of the past few years to ask how they can strengthen their operations. Now, more than ever before, passengers value a smooth, predictable and hassle-free journey through the airport.

As airlines continue with their own plans to become 'modern retailers' we are seeing an even greater focus on the airport as the key step in the journey where the service is 'delivered'. That's why there is a desire among airlines for the airport experience to be more automated, more connected and ultimately, more traveler-centric.

Here airport and airline objectives to improve the passenger experience, deliver more efficient operations and tackle persistent challenges like disruption are very closely aligned.

As this study demonstrates, airport leaders are making significant investments to address these challenges.

At Amadeus, we advocate for a collaborative approach that brings stakeholders at the airport together to deliver more complete operating models. We believe this collaborative approach is also the key to delivering for our ultimate shared customer, the traveler.

The results of this study are particularly encouraging given airport leaders told us they recognize the role technology can play to enable such collaboration. Whether it is better information sharing between airlines and airports or new platform technology at the Airport Operational Control Centre, the industry is already taking steps to deliver this collaborative future.

For me personally, one of the most interesting findings was the high number of airport leaders that plan to implement 'lightweight' passenger processing over the coming years. This trend sees physical infrastructure for check-in, bag-drop and boarding fade into the background as more travelers choose to use their mobile device, equipped with digital identity credentials, to move through the terminal.

A recent IATA pilot with British Airways, and supported by partners including Amadeus, is referenced in this report. It shows the potential of more connected and joined-up journeys, drawing on digital identity, document pre-checks and the convenience offered with end-to-end biometrics across airport service points.

I hope this report provides a useful benchmark for technology investment across the airport sector so readers can understand the priorities and challenges they share with peers across the world. If your organization is seeking to try new ideas and apply technology to transform the airport experience, I encourage you to discuss this further with us here at Amadeus.

Introduc

Travel Technology Investment Trends 2024 is a cross-industry research project carried out by Amadeus[1], alongside market insight agency Opinium Research[2].

It is designed to take a panoramic view across the entire travel industry, with research findings presented in a series of eight reports – addressing sectors including hospitality, airlines, travel sellers and payments.

The study examines the investment priorities and plans of senior technology decision makers from each segment of the industry on a global basis. This has allowed us to better understand today's industry challenges and how technology is being applied to address them.

1 Amadeus.com
2 Opinium.com

ction

Findings included in this specific report are based on individual responses from 50 senior leaders from airports based in ten key countries - Brazil, China, France, Germany, India, Mexico, South Korea, UAE, UK and USA.
Combined with expertise from Amadeus' Airport & Airline Operations experts, each report offers unique insight into technology investment trends across different segments of the travel industry.

This report focuses on airports of all different shapes and sizes to better understand how they are moving forward with plans to digitalize, improve the passenger experience, deliver more efficient operations, tackle disruption and work more collaboratively with stakeholders.

By asking airport technology leaders about investment plans, business challenges and priority areas, this report offers a globally representative understanding of the sector, its priorities and ambitions for 2024.

The report is divided into four sections:

The first explores sector wider investment plans.

A second investigates technology priorities - what is shaping investment trends, which priorities are front of mind and what are the challenges airports are seeking to overcome? Self-service, biometrics and flexible passenger services all feature as key priorities.

A third section of the report looks specifically at disruption management.

The fourth examines the steps airports are taking to reduce their carbon impact through technology investment.

01

Investment plans

Since the widespread return of demand for air travel, airports and their key stakeholders, including ground handlers, have been working hard to ramp up capacity.

Indeed Airport Council International's latest Air Travel Outlook found numbers in 2023 would reach 8.6 billion passengers, or 94.2% of 2019 levels. In 2024, the same study forecasts 9.4 billion passengers, or 102.5% of volumes seen in 2019, underlining the speed and scale that demand is returning.

The challenge for airports across the world continues to be bringing more capacity online to meet new airline schedules and service demand. Doing so in a way that prioritizes an outstanding traveler experience, often with fewer staff and having lost experienced people that decided to leave the industry over recent years. As this study demonstrates, the industry views technology change as part of the solution.

aci.aero.com

Increase in demand coincides with industry flux and staff shortages.

When asked about key operational challenges 46% of airports told researchers they are simply seeing ‘too much demand to service’.

This increase in demand is coupled with an aviation sector still recovering from the pandemic as airlines adjust their routes, schedules and plans to cater to new patterns of demand.

This places a strain on airports that must respond quickly to enable their airline partners to operate effectively. ‘Changing airline plans and schedules’ was the second most frequently selected operational challenge (44%).

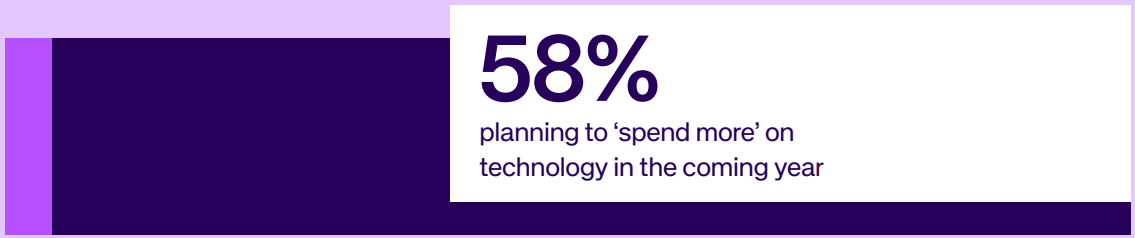
This ramp up in demand and increased flux comes at a time when airports are struggling to recruit sufficient skilled staff to cater to this demand, with 40% of respondents to the Travel Technology Investment Trends survey citing ‘staff shortages’ as a top operational challenge.

The need to increase capacity and flexibility at a time when human capital is limited perhaps explains why this survey shows airports are leading the travel industry when it comes to the intent to invest in technology over the coming 12 months.

Airports plan to increase technology investment more than any other area of the travel industry.

Airport technology leaders told researchers their airports are investing to meet these challenges. Some 94% of airports plan ‘at least moderate’ investment in their organization, with 44% planning to invest ‘aggressively’ over the coming 12 months.

Looking more specifically at investment in technology, 92% of respondents told us they will spend ‘the same or more’ over the coming 12 months when compared to the prior year. A significant 58% will spend more and only 4% will spend less.



58%
planning to ‘spend more’ on technology in the coming year

4%
planning to ‘spend less’

92%
planning to spend ‘the same or more’

On average, airports intend to increase technology investment by 17%, which is larger than any other area of the travel industry covered by the Travel Technology Investment Trends study.

Airports must do ‘more with less’ and many are still constrained by legacy technology while struggling to recruit.

Advances in areas like biometrics and self-service have now matured to the point where these technologies can reliably automate key processes. That’s why we think airports are investing more on average, the opportunity to improve how they operate is particularly significant and pressing at the moment.”

Holger Mattig

SVP Product Management, Airport and Airline Operations
Amadeus

Passenger experience, operational efficiency and sustainability drive technology investment.

Airport technology leaders told us they have multiple objectives competing for this increased investment in technology.

Some 56% said 'enhancing the customer experience' is their top short-term objective, followed by 'improving operational efficiency' (52%) and 'applying technology to operate more sustainably' (52%). Herein lies the dilemma facing many airports. With competing demands for resources, how can budgets be spent wisely on a technology foundation that meets these multiple needs?

Respondents pointed to one possible option, with 46% of airports saying it is a short term aim to move to cloud computing to improve IT efficiency.

Top short-term objectives for investment in technology

56% 'enhancing the customer experience'

52% 'improving operational efficiency'

52% 'applying technology to operate more sustainably'

46% 'move to cloud computing to improve IT efficiency'

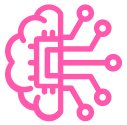
> "Too many airports have a mix of legacy systems that are expensive to maintain, inflexible and require on-site computing. We've seen a significant number of airports decide enough-is-enough and they're switching to the cloud, particularly for passenger processing. Our own Airport Cloud Use Service (ACUS) is now live in more than 100 airports across the world so agents can access any airline system they need using Wi-Fi or mobile broadband. Airports are retiring servers, freeing themselves from the constraints of fixed local networks and providing services from new locations, both within and outside the terminal."
>
> **Holger Mattig**
>
> SVP Product Management, Airport and Airline Operations
> Amadeus

02

Investment priorities

As airports strive to increase capacity, improve operational performance and boost the passenger experience, a number of technologies are expected to play a role in the short and long term.

The technologies expected to make the biggest impact for airports in the next 12 months are:



50%

Machine learning

48%

Digital payments

44%

Data analytics

42%

Cloud computing

34%

Biometrics

Looking out over a five-year horizon this picture changes, as data analytics (34%) drops out of the top five, to be replaced by extended reality, or mixed reality applications. Cloud computing and biometrics both increase in relevance over this longer horizon.

The technologies expected to make the biggest impact for airports in the next five years are:

46%

Cloud computing

44%

Machine learning

42%

Extended reality

40%

Biometrics

38%

Generative artificial intelligence

Over the coming year, airports are betting on digital transformation. From cloud computing to digital payments, machine learning and data analytics, airports are now embracing new technologies more commonly found in other sectors of the economy.

A quiet transformation is underway.

This is visible when working with the industry. Airports are prioritizing data management and aiming for operational improvements that better information can help deliver. For example, airports are increasingly capturing data relating to their passenger service points like check-in, bag drop and boarding.

Analyzing this type of information helps airports in a number of areas.

Pro-active troubleshooting

Airports can spot issues when things go wrong. For example, perhaps passengers are dwelling too long at the self-serve check-in kiosks and the kiosk user experience could be improved.

Optimize resources and improve forecasting:

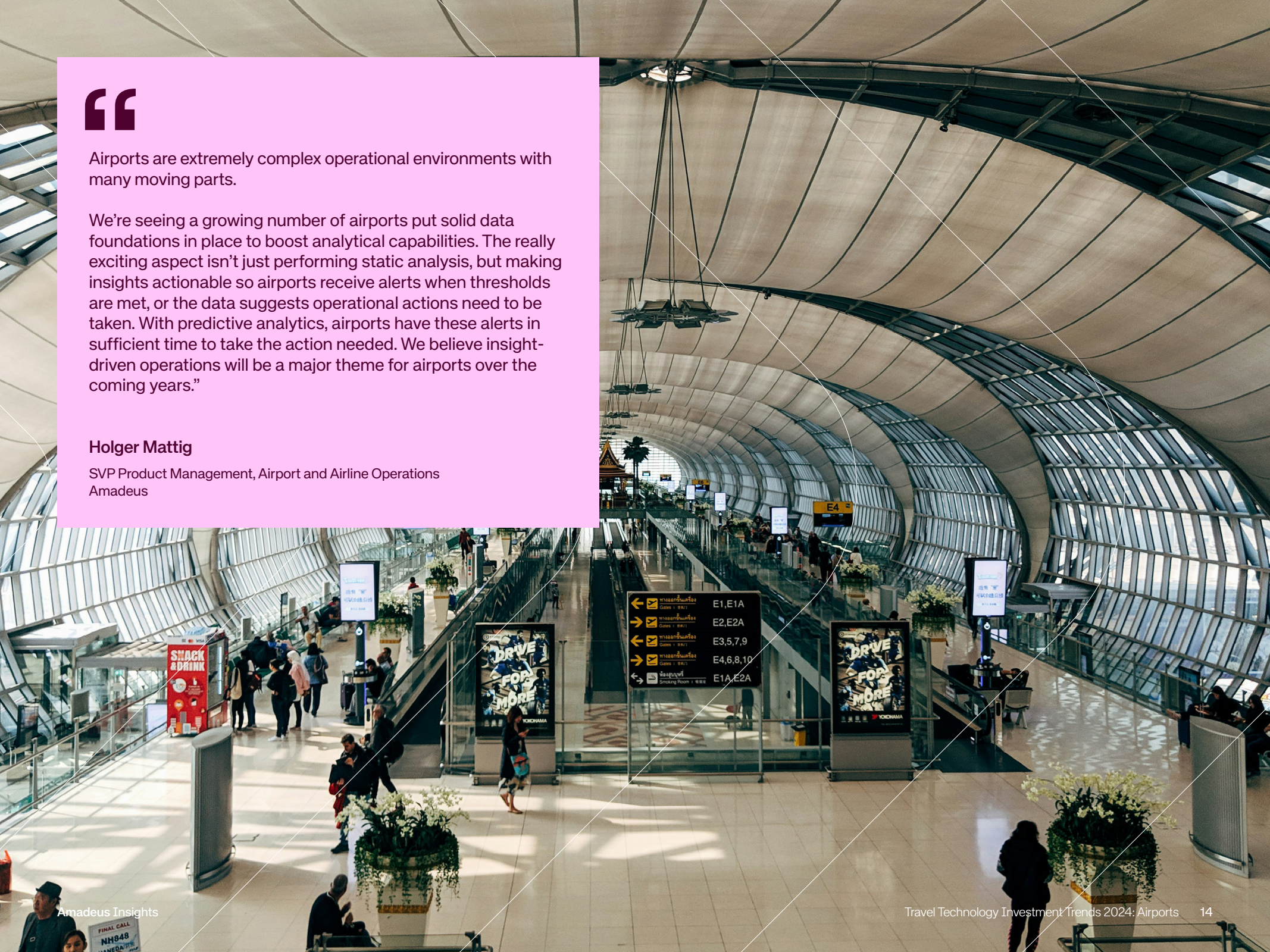
By understanding patterns of asset usage, airports can ramp up or down based on an accurate understanding of what's needed. For example, perhaps only half of an airport's security lanes will be needed today, and others can be placed on standby to reduce costs.

Spot baggage hotspots:

Amadeus is working with airlines and airports to predict where baggage mishandling is likely to occur with machine learning. This helps the industry take proactive steps to address mishandling before it happens.

Improve collaboration:

An airport working with Amadeus identified that passengers were connecting through the airport, but ultimately their destination was New York. This insight was used to work with the airport's largest airline to open new direct international flights to the city.



Airports are extremely complex operational environments with many moving parts.

We're seeing a growing number of airports put solid data foundations in place to boost analytical capabilities. The really exciting aspect isn't just performing static analysis, but making insights actionable so airports receive alerts when thresholds are met, or the data suggests operational actions need to be taken. With predictive analytics, airports have these alerts in sufficient time to take the action needed. We believe insight-driven operations will be a major theme for airports over the coming years."

Holger Mattig

SVP Product Management, Airport and Airline Operations
Amadeus

Airports are focused on implementing the following capabilities in the next 12 months:

40%	Data analytics for insight into key airport processes
36%	New technology for improved airport operations
36%	Improved data sharing with airline partners
32%	Moving passenger processing to the cloud for more flexible services
30%	Billing and contracting software to bill airlines more accurately

When it comes to specific on-going implementations, researchers found that airports are focused on data analytics, new technology for operations and improved data sharing with airline partners, as well as moving passenger processing to the cloud and implementing new billing and contracting systems.

It's particularly interesting to note that a third of airports said they are currently improving data sharing with their airline partners. This has long been an objective across the sector, as common information shared among stakeholders contributes to a common situational awareness, smoother operations and improved passenger services.

By sharing basic, aggregated, passenger information airlines can help their airport partners deliver improved outcomes. For example, if the airport and ground handler know how many passengers are arriving on a flight and the passengers' onward connections, they can allocate the aircraft to a convenient gate. This can reduce passenger connection times in the terminal, avoiding delays for the departing flight and reduce missed connections for passengers.

There are many interesting examples where airlines and airports can share information in a compliant manner that can lead to better overall outcomes. Disruption is a particular case in point, which this report will address in subsequent sections.

Airports are focused on implementing the following capabilities in the longer-term (more than 12 months):

44% Ultralight passenger processes e.g., mobile phone + biometrics for check-in

40% More advanced and collaborative technology at the Airports Operations Centre (APOC)

38% New technology for airport operations

36% Improved data sharing with airline partners

36% Technology to improve sustainability of the airport

While it's interesting to see airports implementing analytics, cloud passenger processing and operational software in the short-term, it's respondents' longer-term plans that are particularly enlightening.

Ultralight passenger processes' came top, with 44% of airports considering this approach. Here, passengers can check-in and drop their bags using only a mobile phone and present their face for a biometric check. For passengers that choose this advanced approach, check-in desks and kiosk fade into the background.

This type of innovation is of particular interest to airlines that are seeking to become modern retailers and to simplify the airport experience wherever possible.

A recent pilot of digital ID conducted by IATA, British Airways and ten partners, including Amadeus, shows what this future will be like.

During this trip, travelers chose from a range of personalized airline offers. Following selection by the passenger, a single order record was created. The passengers chose to share their digital passports in a digital wallet on their phone with British Airways and received a 'ready-to-fly' confirmation via text message. Those passengers that opted to share their biometric data with British Airways in advance were also able to pass through every airport service point including check-in, bag-drop, lounge access and boarding 'handsfree', that is without needing to present paper documents.

> "Our vision for future travel is fully digital and secured with biometric identification. While the technology exists to do this at each stage of a journey, linking these steps together has up to now proven challenging. Today with our partners we showed that we can. And that will open up a world of possibilities for simpler journeys in the future."
>
> **Nick Careen**
> SVP for Operations, Safety and Security
> IATA

> As an airline, we are always innovating and looking at ways to make the customer journey as seamless as possible. We introduced biometric boarding on selected flights earlier this year and it has been a huge success with positive customer feedback. Working with IATA on enabling a fully integrated travel journey helps us build on that and shows us what could be possible in the future,"

Dirk John
Chief Information and Digital Officer
British Airways

Airports are also intending to implement more collaborative technologies at the Airport Operations Centre, or APOC. This is encouraging to see as there is a significant opportunity to improve how the aviation sector handles irregular operations.

When disruption occurs airlines and airports need to be in constant contact to fit airport capacity to evolving airline plans. Today, this interaction is largely manual, relying on phone calls and emails. But APOCs are now beginning to overhaul their technology.

Dynamic dashboards covering key metrics, like runway capacity, turnaround efficiency and on-time performance provide a real-time view of airport capacity and performance. By drawing on third-party data streams, airports can see the likelihood and potential impact of impending bad weather before it happens.

But perhaps most importantly, they can make all this information available to their airline and ground handling partners through collaborative platforms like Microsoft Teams. This brings key stakeholders together around shared metrics so better decisions can be made more quickly and more collaboratively.
It's a step-change from the fragmented systems and legacy communications channels typically in use today. It's encouraging to see such a large number of airports planning to improve APOC integrated solutions.

> "Collaborative platform technology is used across many industries to help different stakeholders deliver an overall operational process. Take ride hailing as a simple example, where platforms match the rider's journey requirements to driver availability. Everyone is kept up-to-date with a shared view and Amadeus is working to bring these capabilities to aviation operations."
>
> **Holger Mattig,**
> SVP Product Management, Airport and Airline Operations
> Amadeus

Priority: Self-service

Around 90% of respondents already offer self-service or plan to offer self-service at each of the following airport service points: check-in, bag drop, security, lounge access and boarding.

Airports are investing in self-service for a variety of reasons, with a focus on 'improving passenger satisfaction' topping the list for 52% of respondents. But 48% of airports also cited 'cost reduction' and 'to comply with regulations'. Respondents also cited the potential to 'attract more airline partners with a modern passenger experience' and to 'process more passengers with their existing physical capacity'.

When asked to estimate how much agent time self-service technology has saved at their airport, respondents estimated 43% on average, suggesting a significant opportunity to reallocate teams to higher value work or to make them available to solve specific passenger pain-points.

Adoption of self-service technology has drastically increased over recent years and is making a significant impact for airports across the world. An example is Heathrow Airport where more than 270 Amadeus self-serve bag-drop units are now installed following a successful ten-year deployment.

These units process 1.5 passenger bags every second at peak times, reducing demand on agents and delivering an outstanding experience.

Self-service is most widely implemented for check-in today (58%), followed by security (54%), bag drop (50%), lounge access (46%) and boarding (42%).

58%
Self-service

54%
Security

50%
Bag drop

46%
Lounge access

42%
Boarding

Self-service technology

- We already automate this with self-service technology
- We don't automate this with self-service technology, but we plan to
- We don't automate this with self-service technology, and we don't plan to

Check-in

58%
30%
12%

Bag-drop

50%
40%
10%

Security

54%
36%
10%

Lounge access

46%
40%
14%

Boarding

42%
46%
12%

Priority: Biometrics

As with self-service, around 90% of respondents already offer or plan to offer biometrics at each of the following service points: check-in, bag drop, security, lounge access and boarding. However, the balance is skewed in favor of 'plan to implement' compared to self-service, which a greater number of respondents have already rolled-out.

Around 40% of airports say they've implemented biometrics at some service points already, with a further 50 % planning to roll it out in the near future, particularly at bag drop.

Investment in biometrics is being driven by a desire to 'improve the passenger experience' at 56% of airports, to 'improve security' for the same number and to comply with regulations for 38% of respondents. Airports also pointed to 'cost reduction', 'attracting airline partners' and 'the ability to process more passengers' as drivers for biometrics at the airport.

While biometrics are now being deployed at airports across the world, the US is perhaps leading the way today. Here, the US Customs and Border Protection Agency (CBP) handles the matching of the passenger's biometric image to its database of passenger images which simplifies the entire process for the industry. Under a federal mandate, CBP's program has led to a significant number of international passengers now being verified with biometrics when they leave the country.

Amadeus is actively supporting the rollout across the US with deployments at tens of US airports including Fort Lauderdale Hollywood International and Sacramento International. In fact, the number of passengers processed using Amadeus Biometric Solutions in the US has increased more than three-fold over the past 12 months.

Self-service biometrics

- We've already applied biometrics
- We haven't applied biometrics, but we plan to
- We haven't applied biometrics and we don't plan to
- I don't know/not sure

Check-in

40%
46%
12%
2%

Bag-drop

30%
60%
10%

Security

56%
34%
10%

Lounge access

46%
36%
16%
2%

Boarding

40%
46%
12%
2%

Priority: Flexible passenger services

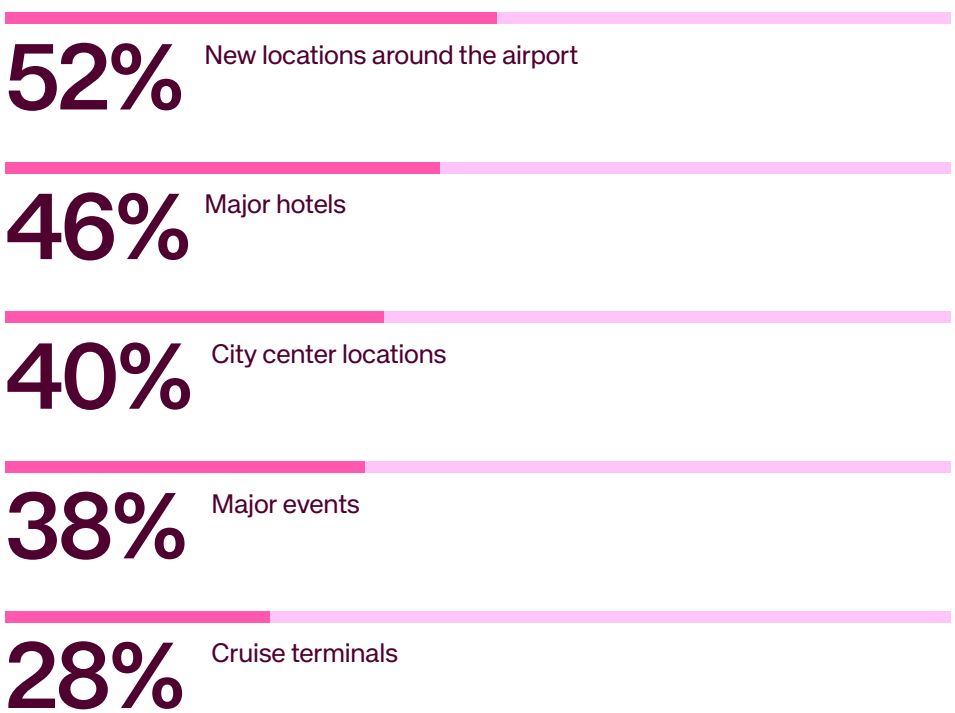
When asked about providing passenger services from new locations, only 8% of respondents said this would not be valuable.

As passenger processing technology moves to the cloud, it's becoming possible for passengers to be checked-in by agents from anywhere. The passengers' bags are then securely transported to the terminal and injected into the standard baggage flow, with a secure chain of custody.

When airport leaders were asked about this trend, they saw the biggest opportunity in serving passengers at new locations around the terminal (52%), but significant numbers also expressed interest in hotels, city centers and major events too.

For Amadeus and its customers, the potential of flexible passenger services isn't new. In fact, it's already happening around the world today.

Top locations for flexible passenger check-in and baggage services:



> The aviation industry is really starting to re-think how it serves passengers. When you free the industry from legacy technology tied to a specific location, it's amazing to watch the new ideas the industry has to make life easier for passengers. ACUS is being used to make some of the largest movements of people and most complex global events much easier."

Holger Mattig

SVP Product Management, Airport and Airline Operations
Amadeus

03

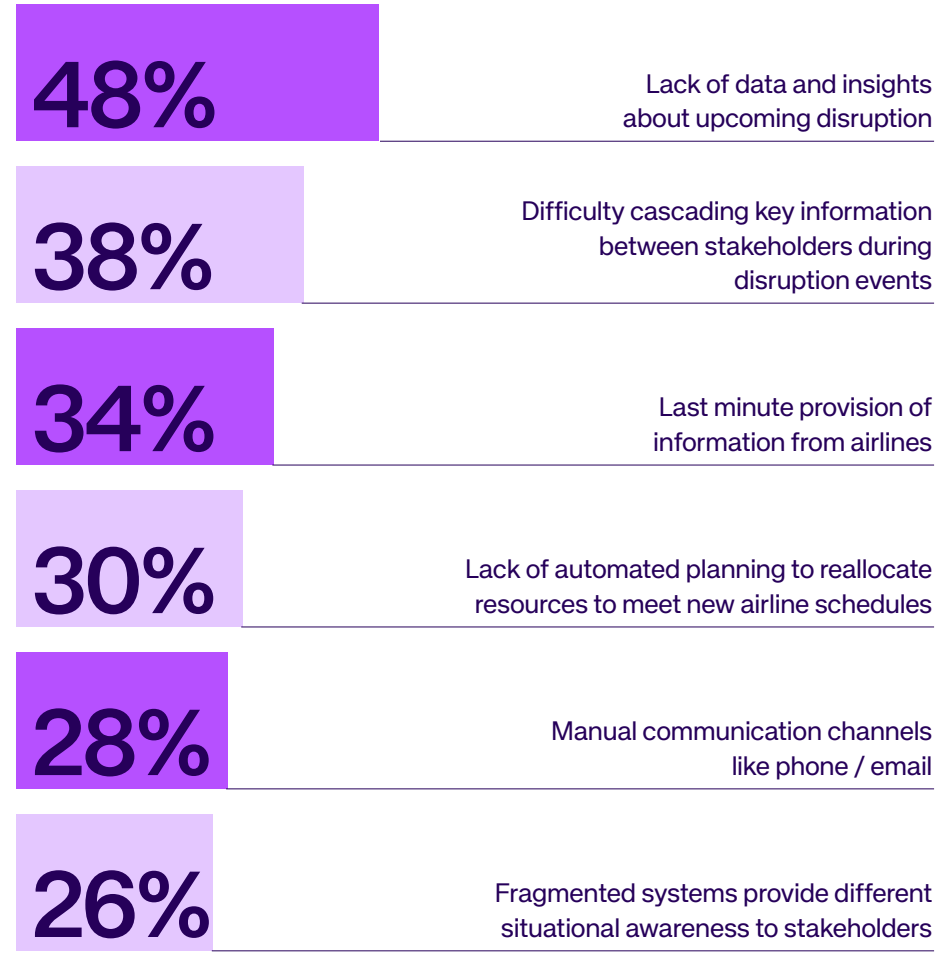
Disruption management

Some 52% of airports are seeing more disruption than before the COVID-19 pandemic, with a further 32% seeing about the same levels. Only 14% reported less disruption than 2019.

Respondents were split on whether disruption would return to its pre-pandemic norm.

Some 48% feel elevated levels of disruption are here to stay, with 38% saying disruption ‘will eventually’ return to 2019 levels.

Top challenges when managing disruption:



Everyone agreed there are challenges when managing disruption. The most significant relating to a lack of timely information and an inability to share key information amongst stakeholders.

Top direct and in-direct airport costs arising from disruption:

Only 4% of respondents said disruption didn't result in additional costs for their airport. Airports see disruption adding cost in four key areas. Interestingly, more airports cited the impact of indirect costs than any other area.

Airport leaders agree there are a wide range of capabilities that could improve how disruption is managed. Respondents particularly highlighted technology that can automate disruption response, deliver a common situational awareness and provide advanced warning of potential disruption.

54% Brand damage from disruption has an indirect cost

50% Disruption leads to reduced spend at retail and leisure facilities

46% Reduced flight / passenger movements impact aeronautical revenues

38% Inefficient use of airport resources hits bottom-line

Top capabilities to improve disruption management

Amadeus recently interviewed a number of industry leaders from airports, airlines, ground handlers and industry bodies as part of a dedicated report, to better understand how the industry is working to mitigate disruption.

58% The ability to automatically optimize the re-allocation of airport resources like stands and gates in seconds based on revised airline flight schedules during disruption events

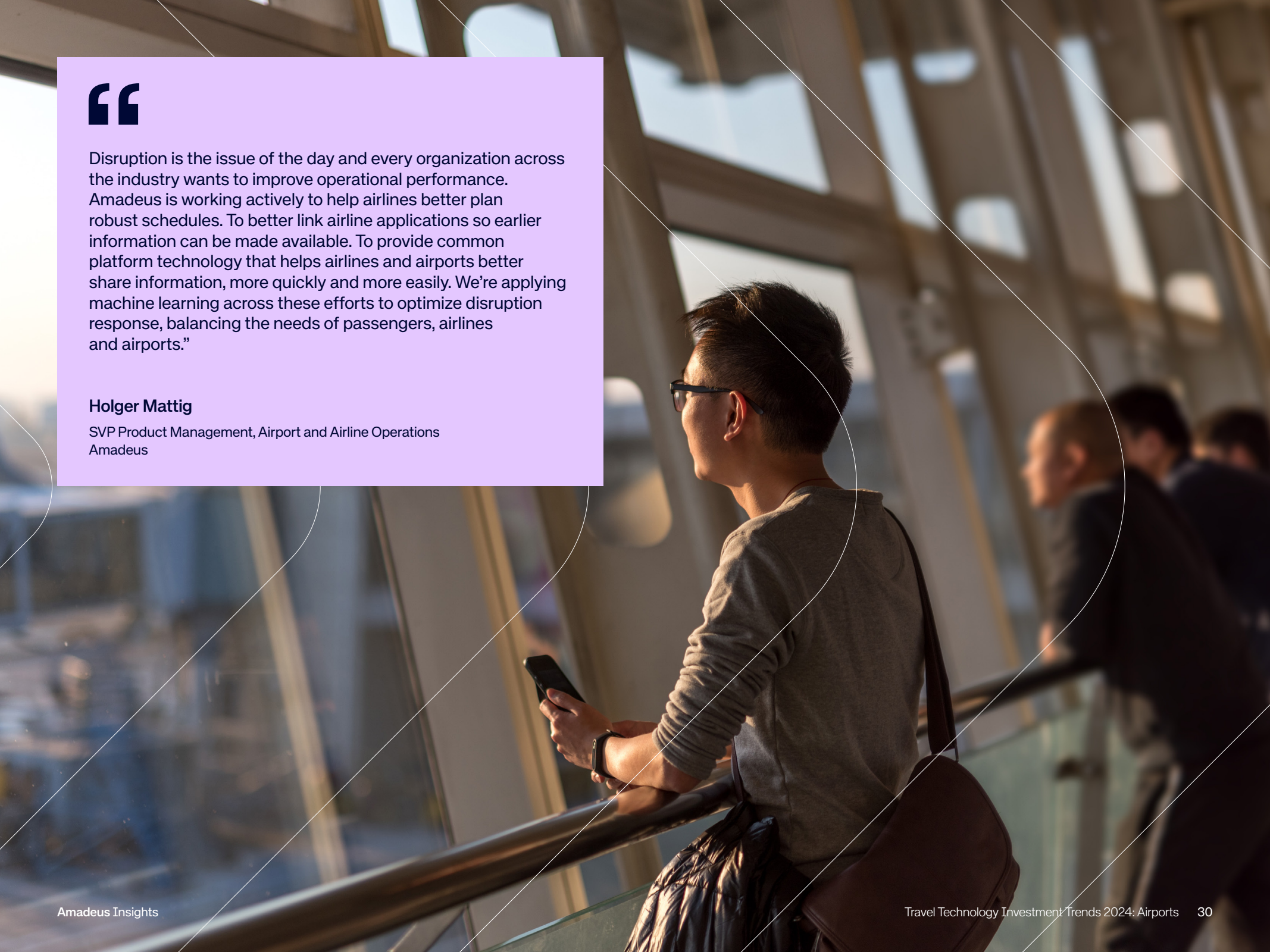
48% Single technology platform where all stakeholders could gain a common situational awareness and communicate digitally in one place

48% Data analytics that could predict when disruption is likely to occur offering advanced warning

40% Improved information sharing with other airports for an understanding of the impact of disruption on entire air transport network

38% Data analytics that could analyze the airport's response to disruption scenarios offering insights to improve in the future

36% Better cascading of information amongst stakeholders (e.g., if a plane's fault detection system was able to alert all stakeholders instantly when an issue occurred)



“Disruption is the issue of the day and every organization across the industry wants to improve operational performance. Amadeus is working actively to help airlines better plan robust schedules. To better link airline applications so earlier information can be made available. To provide common platform technology that helps airlines and airports better share information, more quickly and more easily. We’re applying machine learning across these efforts to optimize disruption response, balancing the needs of passengers, airlines and airports.”

Holger Mattig

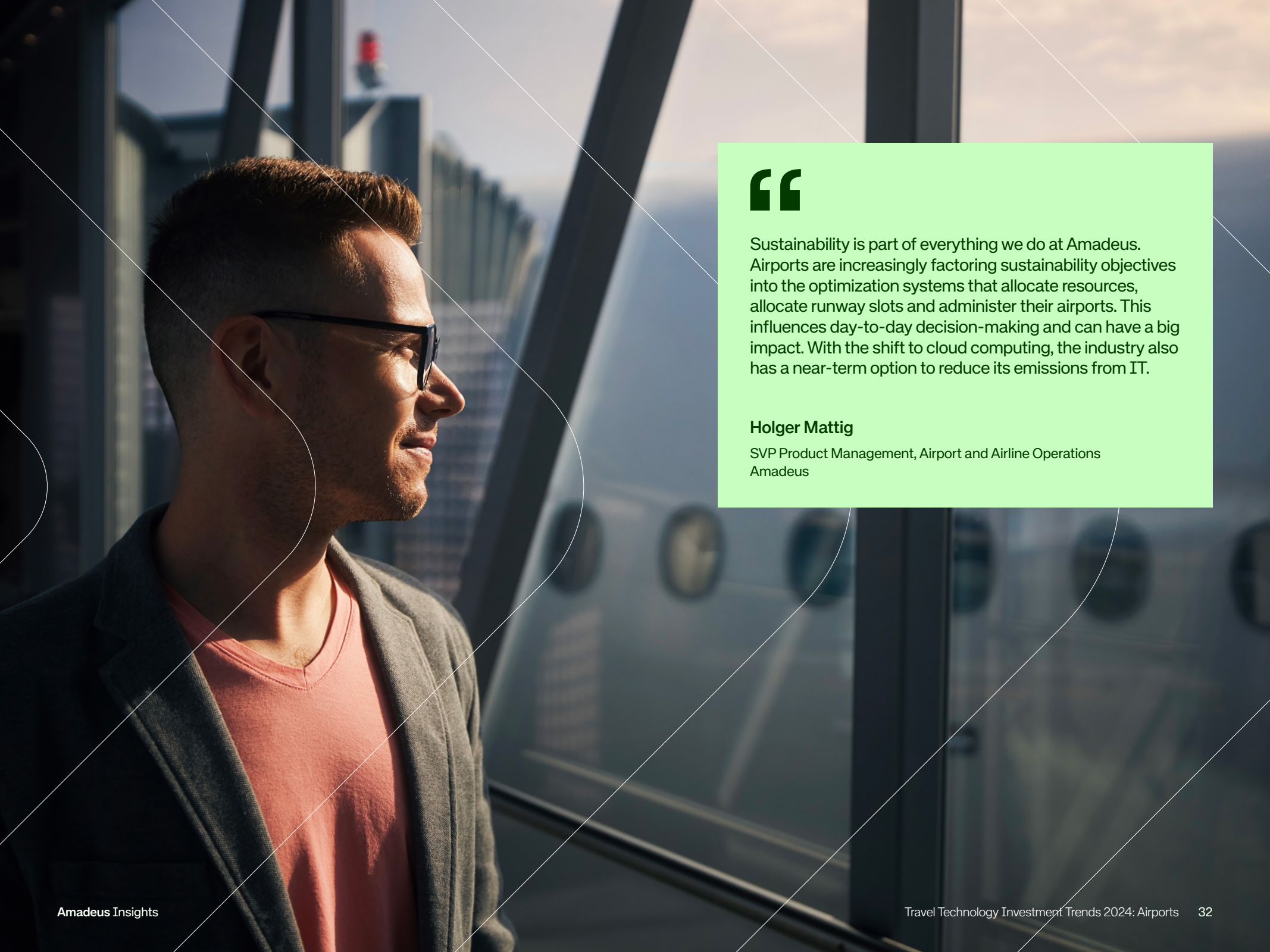
SVP Product Management, Airport and Airline Operations
Amadeus

04

Sustainability

Sustainability featured as a top priority for airport technology leaders. In fact, this study asked about sustainability on several occasions, and it always ranked in the top two considerations, with 76% of respondents confirming that sustainability objectives are an ‘important’ (28%) or ‘very important’ (48%) driver of technology investment for their airport.

Airport leaders were asked about ten specific technologies that can contribute to an airport’s sustainability goals. More than three-quarters are either investing in these technologies already or plan to do so in the future. Typically, between 40-50% are already investing in them today, with a further 30-40% planning to do so in the future.

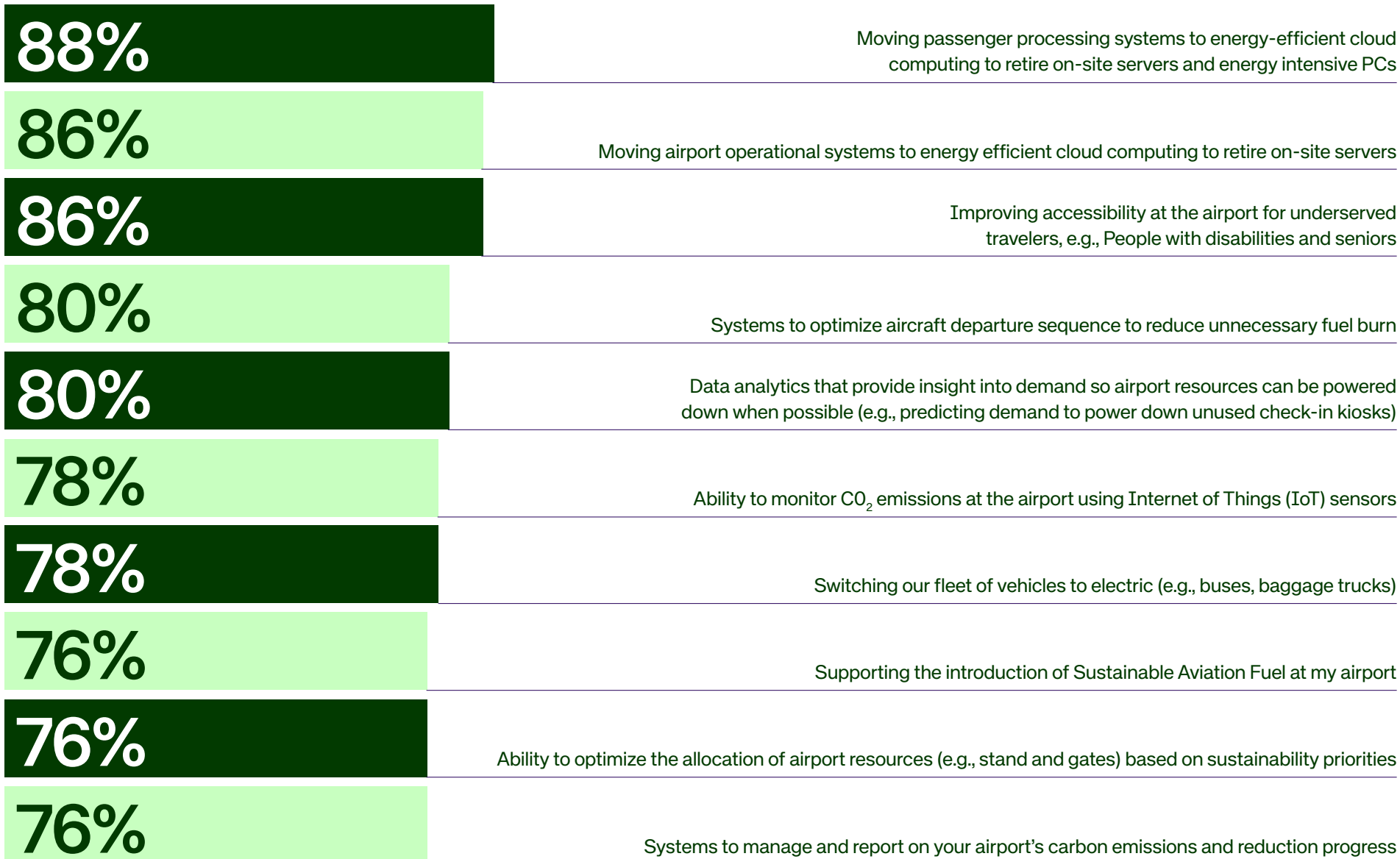


> Sustainability is part of everything we do at Amadeus. Airports are increasingly factoring sustainability objectives into the optimization systems that allocate resources, allocate runway slots and administer their airports. This influences day-to-day decision-making and can have a big impact. With the shift to cloud computing, the industry also has a near-term option to reduce its emissions from IT.

Holger Mattig

SVP Product Management, Airport and Airline Operations
Amadeus

Technologies to improve airport sustainability (currently or 'planning to' invest in each area)



Conclus

The results of this study highlight the broad range of challenges airport leaders face, from elevated levels of disruption to staff shortages and the need to take action to reduce their airport's environmental impact. In each case, respondents to our survey see a role for technology-enabled change.

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When it comes to ‘doing more with less’ and improving the passenger experience, the industry is already very advanced with deployment of self-service technology across all passenger touchpoints. This study indicates the vast majority of airports plan to follow-up this investment by adding biometrics at these same steps in the airport experience over the coming years.

With 90% of airports in the Travel Trends Investment Study ‘already’ or ‘planning to’ invest in advanced passenger processing technologies it does seem like passengers can expect smoother and better-connected airport experiences in the years ahead.

The industry is also open to exploring the provision of passenger services delivered from new locations inside and outside the terminal, enabled by the widespread move to cloud passenger processing technology.

The ability to collate, analyze and act based on data insights remains a key near-term priority for airports, with interest in new technologies like machine learning, generative AI and even mixed reality using Augmented and Virtual reality in the longer term. Although, with 42% of airports reporting difficulty capturing, collating and analyzing data, more work remains to be done.

A significant number of airports are also acting on sustainability. Whether it’s by moving key passenger and operational systems to more energy-efficient cloud computing or applying advanced optimization algorithms to limit fuel burn on the runway, sustainability goals are directly driving investments in technology.

Yet, to focus on a single theme to emerge from this study, it would be the need for better collaboration across the industry. In fact, airport leaders said a lack of common technology that can bring stakeholders together around shared processes was the top technology challenge. This was particularly apparent when we probed airport leaders on disruption management, with a lack of timely information and an inability to effectively share information topping the list of frustrations.

Although there is certainly cause for optimism. More than a third of airports reporting they are already engaged in projects to improve data sharing with airline partners. More collaborative technology is being implemented across APOCs to improve day-to-day operations.

With airports planning to invest an average of 17% more on technology over the coming year, IT teams are expected to be better resourced. The question is likely to be: how best to prioritize this investment for the biggest impact?

Methodology

This report is informed by a survey with 50 senior leaders from airports that are involved in technology investment decision-making. The research was carried out in 10 markets to provide a globally representative view. Respondents were drawn from the following markets: Brazil, China, France, Germany, India, Mexico, South Korea, UAE, UK and USA.
The survey was conducted by independent market research agency, Opinium in Q4 2023.

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It’s how travel works better.