

INTELLIGENT
AIRPORTS
FROM
FRICTION
TO FLOW

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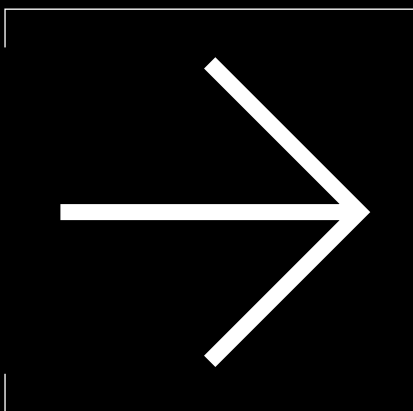
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01 INTRO- DUCTION



“I find myself eagerly anticipating a modern airport experience, as the traditional duty free shops lack integration of technology. So far, my encounters with digital innovations have been limited to pre-pickup and delivery services, leaving me longing for a truly impressive experience.”

[BERNARD SCHLAFSTEIN, CEO HEINEMANN
MIDDLE EAST AFRICA]

Welcome

Airports are spaces of contradictions. They facilitate heavy metal tubes to fly people safely across hemispheres. Yet they remain heavily reliant on paper passports. They are highly regulated spaces of expected behaviours to ensure safety and security — yet 90% of people want to feel more in control of their experience.

More and more people are on the move, navigating this dance between high and low-tech, yield and yearn. Amid these complexities, there’s a consistent message: people are seeking an uncomplicated, streamlined airport journey.

When small things go wrong at the airport, delays can accumulate quickly, impacting thousands of people — both passengers and staff. So, how might we change this dynamic so that, more often than not, things go right? What if we could facilitate a seamless airport experience from arrival to departure?

In our previous report, *Airport Futures: From Function to Feeling*, we learned that how travellers feel impacts their satisfaction and behaviour at the airport, with 54% of people agreeing airports are more stressful than relaxing.

In a time of rapid digital advancement, how can we apply emerging technologies to the airport experience to facilitate better function and positive feelings? What if we could design an end-to-end airport journey that feels seamless, connected, intuitive, and contextual — and still, somehow, human?

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“Airlines and airports hold vast amounts of data, yet it remains unconnected. Our focus for the coming years is to bridge these gaps, ensuring travellers enjoy a smoother, more convenient experience without the hassle of switching between different services.”

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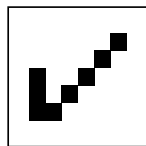
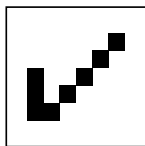
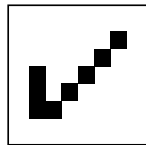
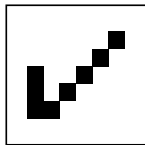
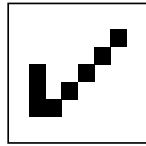
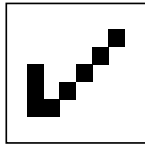
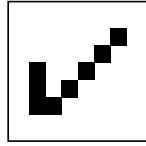
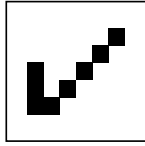
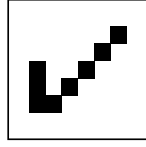
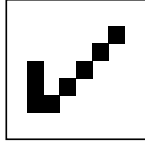
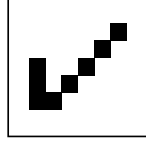
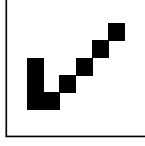
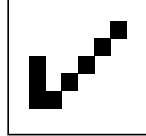
[SOREN BORCH, DIRECTOR SALES EXPERIENCE & EXCELLENCE, GH]

Transforming Stress Into Happiness

↘ LESS

	QUEUING		“WHY IS NO ONE READY?!”
	CONFUSION		“PLEASE CAN I SEE YOUR BOARDING PASS?”
	STRESS		RUNNING BETWEEN GATES
	SWEAT		STARING AT DEPARTURE BOARD
	SHOES OFF/CLEAN SOCKS ON HIGH-TRAFFIC FLOOR		
	MISSING LUGGAGE		
	CRAMMING TOILETRIES INTO TINY PLASTIC BAGS		

↗ MORE

	CALM		INTER-LINGUAL CONVERSATIONS
	QUIET		NURTURING INTERACTIONS
	NATURE		TIME WELL SPENT
	SPARE TIME TO FILL CREATIVELY		RECEIVING A GENTLE NUDGE
	NICE SMELLS		SOFT DIGITAL STORYTELLING
	EASY-TO-FIND WATER STATIONS		THE MAGIC OF AIRPORTS
	SAILING THROUGH EACH CHECKPOINT		

Intelligent Airports: From Friction to Flow is the second in a series of reports by Gharage examining shifting traveller preferences and what they mean for the future of airports.

Through this research, we imagine a realistic but aspirational tech-enhanced vision for airports. We explore how emerging technologies can be applied to serve both functional and joyful ends — to design a significantly different passenger journey.

In this report, we ask:
What are the most promising avenues for emerging technologies in airports?
How can we maximise the benefits of technologies, while balancing cost-effectiveness, new and existing infrastructure, and shifts in traveller behaviour and expectations?

This report does not aim to deliver all the answers. It sits with the complexity of the multiple evolving parts and people within the airport context. Through expert perspectives and inspiring case studies, it aims to deliver a sense of direction to navigate towards. We include 6 strategic opportunities for testing these exciting new concepts so emerging technologies can be better integrated into the end-to-end airport experience.

We conducted a three-stage mixed-method research study that surveyed global travellers and expert stakeholders.



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[01] Explore

We started with a qualitative exploration via 9 x 45-minute interviews with experts within the airport travel sector and from different airports. The findings from these interviews informed the design of the quantitative survey.

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[02] Measure

We surveyed more than 6,000 people across 12 countries (n=500 per country) to gather quantitative data. This large-scale, multi-country online survey engaged frequent travellers (aged 18+) who have taken two or more return flights in the last year.

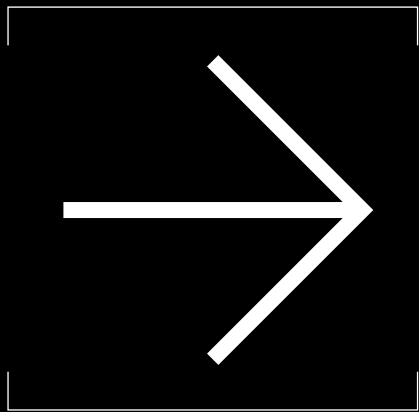
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[03] Enrich

We conducted additional qualitative depth interviews to animate the numbers with rich traveller stories. We performed 45-minute in-depth interviews with 10 travellers from six countries.

REF.	COUNTRY	DATA
[01]	USA	QUANTITATIVE + QUALITATIVE
[02]	UK	QUANTITATIVE
[03]	DENMARK	QUANTITATIVE + QUALITATIVE
[04]	GERMANY	QUANTITATIVE + QUALITATIVE
[05]	FINLAND	QUANTITATIVE
[06]	TURKEY	QUANTITATIVE
[07]	SOUTH AFRICA	QUANTITATIVE
[08]	SAUDI ARABIA	QUANTITATIVE + QUALITATIVE
[09]	INDIA	QUANTITATIVE + QUALITATIVE
[10]	SINGAPORE	QUANTITATIVE
[11]	CHINA	QUANTITATIVE + QUALITATIVE
[12]	AUSTRALIA	QUANTITATIVE

02 CONTEXT



“It’s not human vs.
machine but human
and machine.”

[ARTIST & MIT MEDIA LAB RESEARCHER
SOUGWEN CHUNG, OPEN-ENDED #2023]

What’s Going On (With Tech)

Generative AI

The rapid evolution of generative AI is transforming content creation, design automation, and user experiences.



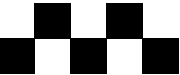
Polyfunctional Robots

Robots are evolving to perform multiple tasks across various industries, from manufacturing to healthcare, enhancing efficiency and versatility.



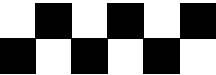
Invisible Intelligence

Ambient technologies are designed to integrate seamlessly into our daily lives and create spaces (like smart homes) that anticipate and adapt to our needs without requiring voice commands.



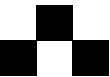
Neurological Enhancement

Advancements in biotechnology and AI are leading to developments in neurological enhancement, potentially improving cognitive functions.



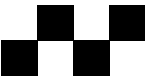
Post-Quantum Cryptography

The development of post-quantum cryptography, which creates new algorithms to resist quantum attacks, is essential to maintaining data security in the quantum age.



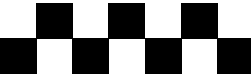
Spatial Computing

Using augmented reality (AR) and virtual reality (VR) to create immersive experiences continues to revolutionise industries, including retail, education, and travel.



Internet of Things

The integration of IoT and AI enables devices to process data locally, leading to more intelligent and autonomous systems. Real-time decision-making and predictive analytics improve operational efficiency.



We are living through an innovation super cycle¹, where tech permeates and facilitates every aspect of our lives. The global landscape is driven by the convergence of technologies like AI, connected systems of things, and biotechnology². Despite overall optimism about AI’s future impact, uncertainty remains high and ‘loss of human qualities’ is a concern. While the dream of AI was sold as a simulation of human intelligence demonstrated by machines, we’re still waiting for these envisioned robo sapiens to perform as promised. Amid a blurred future of humans and machines, travellers desire technologies that are both simple and sophisticated, and human connections that co-exist with AI efficiency.

How This Manifests At The Airport

The airport, traditionally a liminal non-place³ of contractual relationships, prescribed movement, and expected behaviour, is evolving in response to this increasing technology integration. This evolution reflects a broader shift towards personalised, stress-free, and experience-rich environments for travellers.

Make it Simple

In 2024, amid the chaos and burnout of modern life, 67% of consumers actively sought ways to simplify their lives⁴. This simplification encompassed both product choices and online experiences. People are increasingly prioritising convenience, but not at the expense of quality or other values. While speed and ease of use are highly valued, there’s a growing recognition that overly automated experiences can be detrimental to customer satisfaction.

This nuanced view of convenience presents both opportunities and challenges for airports, requiring a careful balance between efficiency and personalised experiences. For example, while many consumers appreciate quick solutions (55% prefer them over traditional methods), some retailers are moving away from self-checkouts due to errors, costs, and a desire for more ‘human’ interaction. A middle ground for experimentation might lie in humanising UX and UI with more caring, conversational language.

Come Together

The desire for belonging and connection is constant and universal. Online groups built around shared interests provide a sense of belonging by facilitating real-time connection and content sharing. These private communities offer security, especially for younger generations, and encourage identity formation and creative expression. In contrast, physical spaces can offer invaluable grounding experiences in shared reality⁵. The question remains: how can we defy digital and physical boundaries to enhance human connection?

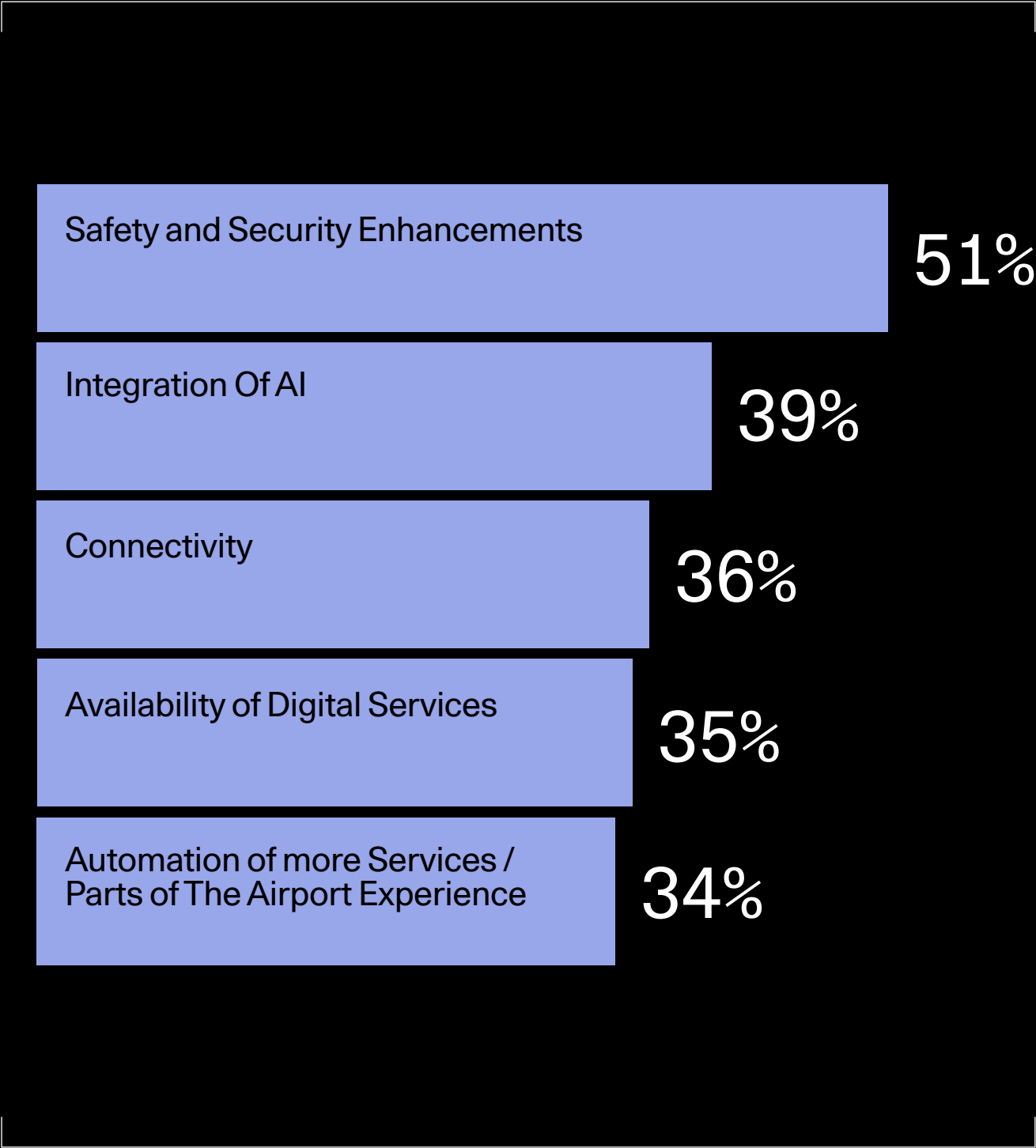
At the airport, 81% of travellers believe that it's important to feel accepted and valued. Multi-platform experiences at airports might introduce concepts that provide travellers with unique, communal, and immersive pre-flight activities, elevating their overall experience at airports.

Quiet Time

With fast-paced lives, we often squander our most valuable asset: time. In our previous report, we introduced the idea of softer, slower tech: how technology can help us to rediscover slowness and intentionality in our daily routines. In creating moments of pause, we can allow space for the unexpected and calm our senses. Airports will increasingly adopt designs that make the most of our waiting time, prioritising increased comfort and reduced anxiety. Such initiatives demonstrate an effort to address the mental well-being of travellers by creating more inclusive and comfortable environments, bringing humanness back into travel.

Airports might also offer services that encourage travellers to disconnect from their devices. The emphasis on personal interaction and analogue experiences could manifest in designated tech-free zones or digital detox lounges, where travellers can unwind without the distraction of screens.

What People Want From Tech in Airports



What Travellers Have Told Us

Technology Utilisation

Travellers frequently use mobile apps for navigation and flight management, self-check-in kiosks, and biometric security like facial recognition to speed up airport processes.

Convenience Appreciation

There is a strong appreciation for automated systems that streamline security clearance and self-service options, significantly reducing waiting times and enhancing independence.

Frustrations with Delays

Travellers are frustrated by long lines, manual security checks, and paper verifications, which they find cumbersome, especially when carrying multiple items.

Suggestions for Improvement

Recommendations include developing user-friendly apps for real-time updates, clearer signage, and more automation in security checks.

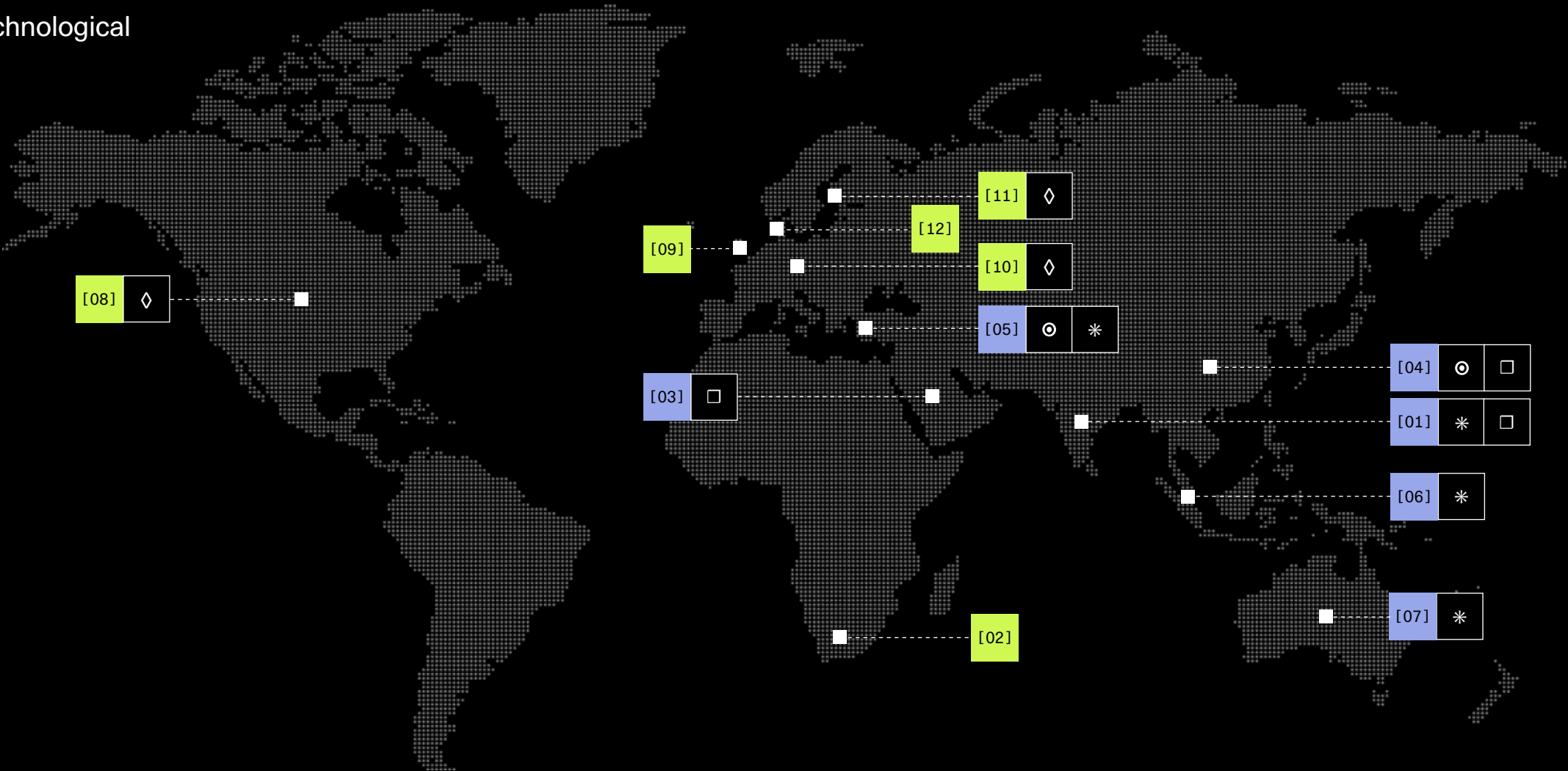
Sentiment Analysis

Overall sentiment towards airport technology is predominantly positive (60%), with 30% expressing mixed feelings about its effectiveness and 10% showing no sentiment.

Mapping Tech Interests

Average regional appeal in integrating technological advancements in airports.

REF.	APPEALING PERCENTAGE	TOTAL
[01]	INDIA	77%
[02]	SOUTH AFRICA	78%
[03]	SAUDI ARABIA	73%
[04]	CHINA	66%
[05]	TURKEY	66%
[06]	SINGAPORE	62%
[07]	AUSTRALIA	61%
[08]	USA	54%
[09]	UK	49%
[10]	GERMANY	49%
[11]	FINLAND	44%
[12]	DENMARK	40%



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What markets want

AI & Personalisation

⊙

China, Turkey

Security

◇

USA, Germany, Finland

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Airports considered ‘best’ because of the way tech is integrated into the airport experience.

*

Sydney, Delhi, Singapore, Istanbul

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Integrating automation and technology is a top factor for making the airport experience enjoyable.

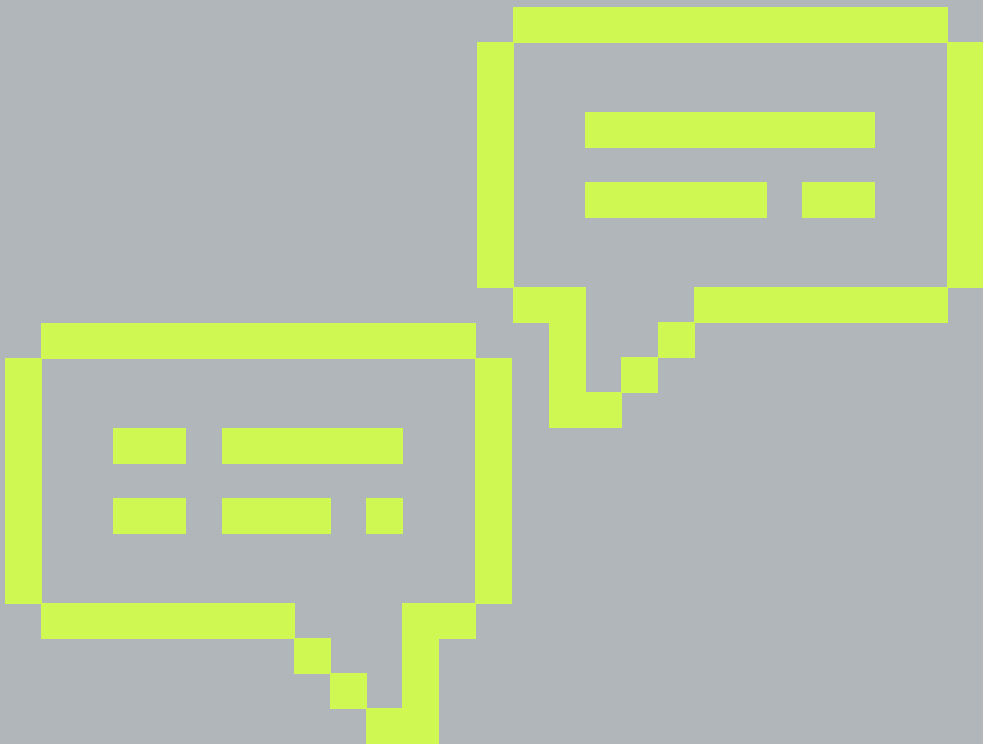
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China, India, Saudi Arabia

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APAC and the Middle East place greater importance on tech to improve airport experience.

In Conversation With Random Studio



Respondents:

ROEL WOUTERS:
Artist and Director, leading Random’s Living Lab, an internal artistic research lab that investigates and expands our concept of Living Spaces through a series of experiments.

STEPHEN BUCHANAN:
Senior Creative Technologist at Random Studio, turning ambitious concepts into working productions using custom hardware and software.

LEA LEMAIRE:
Leading Creative Strategy at Random, translating business goals into creative requirements while blending storytelling, market insights, and cross-disciplinary collaboration to shape the early stages of projects.

Random is an independent experience design studio with offices in Amsterdam and Paris. They are a certified B Corporation®. The team brings together a diverse mix of disciplines — including strategists, interaction designers, architects, creative technologists and producers — collaborating to craft spaces that spark curiosity and invite dialogue.

With a portfolio featuring collaborations with brands such as Apple, Nike, Chanel, and Gucci, Random develops projects ranging from AI-powered community experiences to dynamic retail spaces. Beyond visual impact, the focus is on creating experiences that cut through the noise, leave a lasting impression, and spark conversation. Grounded in research, trends, and hands-on rapid prototyping, each project is shaped by a commitment to innovation and exploration of emerging technologies.

[Q]
What’s going on with tech? We are living through an innovation super cycle, where tech permeates and facilitates every aspect of our lives, what is happening and why?

[A]
[Stephen Buchanan] What’s interesting for designers and creatives is that immense computing power has become so cheap and accessible. Mass production makes things cheap, and the Open Source movement makes it possible to tinker and experiment with advanced technologies without having to build everything from scratch. You also don’t need to understand all the underlying mathematics and science: even massively complex things like Artificial Intelligence models are available to play with and re-use in all kinds of ways that the original designers never imagined or intended.

[Roel Wouters] Where the previous tech super cycle (the web) was all about the promise of democratising the world’s knowledge and connecting people around the world. The current AI-fuelled super cycle has a very different vibe. For the first time in the history of humanity we are able to engage in deep emotional relationships with non-humans. Currently it is hard to see the consequences of this but it will definitely have a great impact on how we will relate to each other. One could say that where the previous supercycle was gravitating towards connection, the current one might gravitate towards isolation. This is why we at the Living Lab are investigating how contemporary technology can be leveraged to bring people together in the real world.

[Q]
People are seeking an uncomplicated, streamlined airport journey. How might tech facilitate a seamless airport experience from arrival to departure?

[A]
[Lea Lemaire] Technology can create a seamless airport experience by addressing common challenges like reducing wait times, avoiding congestion, better baggage handling, and offering tailored travel experiences to meet individual needs. Amsterdam’s airport does it quite well already, with an app demonstrating this by offering real-time estimates for security and baggage drop-off wait times, optimised paths to specific gates, and location-based notifications. Originally developed during COVID-19, it stayed after quickly proving essential in streamlining the airport journey.

The solution to reducing friction already lies in travelers’ hands: smartphones. Making use of digital IDs and wallets, facial recognition, or GPS, and designing in ecosystems to connect as many touchpoints and minimise platform switching has potential to streamline even more from what was described before. Some obvious but essential improvements.

More importantly though, technology offers a unique opportunity to create a more inclusive and accessible travel experience. Often overlooked are the “edge case travellers”, those with reduced mobility, vision impairments, temporary or permanent disabilities, those who require special assistance. Working with these groups to co-design solutions is a great opportunity for airports in making flow, information and navigation more accessible to all.

[Q]
How can we apply emerging technologies to the airport experience to facilitate better function and positive feelings?

[A]
[Roel Wouters] To me airports are highly non-personal and anti-social. There is no space for naivety, play, or cheating. It's a serious environment with hardly any ways to deviate from the norm. Most humans we interact with at the airport have to perform micro tasks (Can you please step aside sir) and are not allowed to improvise. In my case, that means I will shut off from all unnecessary human interaction. My Apple AirPods with active noise cancelling and playing Polytopia on my phone make time fly without me getting nervous about the absurdity of the reality around me.

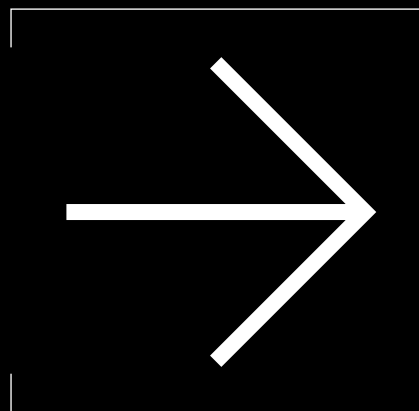
A fun observation here is that people seemingly like to play at the airport. If you get to the travelator (the flat conveyor belts in the long hallways), you always see people playing around! Being in a large environment that you can discover and feel you have the time because your holiday creates the right context and vibe to allow people to play. There are plenty of opportunities to use the current infrastructure for active and playful moments (like we did for Louis Vuitton's VVV exhibition).

So I would recommend implementing emerging technology in a way that would allow airports to feel less strict and rigid. Then I would be happy to pull out my airpods and start engaging with the space around me. It would put back some of the magic that flying naturally has. In the Living Lab we like to design digital products that allow highly technological space to turn into social spaces. Spaces that allow for play and interaction. Our project: Let's Pollinate is a great example in which we made people forget about their phones and start talking (or flirt) with people they would hardly know. Much of phone use stems from micro-boredom or overload — scrolling in line, hunting gate info.

[Lea Lemaire] Better function and positive feeling comes down to a smoother, more enjoyable airport experience rooted in speed, ease, and efficiency — enabled by the use of AI, automation and robotics, touchless technology, etc. Security also plays a key role in feeling at ease, though some may find this to be lost when airports move toward unmanned touchpoints.

To enhance the experience further, and aim for more positive feelings, adding interactivity could be impactful. Like the Living Facade Random developed for the French Jewellery Boucheron’s flagship store in Tokyo, imagine large windows that transform — clear by day, but at night revealing local nature scenes shifting in sync with the seasons, offering a subtle, evolving dialogue (and connection) with frequent travellers and staff, rewarding those who notice. To create this generative “living architecture”, we used the Unreal game engine, which provided the greatest opportunity for exploration and innovation.

03 DESIGNING A SEAMLESS JOURNEY



“Over the next decade, the air travel industry is going to grow exponentially. When implemented correctly, emerging technologies can help airports adapt to a new generation of digitally-engaged travellers, creating a responsive, seamless journey — whether that's getting to their gate or exploring the shop floor.”

[NICO REIFKOGEL, DIRECTOR BUSINESS
DEVELOPMENT SALES, GH]

[03.1]

Getting the Basics Right with Tech

Passengers are frustrated by long waits for checking in and dropping bags, and dread queues for security and border control. It's these essential checkpoints that cause travellers the most stress. They can hear final call announcements, yet the bottleneck is unmoving, and there's no mechanism to communicate the urgency.

Exploring technological interventions in this early phase of the airport experience presents the greatest opportunity for enhancing passenger happiness — and creating a positive foundation for the remainder of the airport journey. In our research, it's also the most requested innovation:

51% of people would like to see technology applied to safety and security enhancements.

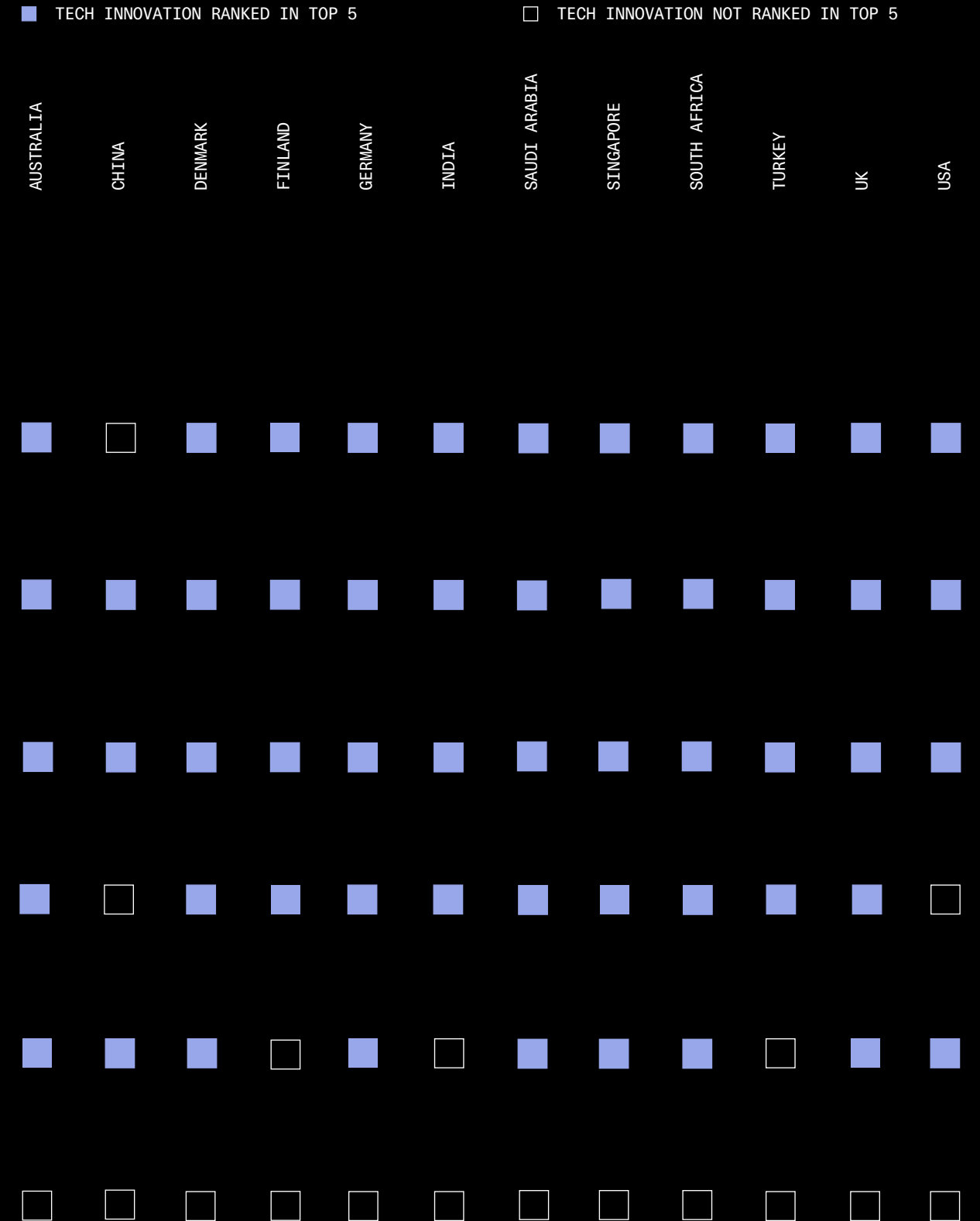
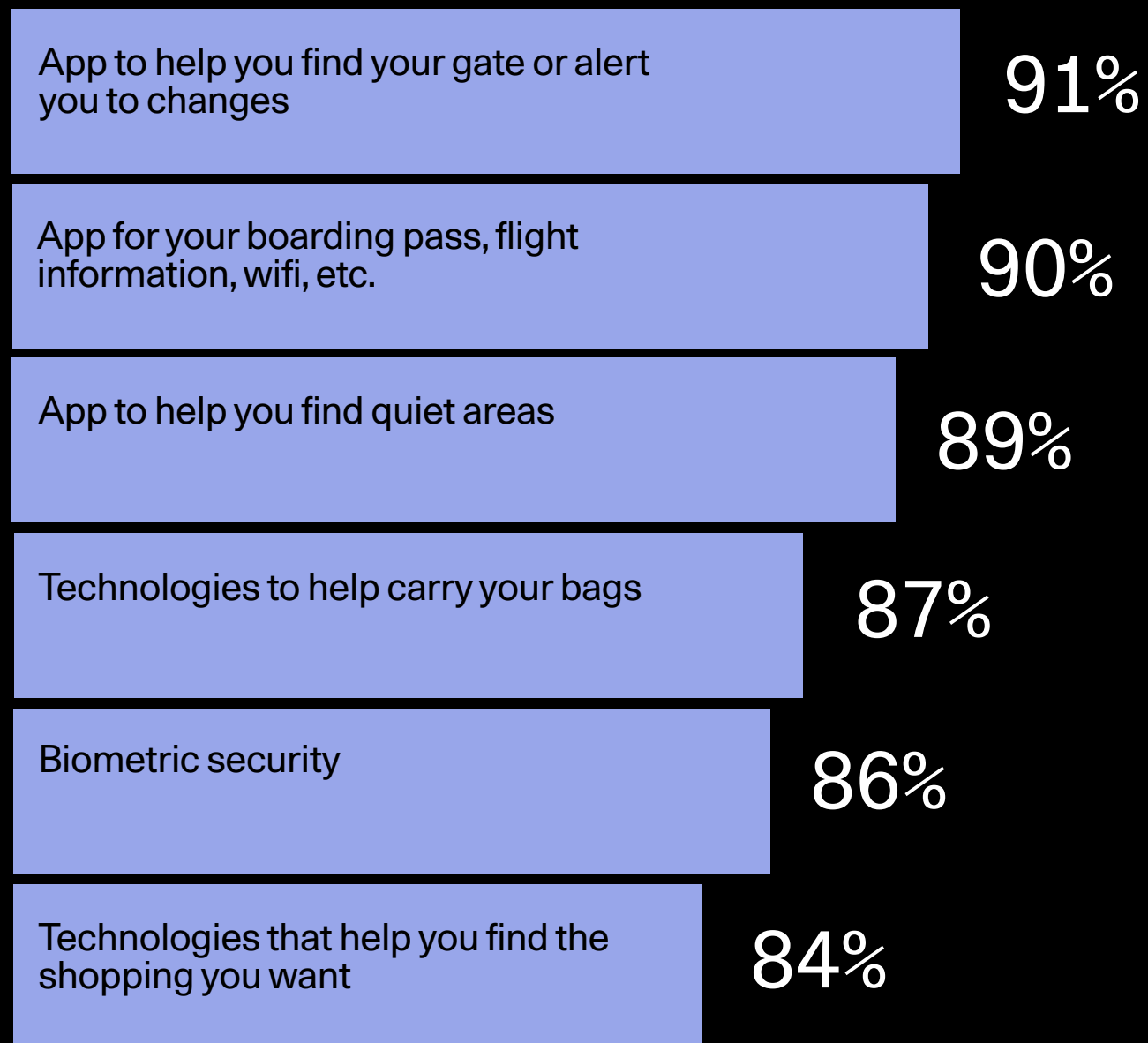
Enhanced safety is always at the top of travellers' minds at the airport, but they're equally interested in a pleasant experience. So, how can we transform winding queues of slowly shuffling bodies and bulky luggage into low-touch, free-flowing processes?

Airlines are innovating in their use of AI and robots, like KLM's Spencer⁶, a multilingual robot designed to guide passengers to the correct gate. It's anticipated that biometric scanning and AI-driven security checks could reduce queuing time by 30-40%⁷.

Cody Candee, founder and CEO of Bounce, told us "Emerging technologies bring airports new opportunities to meet the needs of today's digitally connected travellers, who expect greater speed, flexibility, and control at every touchpoint. Frictionless services — like tech-enabled luggage storage — empower passengers to move with ease from arrival to departure."

Improving Basic Services Through Tech

Appeal of digital and technological advancements



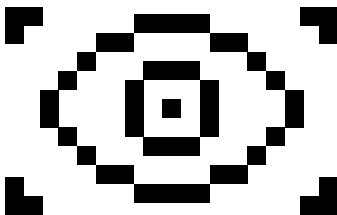
Contactless Check-in

While biometrics for identity screening might still feel like a futuristic concept for many people, the technology has existed since 1969, with the first fingerprint scanners introduced in the US in 1975⁷. Fast-forward 50 years and 73% of people prefer using biometric data instead of traditional passports and boarding passes⁸.

Biometrics could facilitate pre-airport ID screening and contactless walk-through immigration.

Challenges arise in making this technology widely accessible and uniform for cross-border collaboration. Experts flag privacy, transparency, and surveillance concerns that could come with passports being phased out⁹.

People are seeking simple, easy-to-navigate digital experiences, with 52% of consumers citing ease of use as their primary reason for using digital wallets¹⁰.



Biometrics still feels ‘new’ to 24% of people.



At DXB airport in Dubai, facial recognition technology enables Emirates passengers to stroll through check-in, immigration, and boarding and also access the lounge. A quick photo at check-in links people’s retina scans to their passports, facilitating a contactless journey through biometric smart zones¹¹.

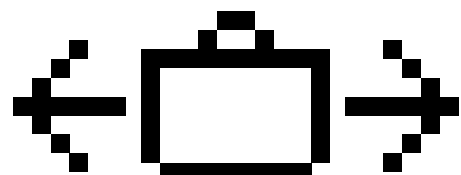
Buoyant Baggage

A 1997 article on airport futures speculated solving “the luggage nightmare” with suitcases air-couriered from home to destination with top security technology but no passenger involvement¹². Private door-to-door baggage transport services now exist, and with their increasing popularity, some airports are considering how to reimagine these spaces within airports.

Behind the scenes, airports like Munich are innovating with better robotics for lifting and tracking baggage to reduce errors (and misplaced bags) as passenger and cargo volumes increase¹³.

Korea Air’s mobile app notifies passengers before take-off that their luggage has safely boarded the correct flight, easing stress¹⁴. Passenger side, robots can now follow you around the airport, carrying your luggage¹⁵.

While automation aims to improve convenience, airports still need (human) staff on hand to answer passenger questions and resolve digital glitches.



Baggage-carrying technologies rank among the top 5 tech advancements desired by 10 out of 12 key markets.

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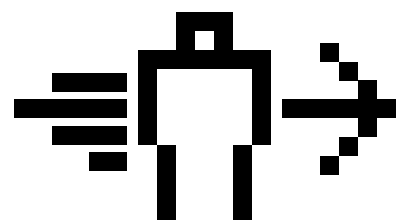
The Bounce App currently operates in over 4,000 cities and 86 countries worldwide, offering travellers the ability to locate and reserve luggage storage in convenient locations, simplifying not only luggage transportation with seamless tech but storage as well¹⁶.

Zero-Queue Security

People are already experiencing multiple tech touchpoints at security, but it's far from a seamless affair. Security is a complex hotbed of humans and machines, often with many workers operating the infrastructure and guiding passengers. Technologies and processes differ from airport to airport — a source of stress for passengers trying to move through efficiently and follow the rules. It's a major bottleneck where automation and AI could improve flow and enhance passenger happiness.

These technologies must feel unobtrusive while enhancing

safety and reducing stress. Already, solutions include 3D computed tomography screening, which removes the need for people to take toiletries, laptops and other items out of their bags — and has halved the time passengers spend going through security in the UK¹⁷. EuroAirport Basel Mulhouse Freiburg operates shoe scanning technology so that boots can stay on. Fukuoka International Airport has installed an automatic tray return iLane¹⁸. Private firm Landline performs off-site security screening and transports passengers via bus between Philadelphia, Allentown, and Atlantic City airports¹⁹.



Digital ID customers move through security 60% faster than standard TSA PreCheck customers²⁰.

X



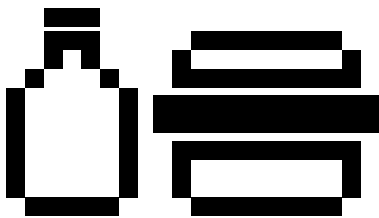
After a one-year test phase, Frankfurt Airport now operates enhanced security scanners that allow passengers to walk through at their usual pace without needing to pose or wait for the scanner to complete. The millimetre-wave technology reduces queue times and makes checkpoints faster and easier to navigate²¹.

Predictive Maintenance

As airports increasingly experience productivity pressure, connecting siloed data sets can be a potent tool for smoothing airport hygiene factors. An Airport Internet of Things — a network of connected technologies brought together to do something new — presents the possibility of joining up existing infrastructures rather than technological solutions always requiring a total overhaul. AI-powered analytics improve operational efficiencies and transparency by transforming maintenance needs from reactive to predictive.

Think Minority Report levels of precognition but for cleaner toilets and fixing escalators before they're out of order²².

Specifically designed for transit and airport facilities, floor-cleaning robots are equipped with sensors that detect spills and address them autonomously²³. But just like robo vacuum cleaners and lawnmowers before them, they sometimes end up stuck in a corner — or interrupt a line of passengers waiting to board. IoT could alert human workers to intervene until Mop-bot evolves to have more contextual awareness.



93% of people would be happier if their basic needs were better met, including water, food, and seating.

X



Edinburgh Airport is leveraging AI, machine learning and apron-mounted cameras to monitor 30 ground-handling processes to enhance efficiency and predict delays up to 40 minutes before. The technology will ease capacity constraints and improve passenger experience through precise data, streamlined processes, and stakeholder collaboration²⁴.

[03.2]

Intuiting Needs + Desires

As emerging technologies reshape services and customer journeys, people increasingly expect smoother, more personalised attention — accentuating the ‘custom’ in ‘customer’. In particular, young travellers (18-34 years) place high importance on personalised experiences (82%), with the average across all age groups also high at 74%. Despite desiring an end-to-end journey that’s personalised to individual needs, 53% of consumers are highly concerned about the privacy of their personal information²⁵.

While increased data points (and sense-making across data sets) are key to seamless personalisation, transparency and control over data usage remain important factors. 90% of passengers want to feel in control of their airport experience — and this sentiment extends to data privacy. Building and maintaining trust is also crucial for successful personalisation strategies, with an 11% increase in comfort levels when people trust an organisation.

Istanbul Airport’s CCO Ceren Tonguc told us: “While some may shy away from using advanced technology, younger travellers are eager to leverage AI for a smoother journey through the airport.”

When 94% of people strongly state that a nice airport experience is as important as safety and security, the future is ripe for highly personalised apps and targeted recommendations that adjust with shifting trends and behaviours. The first step might be a simple welcoming gesture. Delta is testing a Parallel Reality screen in Detroit’s airport, where up to 100 people at a time can view a single screen where the information is tailored to them, welcoming them to the airport and guiding them to their gate²⁶. Information is presented in their language too: English, Spanish, Japanese, Korean, and otherwise.

Personalising the Traveller Journey

18-24 year olds are more likely to mention AI analysis and social media algorithms in their responses.

Overall, personalised technologies at the airport are important to 78% of travellers. For younger travellers (18-24), this jumps to 82%.

56%

App that tells you where to go based on your preferences and departure gate.

44%

Recommendations for meals or shopping based on data or preferences that have been entered into an app.

38%

Relevant suggestions based on data from rewards programs.

36%

Tailored recommendations for what to do in an airport based on wearables or smart devices.

34%

AI-powered recommendations based on analysis of your past behavior.

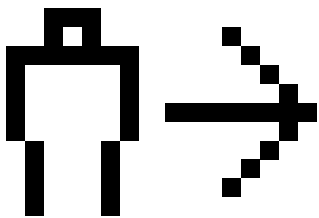
28%

Algorithms on social media making recommendations prior to your arrival at the airport.

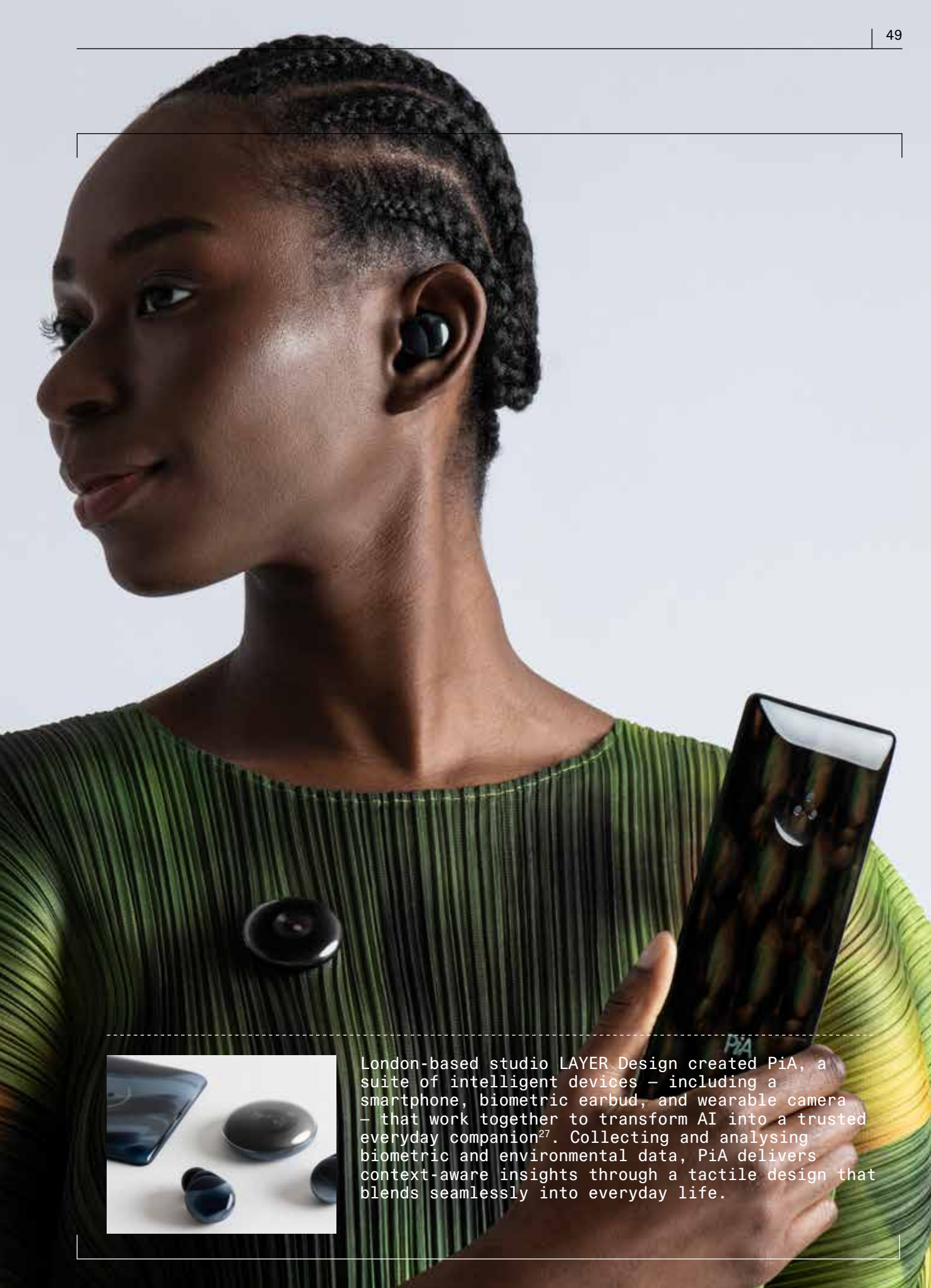
Finding Your Way

From our research, we learned travellers are particularly interested in apps as tools to facilitate future tech experiences, particularly if they can guide people to their gate (91%) or help them find quieter areas (89%). These figures suggest opportunities for reimagining wayfinding beyond a direct security-to-gate route to enable travellers to choose creative, customised ways unique to their needs and desires.

Wayfinding tech could recommend routes with stops along the way based on personal preferences, previous shopping data, and other inputs. It might share the estimated time and distance to the gate, suggest less congested routes if in a rush, and show available toilets or areas with more seating. We also know that 25% of people are ready to spend more time at the airport. So wayfinding prompts could also be playful: taking in nature or art installations; time-sensitive or cultural retail experiences only available at the airport.



56% of travellers would like to have 'an app that tells them where to go based on preferences and departure gate'.



London-based studio LAYER Design created PiA, a suite of intelligent devices – including a smartphone, biometric earbud, and wearable camera – that work together to transform AI into a trusted everyday companion²⁷. Collecting and analysing biometric and environmental data, PiA delivers context-aware insights through a tactile design that blends seamlessly into everyday life.

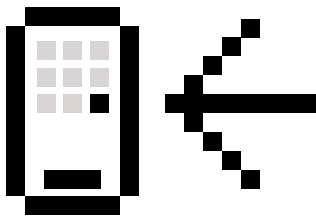
Carefully Curated

The rise of digital identity technologies is expected to enhance travel experiences by enabling smoother processes and personalised journeys. Passengers increasingly expect end-to-end personalisation at every step of the airport journey. There's a growing acceptance of AI in customer service, provided it enhances personalisation, with 61% of consumers desiring more personalised services driven by AI.

Most travellers are seeking a single app that shares everything from flight changes to curated knowledge to help them decide which retailers to visit while at the airport.

“The real transformation happens when AI becomes suggestive, anticipatory and truly agentic. That’s when things get truly interesting – when it integrates seamlessly into your life, anticipates your needs and provides a head start on what you’re planning. This is just the beginning of what’s possible.” – Don McGuire, chief marketing officer, Qualcomm, at Web Summit 2024.

iGA Istanbul Airport is leading the way with its mobile application, which aims to enhance the terminal experience, promote sustainable passenger movement, support map infrastructure with location-based services, and deliver personalised experiences²⁸.



90% of people would like a single app that keeps everything they need in one place.

X



HUMANE's AI Pin was an intelligent, voice-powered wearable companion that could answer questions and suggest routes and relevant stops when travelling – adapting to you and your changing surroundings²⁹. While no longer available, the product signifies a shift towards agentic devices that seamlessly blend into everyday life.



Intersectional Access

Digital accessibility is evolving beyond website and mobile UX, particularly as emerging interfaces like self-service terminals, automatic gates, and virtual assistant displays become more ubiquitous. Creating physical and digital spaces and customer journeys inclusive of different abilities, languages, and cultures needs to be integrated into airport technology strategies — and designed in collaboration with the communities these services should serve. Creative, personalised wayfinding and airport experiences should be accessible to all.

Advanced virtual information, navigational aids, and assistance apps that allow users to request help from service providers are already implemented at some airports³⁰. Under the European Accessibility Act, airports across Europe are required to ensure that all facilities and digital services introduced after 28 June 2025 are universally accessible.

When the passenger journey is designed to be inclusive of varied sensory, auditory, and visual needs it supports all passengers to adjust their journey — even if they don't identify with experiencing disability.

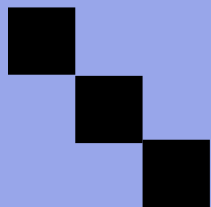
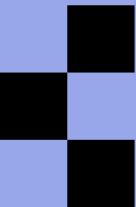
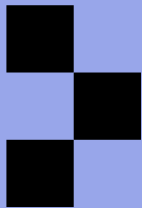
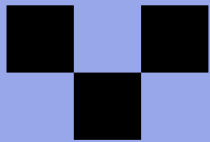
While existing apps on our smartphones can translate words and images in seconds, understanding multiple languages as we move through the world could be a much more fluid and flawless process, complete with local know-how and dialectic nuances. Speech-to-speech translation tools rely on machine learning, natural language processing, and automatic speech recognition. These technologies could be embedded with virtual assistants at airports to support people at points throughout the terminal. With the right tools at hand, they could also be something travellers carry — an essential travel accessory to replace the passport as our gateway to global communication.



Rocco Giovanonni's Immergo headphones use liquid rather than air to carry sound, improving current bone-conduction audio technology³¹. The technology could be applied to deliver rich audio for people with hearing loss and for sound-therapy or virtual reality experiences.

[03.3]

Elevated Experiences



A zero-queue, seamless early phase of the airport journey frees up time to play and explore. What kind of tech-related experiences might encourage people to continue arriving early at the airport? Not to stand stagnant and frustrated in queues, but to carve a magic preflight moment of calm, immersion, surprise — or whatever a traveller needs it to be.

Rather than revenue opportunities focusing solely on products, how might retailers facilitate time well spent in this liminal zone? Brands can build interest and loyalty through interactive experiences and installations. Brands might also rebrand discovery — leaving all the necessary components lying (digitally) around for customers to spontaneously uncover, returning decision-making powers to travellers in what is typically a highly controlled environment, often with a limited and predictable spectrum of retailers.

Strategising new notions of discovery relates to a growing anti-algo culture, where consumers seek to escape the algorithm and resist the homogenising influence of algorithms and AI-generated content.

In this paradox, brands can become curators of exclusive experiences that defy replication. Because humans make and recall memories in attachment with place³², unique elevated experiences are a powerful tool for shaping the reputation of individual airports.

Surprise and delight marketing has been preached to retailers to get through to oversaturated consumers. When consumers are increasingly attuned to what they do and don't want from tech, brands need to tune in to deliver elevated experiences that reflect what people want.

Immersive Storytelling

Consumers are seeking immersive, meaningful experiences that nurture connection and challenge routines. This stems from a growing desire for personalisation and the expectation of rich, tailored interactions with products and services. The airport setting is ripe for experimenting beyond the everyday — starting the adventurer’s mindset early.

“Soon your AI companion will start to live life alongside you, whether playing Minecraft or helping you navigate life’s most difficult challenges.” — *Mustafa Suleyman, CEO, Microsoft AI*

Gaming facilitates escapism through storytelling and a sense of control in an anxious world — and it’s emerging as a format suited to AI innovation. New developments like Nvidia’s Avatar Cloud Engine enables co-playable characters that act and communicate like human players. Immersive experiences could be adapted to airport environments — with session lengths to match the time available before a flight and the option to play alongside fellow travellers.

X



18% of people would like a gaming area to encourage them to spend more time at the airport – the most desired type of space after cultural experiences (20%) and tied with museums/art galleries.

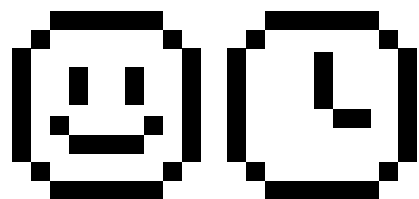


More and more, transit spaces are investing in public art for passengers to explore along their journeys. We Are Made of Time is an installation at New York’s Penn Station by creative technologists Tin&Ed³³. Using procedural modelling software, the artists meld generated rocks and minerals with 3D sculpted fossils into a constantly transforming panorama – that compresses 4.5 billion years of geological change into an otherworldly visual symphony.

Phygital Fun

Airport experiences that are entertaining and fun can encourage travellers to spend more time at the airport. This aligns with a shift towards playful consumerism, especially among younger generations, who prioritise entertainment and humour and prefer experiences over possessions. This trend also reflects Gen Z's growing desire for purposeful, mindful activities and a consumer landscape that values joy, escapism, and meaningful engagement.

Generative AI is pushing the boundaries of phygital retail, analogue hobbies, and food experiences, from AI-powered chess sets and burger-making robots³⁴ to a virtual concierge guiding product decision-making³⁵. These applications demonstrate how AI is being integrated into everyday life for personal enjoyment.



70% of people agree that they are happy to arrive at the airport early when there are lots of things to do.

X



During Art Basel Hong Kong, visitors could explore and shop – both digitally and physically – Peter Yee's 25-year archive of designs for Oakley³⁶. In this phygital retail space, users connected their phones to NFC chips to project the archive items in augmented reality and listen to an audio guide.

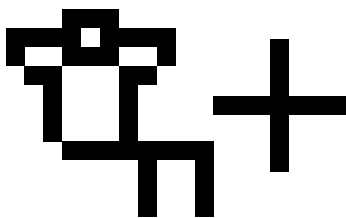
Reclaiming Slowness

Amid increasingly busy lives and fast-paced technological change, people are seeking ways to reclaim stillness, slowness, and intentionality. 29% of people are ready to spend more time in the airport and 24% of people are ready to pay for no noise areas.

Once an airport has the basics sorted (water, food, seating) and a streamlined early phase, it can turn its attention to sensory interventions that encourage relaxation and grounding in the present.

In creating possibilities for people to pause, airports can dispel stress, calm the senses, and boost revenue: increased passenger happiness translates to increased spend.

Ambient technologies offer simplified digital connectivity without the added screen time. Airports could offer services or spaces like tech-free zones or digital detox lounges that encourage travellers to disconnect from their devices – while subtly delivering flight information in softer ways.



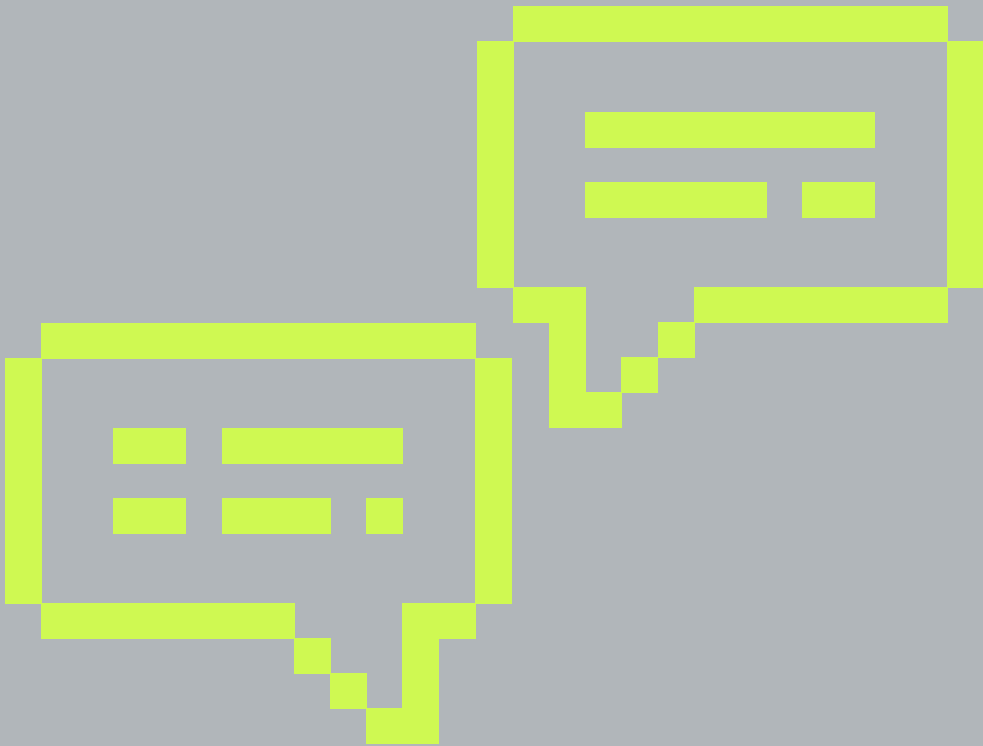
92% of travellers are looking for a calm and relaxing experience.

X



For Google's Sensing Spaces, FIELD.IO developed bracelets with biometric sensors that collect data as people journey through unique interior spaces³⁷. The data is transformed into watercolour visualisations of the brain's response to light, sounds, scents and textures – a potential tool to help travellers understand their sensory needs.

In Conversation With PITCH Studios



Respondents:

CHRISTIE MORGAN:

Christie is a creative director, designer, artist and the founder of PITCH Studios. Through both her personal and commercial work, she brings her deep interests in digital culture, fashion, ecology, nature, technology and gaming together to inform cross-platform creative and interactive projects.

ALEXA CHIRNOAGA:

Alexa is the strategy director and partner at PITCH Studios, exploring visual storytelling and world-building narratives powered by emergent and creative technologies.

We chat with PITCH Studios founders — creative director and artist Christie Morgan and strategy director Alexa Chirnoaga — to unfold their expert perspectives on the challenges and possibilities for emerging technologies in airports.

PITCH Studios operates at the intersection of digital arts, creative strategy, and design. They create narratives and worlds that flow across digital platforms and mediums, guided not by technological constraints but by the stories that need to be told. They combine rigorous conceptual thinking with technical innovation to create work that honours human rhythms, needs, and aspirations.

[Q]
What if we could design an end-to-end airport journey that feels seamless, connected, intuitive, and contextual—and still human?

[A]
Travellers move through two psychological realities in airports: the standardised, universal flow of global air travel and the distinct cultural atmosphere of the place. Standardised processes create predictability, while some travellers seek experiences that connect them to their location, even in transition spaces — like noticing universal wayfinding cues in a new city while craving its local flavour.

A seamless airport blends these realities together. Environmental psychology shows that thoughtful cultural elements — like local architecture or familiar touchpoints — spark *place attachment*, reducing stress and building connection, even briefly. Modern airports can tap into the art of game design, shaping journeys with environmental storytelling. Think of how games pull you into a world without a manual — airports can embed local identity into the journey, supported by ambient guides and automation that streamline logistics. This frees travellers to shift between *airport time* (structured, efficiency-driven) and *place time* (immersive, culturally engaging), navigating with calm assurance.

Optimised airports sometimes feel sterile and transactional. A human-centred experience folds in cyber serenity — spaces that prioritise calm, with softer aesthetics, intuitive flow, and quiet discovery. Like a well-designed game world, an airport can guide, immerse, and enrich, moving people from gate to gate with purpose.

[Q] What are the most promising avenues of emerging technologies in airports?

[A]
Emerging technologies in airports can ease early travel stress with *crowd-sync tech* that adapts to real-time pressure points. In busy spots like check-in lines or security checks, sensors track crowd density and pace, adjusting lighting or audio signals to calm and direct flow. A steady green glow might signal a faster-moving lane or a low chime could mark where to line up, cutting through the chaos without adding mental strain. It's a quiet, behind-the-scenes fix that keeps people moving and less frazzled, tailored to the toughest parts of the journey.

This responsive environment continues with *audio wayfinding* using simple, directional sound cues. Small speakers positioned throughout terminals can create subtle audio zones that help orient travellers without requiring them to look at screens. This system works with our natural ability to navigate by sound while keeping hands free for luggage or children. The approach requires minimal new infrastructure since many airports already have speaker systems that could be repurposed, making it a practical enhancement to traditional signage while reducing screen dependency.

Next comes *multi-sensory zones* to provide a break area that doubles as trip prep. These spots mix nature and tech in a functional way — plants rigged with sensors buzz with gate updates when brushed, or air systems adjust the breeze to match the traveller's destination, like salty air for a coastal spot or crisp drafts for a mountain one.

Together, these options of crowd management, audio wayfinding, and nature-based breaks turn airports into efficient, user-friendly spaces. They tackle travel demands with systems that deliver what's needed — whether it's a calmer start, a signal to the right gate, or a short breather tied to the destination. The tech keeps it basic and built for real use, cutting stress and smoothing the journey ahead.

[Q]
What about services that encourage
travellers to disconnect from their devices
and discourage use of screens?

[A]
In an airport, the smartphone is both a necessary tool — for navigation, updates, coordination — and a habitual escape during waits or uncertainty. Travellers grab it out of need and reflex, checking flights or scrolling to dodge boredom.

But airports can shift that. Attention locks onto what stands out — when spaces feel intuitive and engaging, screens lose their pull. Human focus drifts toward novelty and clarity, so dynamic lighting, tactile surfaces like a sculpted wall that doubles as a map, and clear signage ease cognitive strain.

Much of phone use stems from micro-boredom or overload – scrolling in line, hunting gate info. A smart environment anticipates this with soothing soundscapes (think soft water echoes, not blaring announcements) and natural textures (wood benches, plant walls) that ground travellers without them realising it.

The goal? Flow states and moments of full immersion where distractions fade. Contrast, rhythm, and materiality create a visually and physically engaging journey that holds attention effortlessly. No need to check a phone when the next step feels instinctive.

Changing habits takes time. The best approach works with them, not against them — designing spaces so inviting that your device feels optional, making the best disconnection feel irresistible rather than forced.

[Q]
What are some challenges with emerging technologies, and how do we meet them?

[A]

Emerging technologies in airports face three main hurdles that need practical solutions. First, there's the novelty problem — flashy tech often feels like a gimmick rather than a useful tool. The fix is straightforward: focus on solving actual problems travellers face. A digital wayfinding system should help people find gates faster than signs do, or it's just expensive decoration. Start with pain points like security wait times or gate changes, then build tech that directly addresses them without extra bells and whistles.

Second, we can't ignore the usability gap between different travellers. What works for a tech-savvy business traveller might completely confuse an elderly tourist or a parent juggling children. The solution isn't complicated: design for the lowest common denominator. Use universal symbols, provide multiple feedback methods (visual, audio, and tactile), and test with diverse user groups. Watch where people hesitate or make mistakes, then simplify that interaction – if someone stands confused at a kiosk for more than five seconds, that interface needs fixing.

Third, there is legitimate trust resistance when new systems collect data or track movement. People worry about surveillance and privacy, especially with technologies like facial recognition. The most effective approach is transparent implementation with clear opt-out options. Show exactly what data is being used and why it helps – “This scanner checks your boarding pass to estimate wait times” is better than mysterious sensors with no explanation.

Always provide traditional alternatives so travellers don't feel forced into using technology they don't understand.

These challenges require real-world testing rather than theoretical solutions. Launch small-scale trials in controlled areas of an airport, then watch actual behaviour instead of relying on what people say they'll do. Note where travellers avoid the new system, where they make mistakes, or where they simply ignore it in favour of asking staff. These observations highlight practical adjustments needed before wider rollout. The goal is solving everyday problems in ways that work for everyone, regardless of their tech comfort level.

What We've Learned

With growing traveller numbers and limited terminal space, efficiencies need to come from rethinking how space is used to increase flow and productivity. Spaces need to work harder, and for this, we can look to technology — rather than the burden of passenger growth (and the resulting chaos of high foot traffic) falling to (human) workers.

Increased investment in digital operations — both new and reconfigured infrastructures — ultimately reduces costs and increases resilience. An airport Internet of Things (IoT) can detect disruptions before they happen and create new sources of revenue³⁸. Turning messy data into joined-up data can be applied to smoothing out hygiene factors (food, water, seating, toilets, WiFi, security, etc.), so that airports function well and passengers can focus their energy and attention on unique airport experiences.

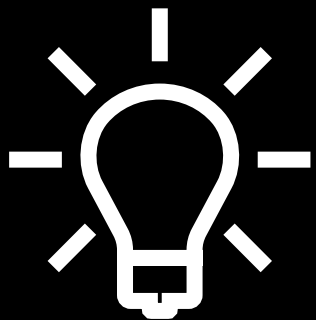
Both passengers and staff will benefit from a less stressful, more efficient airport experience, creating a seamless journey for both groups as they move through checkpoints and shifting how they relate to one another. While people have long learned languages to connect with each other and pursue new opportunities, technology is expanding the possibilities of fluidly communicating across cultures.

So, how can we balance the need for safe, clean, well-functioning airports with the need for imaginative, meaningful experiences? How might better-connected technologies facilitate time and space for better human connections?

“Travellers appreciate simplicity and meaning, prioritizing their devices for journey organisation and convenience. Having all necessary trip information, like flight times and gate locations, readily available on these devices is key.”

[RICHARD HOYER, MANAGING DIRECTOR
FRANKFURT AIRPORT RETAIL, GH]

04 STRATEGIC OPPORTUNI- TIES



“Today’s consumer landscape is complex, not only because of the diversity of generations at play, but also because of the contradictory behaviours within each. Across all these groups, there’s a shared tension between wanting personalisation and protecting privacy, as well as desiring value that doesn’t come at the cost of quality. It’s a tall order for retailers, but to navigate these contradictions, they need to balance agility and innovation with authenticity and cultural relevance.”

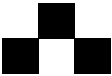
[ALEXANDER HAWKINS,
FRAME CONTRIBUTING RETAIL EDITOR]

Strategic Opportunities

How can we apply the intelligent use of data, automation, and connectivity to facilitate an efficient, integrated, personalised and responsive ecosystem – and elevated passenger experience?

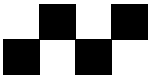
Get the Basics Right

Make intelligent use of data, automation, and connectivity to facilitate an efficient, integrated, and responsive ecosystem – and elevated passenger experience.




Predict My Needs

Utilise the IoT and predictive analytics to improve real-time decision-making and operational efficiency.




Come Together

Introduce multi-platform concepts that provide travellers with unique, communal, and immersive pre-flight activities, elevating their overall experience at airports. Enhance human connection through surprising, inspiring experiences that blur the boundaries between the digital and physical.



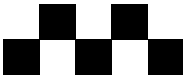
Personalise My Experience

Accentuate the ‘custom’ in ‘customer’ and build trusted, personalised solutions to help with specific passenger needs – from accessibility to wayfinding and curation to virtual translation. Tech can help us overcome the usability gap.



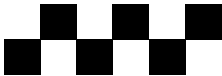
Make It Soft

Focus on ambient technologies that integrate seamlessly into our journey, anticipating and adapting to our needs without requiring voice commands. Think about subtle directional vibrations or shifting lights.



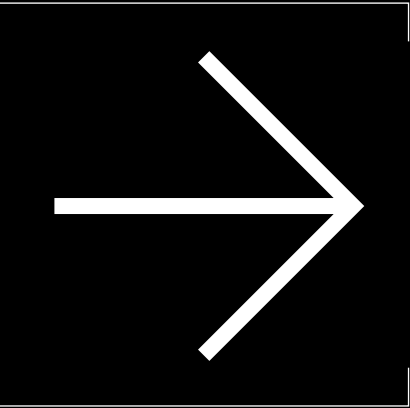
Elevate My Wait

Break the boredom of waiting for a flight by allowing for serendipity, discovery, and surprise. Retailers can build interest and loyalty through interactive experiences and installations. Shift between ‘airport time’ (structured, efficiency-driven) and ‘place time’ (immersive, culturally engaging).



05

APPENDIX



Endnotes

[NO.]

[AUTHOR]

[TITLE]

[SOURCE]

[WEB LINK]

[01]

Yves Bonzon

Secular Outlook - 2025 update: The investment trends shaping the future

Julius Bär

<https://www.juliusbaer.com/en/insights/market-insights/cio-views/secular-outlook-2025/>

[NO.]

[AUTHOR]

[TITLE]

[SOURCE]

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<https://aibusiness.com/ml/a-new-tech-supercycle-is-emerging-sxsw-2024#close-modal>

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[SOURCE]

[WEB LINK]

[03]

Non-Place

Air Travel Design Guide

<https://airtraveldesign.guide/Non-Place>

[NO.]

[AUTHOR]

[TITLE]

[SOURCE]

[WEB LINK]

[04]

ADD

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Matt Klein

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ZINE

<https://zine.kleinkleinklein.com/p/meta-trends-2025>

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[SOURCE]

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[06]

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<https://www.aph.com/community/aph-airport-of-the-future/>

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Luke Peters

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[SOURCE]

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[09]

Matt Burgess

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[WEB LINK]

[10]

Alison Angus

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[NO.]

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[SOURCE]

[WEB LINK]

[11]

Emirates

Emirates' smart contactless journey at DXB | Emirates Airline

Emirates

<https://www.youtube.com/watch?v=JtF-j4a0LC0>

[NO.]

[AUTHOR]

[TITLE]

[SOURCE]

[WEB LINK]

[12]

Nonie Niesewand

Airport of the future - flight of fantasy?

Independent

<https://www.independent.co.uk/life-style/airport-of-the-future-flight-of-fantasy-1247758.html>

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[NO.]

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[SOURCE]

[WEB LINK]

[13]

DGW_ai

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YouTube

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[AUTHOR]

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[SOURCE]

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Intelligent Airports: From Friction to Flow

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