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Retooling to take flight:
Technology trends and the airline industry

Airlines have some of the most sophisticated technology ever created and are becoming even more technology led, now encompassing a wide breadth of interconnected industry ecosystems. From the day the Wright Brothers took off from Kitty Hawk—one of the most significant technological advancements in history—technology and innovation have been at the heart of the industry. More than a century later, this has not changed; however, the pace of disruption has. Today, airlines face constant pressure to meet elevated customer expectations, increasing regulatory requirements, and their own ambitious growth plans, while continuing to work on outdated legacy systems.

This is complicated by the fact that we are entering a new era with many unknowns. Traveler personas have changed. The workforce is aging. Jobs requisitions are left unfilled.

Technology and operational systems built in the 20th century are failing 21st-century tests. Airlines have long been leveraging technology as a competitive advantage to scale, lower costs, increase safety, and maximize revenue. Core systems, however, are approaching 60 years since inception. These

disruptions are making the front page of the newspaper and going viral on social media in seconds.

Deloitte's annual Tech Trends 2023 report offers six lenses through which to view the industry's challenges and work to chart a path forward. The categories offer a road map to examining broader technology trends and can also be used to evaluate how they might benefit the airline industry.

Setting the stage: A rapidly changing customer and employee

Customer demographics, changing expectations, and pandemic consequences are shifting trends away from business and toward leisure travel. "Passengers' bills of rights" and government loan programs have placed additional visibility on the sector, leaving little room for forgiveness. A resurgence in capacity and infrequent spikes in demand could strain the current system. Additionally, customer expectations for mobile access to live information has caused challenges, with travelers often more up to date than gate agents.

Traditionally, airlines have seen business travel drive a large share of revenue[1]. Now, however, corporate travel lags behind pre-pandemic levels. And while spend volume is expected to recover by 2025, accounting for lost growth and inflation, in real terms corporate travel will likely be smaller than it was pre-pandemic. Concurrently, travel is seeing an uptick in "work-cations." Deloitte's 2022 summer travel survey indicates one in five travelers intend to work at least part of the time on their longest summer trips. When leisure or "work-cation" travelers begin to outpace business travelers, cost-sensitivity can change, impacting buying and demand patterns.

In terms of staffing, airlines face both frontline and corporate worker issues. Under current circumstances, it may be difficult to find frontline workers, such as flight crew, agents, ground crew, and pilots. During the pandemic, voluntary turnover rates peaked at nearly double the rate of the average private-sector worker[2]. On a corporate level, skilled workers might be aging out faster than they can be replaced, taking legacy knowledge with them. This could pose a challenge to rapidly rebuild the workforce, with an unavailable, untrained, or unwilling talent pool facing a large gap in experience and knowledge. These staffing issues can affect consistency and standards of service across the board. Employees who stay longer are more experienced and productive—with higher morale and job satisfaction, contributing to better customer service[3]. Holistic efforts to leverage technology automation could potentially ease this crisis.

Technology challenges airlines are currently facing

Since it is often what the customer sees and experiences that drives perceived value (versus the underlying support systems and infrastructure), airlines have been investing in customer service and loyalty programs as well as in the gate, airport, and onboard experience.

Despite these investments, the underlying structures should be addressed. Metaphorically, the foundation of the house (airline infrastructure and technology) was built decades ago. Today, the weight of the house may be heavier and could require the foundation to be excavated and rebuilt. This may lead to intellectual property and multiplayer ecosystem challenges.

Many airlines have perpetual use rights to their technology but do not officially "own" the code, which could limit options for entirely rewriting systems. The process of building new technologies versus buying them is more complicated than in the past. These foundations may represent

many individualized capabilities that today would be separate structurally. The solution could lie in a new cooperative ecosystem of many businesses working collectively.

Additionally, the cost of replacing "heart-of-the-business" technologies may be an unrealistic investment. These core systems could include maintenance repair operations, irregular operations, passenger service systems, and crew management. Other more peripheral systems that also may require constant innovation include loyalty, promotions, and fares.

Ultimately, technology should have the agility to change, enabling businesses to pivot when faced with legacy challenges and the growing need to accelerate modernization. Operations have been the "back office" cost-constrained aspect of the airline industry, but this should change, contributing to an industry secure in resiliency, scalability, security, availability, and observability.

Meet the trends

This year's report identifies six global areas of significant innovation and evolution in technology. The first four trends address the aging infrastructure and rebuilding the foundation, while the final two trends advise on how to accelerate change and jump to the future.

· **Connect and extend**: Mainframe modernization hits its stride

· **Opening up to AI**: Learning to trust our AI colleagues

· **Above the clouds**: Taming multicloud chaos

· **In us we trust**: Decentralized architectures and ecosystems

· **Flexibility, the best agility**: Reimagining the tech workforce

· **Through the glass**: Immersive internet for the enterprise

Connect and extend: Mainframe modernization hits its stride

Rather than "ripping and replacing" legacy core systems, some enterprises are increasingly looking to bring them into the modern era by connecting them to emerging technologies. Through tried-and-true approaches to legacy system modernization, businesses may leverage mainframes—and their precious data—to try to drive digital transformation. Airlines, as an industry, are especially reliant on mainframes for their operations. As airlines look to bolster technological capabilities, mainframe modernization may be critical to unlock value.

The fundamental question may be whether to modernize on a new form of mainframe or to structurally break up the monolithic systems into subcomponents and modernize.

This technology is based on highly specialized systems and software language. To date, many airlines have largely opted to rewrite systems, but this has been proving to be slow and costly. Instead, multiple modernization and migration approaches may be needed concurrently. Airlines should strategically map out which areas need to be rewritten (versus replaced or refactored). Nonstrategic systems could represent an opportunity for an ecosystem approach, teaming up with others working the same issue. Each airline may no longer need its own unique technology.

Opening up to AI: Learning to trust our AI colleagues

As artificial intelligence (AI) becomes more prevalent in businesses, organizations should learn to leverage and optimize it. AI's functionality, increasingly accessible via the cloud, can lead to better outcomes. Airlines were one of the first industries to automate with the invention of autopilot. However, since then, the industry does not seem to have moved toward applications of AI.

AI could help make a profitable difference for airlines to help inform decisions about flight cancellations, rerouting, rebooking, and scheduling. In operations, digital twins, virtual replicas of real-world objects or environments, could help boost efficiency. Use of digital twins for ground operations, air traffic control, and flight scheduling may offer up more advanced models for business. Leveraging solvers and decision-support AI could increase efficiency and speed. Initial pilots may have been largely encouraging, but hesitation to trust could remain a barrier for now, and airlines are likely in a very early stage on their AI journeys.

Above the clouds: Taming multicloud chaos

Multicloud strategies use a mix of cloud environments and providers to benefit from specialized capabilities and optimized pricing. However, they also add complexity that can make it difficult to fully realize those benefits. Airlines have the potential to use multicloud architectures to help build a more resilient, cost-effective, and secure IT infrastructure while also fostering innovation and agility. Building redundancy into the cloud strategy may be key, since airlines likely have multiple domestic data centers, SaaS providers, and public cloud environments that need to communicate with other and orchestrate across.

In us we trust: Decentralized architectures and ecosystems

Decentralized architecture is about more than just blockchains. While cryptocurrency and distributed autonomous organizations (DAOs) are representations on how decentralization can work in practice, organizations should look to deploy these practices when building and designing systems for resiliency, reliability, and availability. This also could require looking at monolithic systems a bit differently, breaking them down into their subcomponents and selecting new ecosystem partners to design and build for decentralization. Decentralization and ecosystem formation may be keys to helping establish and maintain a durable relationship and trust with the user and customer alike.

Flexibility, the best agility: Reimagining the tech workforce

There's no one-size-fits-all strategy for technology talent, but leaders who expand their thinking beyond a single approach have a chance to reimagine their workforces[4]. Talent shortages are a widespread issue, exacerbated by a retiring workforce and the pressing need for skills that didn't even exist a few years ago[5]. One part of the solution may lie in considering new sources for finding tech talent and providing a compelling talent experience to retain top performers. Skills-based approaches to talent management can also help, along with expanding the conception of how technology work is planned and executed. Finally, the airline industry may find value in the increased use of low-code, no-code (LCNC) technologies and broader use of automation throughout the Software Development Lifecycle (SDL), especially in Development, Testing, and Operations.

Through the glass: Immersive internet for the enterprise

The metaverse describes an immersive virtual experience that can be accessed through augmented and virtual reality (AR/VR) devices. Metaverse applications provide human connection in a virtual space; add power to edge computing; and help companies reduce costs, increase customer engagement, and create entirely new offerings. For the airline industry, the metaverse can be used to improve customer experience before and during flights. These experiences can help customers make more informed travel decisions and increase sales.

Tech trends in action: How new approaches are already enhancing business

As we look at technology choices that affect the core airline operations, customers, and employees, we turn to a few examples for insights into how to apply these trends. Several of these trends have already proven themselves in the market, while others are in testing in the business environment.

Example 1: American Airlines recently reduced a laborious four-hour gate assignment process, which once required a team of people working late into the night to assign flights to gates and account for the day's cancellations, to a 2.5-minute procedure using AI. This freed up their team members while providing an improved experience for their customers[6].

Example 2: An airline client built a new app for customers to manage their membership, loyalty, and points programs. The app is hosted in the cloud, but its rules engine references data in the airline's mainframe without changing any of it. This allows the airline to change offerings and functionality as needed without forcing it to completely revamp its data platform, which would have been a heavy lift given the dependance airline companies have on mainframes[7].

Example 3: Deloitte developed a travel app for an airline client that reaches across both cloud and mainframe environments to aggregate travel information, so travelers can organize and share their plans simply by forwarding trip data such as reservation confirmation emails. The service draws mainframe data such as changes in arrival and departure times while also using data from other sources to deliver new functionality that is largely managed and delivered on the cloud. This app doesn't replace or improve existing capabilities, but it delivers new innovation by combining the value of two platform types at once, giving consumers the convenience of a single travel planning resource that is constantly, automatically updated[8].

How to get started: What airlines need to embrace these trends

Ask the deep questions. Airlines should revisit the strategies guiding their ecosystems, systems, and workforces. Knowing what you do and why can be an effective way to start embracing key technology trends and countering macroeconomic challenges. Focus on the opportunity, cost of doing nothing, constraints, and barriers to action. The enormity of the problem can be daunting, so break it up. Consider what can be dealt with internally versus leveraging external experience. Deloitte can provide guidance so that airlines can tackle more complicated issues, such as transformational change, large program execution, mainframe migration, and more.

Take a fresh look at ecosystems and alliances. There may not be just one answer in the market to address these issues, so airlines should rethink their ecosystems to help ensure toolsets can meet their needs. Deloitte has multiple strategic and market relationships collectively helping drive growth that can be leveraged based on ability to and interest in envisioning and shaping the future of the industry.

Minimize risk as you migrate away from mainframes. Mainframes have been a part of the fabric of airlines for a long time. There are paths where a more modern mainframe can help bridge the current environment to the future without significant disruption. With the right adaptations, decades of investments into airline mainframes can be leveraged and modernized to enhance next-gen capabilities. Early understanding of cross-system dependencies and how the building blocks of business capabilities are codified is crucial. Deloitte can provide tools and services to rapidly discover these elements.

Reimagine the workforce. Airlines' challenges may require new skill sets, but large parts of today's workforce seem to be retiring. Airlines could bolster their delivery by reimagining the sourcing and constitution of their workforces. Focus on the technology knowledge and skills that can be distinctively competitive differentiators.

Summary and conclusions

In the early days of the industry, technology challenges may have involved aerodynamics, fuel mixtures, and weather forecasting. Today—from scheduling, maintenance, and customer service concerns to regulatory and financial issues—airlines seem to have become one of the most technology-dependent industries in operation. When systems age, workforces atrophy, and macro forces press in, that dependency can be a weakness. But there can also be much promise. Airlines could have an opportunity to revamp both their systems and their business models, with technology at the center of a more agile industry that has the potential to boost profit and customer satisfaction in equal measure.

How Deloitte can help

As part of the world's largest professional services firm, our network comprises more than 1,000 airline practitioners across six continents focused on supporting industry clients. We take an active role in collaborating with leading organizations worldwide to tackle the industry's most important challenges and opportunities.

If you are interested in learning more about our technology capabilities in airlines, you can …

Schedule a lab. We offer half- and full-day sessions to help prioritize choices you need to navigate so you can select an approach to tackling your biggest technology and business hurdles. This is our immersive experience to help you navigate strategic choices and develop an action plan.

Book a Smart Factory tour. We offer periodic open forums and bespoke sessions at our Smart Factory @ Wichita to gain hands-on exposure to operational technology. This is our proving ground for new and emergent technologies that affect airline operations.

Contact a leader. We are happy to discuss these topics further and help you determine logical next steps. Our leaders have decades of experience with commercial aviation and airlines and can work with you to explore concepts.

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Endnotes

[1] "Reshaping the landscape: Corporate travel in 2022 and beyond", Deloitte, 2022".

[2] Cathy Guitierrez and Frances Symes, "The competition for frontline workers," Deloitte, 2022.

[3] Cathy Guitierrez and Frances Symes, "Retaining frontline talent through career mobility and growth," Deloitte, 2022.

[4] Meghan McAneny, "Talent shortage? Here's an older solution to a newer problem," Deloitte, January 25, 2023.

[5] Deloitte Insights, "Flexibility, the best ability: Reimagining the tech workforce," December 6, 2022.

[6-8] From Deloitte Tech Trends 2023.