Airport Digital Transformation

BEST PRACTICE

“Digital transformation is about business transformation in a digital world”
Airports Council International (ACI), the trade association of the world’s airports, was founded in 1991 with the objective of fostering cooperation among its member airports and other partners in world aviation, including the International Civil Aviation Organization, the International Air Transport Association and the Civil Air Navigation Services Organisation. In representing the best interests of airports during key phases of policy development, ACI makes a significant contribution toward ensuring a global air transport system that is safe, secure, efficient and environmentally sustainable.

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1. How to use this document

This document is intended as a decision and implementation aid for airport managers who are responsible for evolving their companies in a digital world.

The main body of this document is meant to be used in sequence. Section 2 provides an explanation of the importance of digital transformation. The ensuing section explains what digital transformation actually is and details topics that need to be taken into account. Once the context is clarified, Section 4 provides a maturity path for an airport to become a digital-ready airport and introduces a self-surveying document to be used to check an airport's current status. Because the process of digital transformation is neither quick nor simple, the last section contains a collection of best practice for selected focus areas.

Of course, there are many steps in embracing the digital transformation. So it is envisioned that this document will help airport corporate executives (CXOs) to pick a starting point and develop a digital culture across the enterprise which will enable it to gain as many benefits as possible and as quickly as possible while the airport is developing a longer-term evolution strategy.
2. Why digital transformation is important

Today's airports are no longer just places where airplanes take off and land. Instead, airports are vital economic generators providing gateways to their cities, states, regions and countries. Airports are important for tourism and other business, handling people and goods traveling by air and offering transport connections between aircraft and with all other modes of transportation. In 2014, aviation’s total contribution (direct, indirect, induced and tourism-catalytic) to the global gross domestic product exceeded US$2.7 trillion\(^1\) and none of that contribution would have been possible without airports.

In this very competitive environment, airports are focused on expanding and enhancing their appeal to increase their community’s share of air travel and tourism, innovating and maintaining a strong focus on enhancing customer experience. While safety and security always remain airports’ top priorities, their leaders also focus on ways to streamline airport business and operations. They leverage technology to meet and exceed goals and objectives. In today’s digital world there is no escaping the power of data, so harnessing its benefits is key.

Airport leaders acknowledge that business success is not just about the deployment of new technologies, simply because IT systems and applications change too quickly. Instead, success is about transforming the business of airports, adapting to customers, staff, community and cultures and leveraging existing and new technologies to meet objectives and goals.

Countries throughout the world are promoting transformation with visions such as that of Singapore: “harnessing of technology to the fullest with the aim of improving the lives of citizens, creating more opportunities, and building stronger communities,”\(^2\) a Smart Nation is “built upon the collection of data and the ability to make sense of information.” Similarly, the city of Barcelona, Spain, applies innovative solutions in its management of services and resources, all to improve the quality of people’s lives.\(^3\) With the help of Hitachi, vast amounts of data generated in the city of Copenhagen, across public and private websites, have been homogenized into an easily accessible format and used to make the city “smarter,” driving productivity,
supporting sustainability and improving the quality of life for those who live and work there. The Netherlands is a world leader in smart-city applications and in the fields of autonomous driving and e-mobility.

Now is the time for airport leaders throughout the globe to embrace the digital transformation. As such, Airports Council International (ACI) has set out to develop a guideline document to help leaders understand what digital transformation is; what digital transformation means to the airport business, its customers and operations; approaches for evolving the organization; and, the high-level impact of digital transformation on risks and opportunities.

Digital transformation for the airport is about evolving processes and services to deliver a better experience to all passengers and customers, by adopting and implementing new technologies and integrating them with existing ones.

From the viewpoint of the passenger, a better experience means a personalized and individual experience which offers a seamless flow through the airport. It starts before the passenger even arrives at the terminal.

From the moment travelers start planning their journeys they have numerous choices for obtaining additional information, offerings and enhanced services from the multitude of websites and applications offered by traditional and non-traditional travel companies. At the airport terminal, a multitude of programmes makes it nearly impossible for passengers to know which one will be the most informative. This becomes a big challenge for airports throughout the world as they vie for the digital and physical attention of passengers. If an airport is not successful in gaining direct engagement with its customers, there is a great risk that a third-party disrupter will fill the gap, diverting customers away from the airport and taking control of the attention of passengers, even inside the terminal, putting at risk any loyalty to that airport. As soon as passengers purchase their airline tickets, they should be able to plan their journeys to and through the airport and reserve offered services such as parking, security fast track, lounge access, concierge treatment and food and concession promotions.

From the staff’s perspective, an understanding that the assessment, application and results of digital transformation belong to the entire team will help create a culture that promotes speed and agility; governance and incentives; and, risk-taking and experimentation.
Digital transformation should provide a number of strategic goals and benefits. In terms of internal gains (which includes operations and staff), the focus is on cost savings, e.g., improving overall productivity, introducing Internet of Things (IoT)/Smart Building management, and digital touchpoints. Major drivers for airports in providing external benefits are their customers (passengers and visitors, airlines, ground handlers, local communities, etc.), enhanced services, improved collaboration and increased revenue. Furthermore, digital channels and distribution not only will drive results but will also create completely new business models such as use of commercialized Application Programming Interfaces (APIs).
3. What is digital transformation?

Digital transformation is not only about technology. It is also about business transformation in a digital world. It involves both the implementation of new technologies and the integration of existing technologies, processes and services to deliver a better experience to all stakeholders. Digital transformation embraces achieving a seamless flow through the airport by means of integrating systems and services, including those provided by partners such as airlines, security, customs, concessions, ground handlers, etc. Digital transformation leverages the use of technologies such as indoor geolocation, identity management, flow management, data mining and IoT. It is also about making these digital technologies secure in the cyber world to ensure that every system works as intended.

Almost every airport is experiencing some component of the digital evolution, so this chapter should help airport management at all levels to understand how embracing digital transformation and leveraging technology will help maximize business and operational objectives.

Today’s technologies can allow airports to do something that was unimaginable just a few years ago: deliver personalized and individual services to millions of passengers. When you think about it, 99% of the information shown on typical airport flight information displays is irrelevant to each individual passenger because each is only interested in the information related to his or her own flight and present/future connections. Today’s digital devices bring this personalized information in real time directly to the customer, such as mobile applications to track flight information and changes and provide wayfinding in the airport.

Artificial intelligence (AI) and the use of algorithms now make it possible to give the right information to every passenger at the right moment, based on location, time before flight, profile and preference. Whether it is about finding his or her way in the airport, pushing promotional offers for products and services, or reacting to an emergency, every visitor provides a unique, specific context and has different needs and interests—e.g., adapting the way-finding path to the specific airline lounge or gate according to the traveler’s membership status, taking into consideration
any disabilities, luggage type (count, oversized), family count, etc. All of this should be incorporated into any digital communication from the airport. Additionally, AI will help to target commercial offers to visitors based upon each visitor's location in the airport, time remaining before boarding, time of the day, purchase history, social-network interests, etc.

Maturation of 'big data' technologies opens new opportunities to deliver an enhanced experience to all passengers, simply by gathering information on each passenger’s flight history, habits and preferences, social-network interactions and use of services and commercial offers. Machine learning and data mining can be applied to customize future communications, services, interactions and offers. For instance, frequent travelers can be offered their preferred parking locations, the opportunity to purchase a “fast pass” or assistance through the airport and coupons for their favorite beverages or foods. Digital transformation will help airports gain knowledge about each customer and use it to build loyalty.

Passengers will want to interact with the airport through various media at different points of time: on a computer or a tablet when they are planning their trips; on their mobile or wearable devices when they get to the airport; and, through social media when they want to express and share their satisfaction—or their dissatisfaction. Examples of such interactions might include booking parking online at the time of booking a flight; and using a mobile application to show the way to the right parking lot when the passenger nears the airport and then using near field computing technology to open the gate to the parking lot.

Ultimately, in getting to and through the airport, passengers who have accurate and real-time information at each step in their journeys will be less stressed and they will feel in control and enjoy their experience. Studies have shown that when customers are more relaxed they will be much more likely to take advantage of the products and services offered by an airport and its partners. In the near future, we can imagine a world where passengers plan their journeys through the airport and the airport dynamically adapts its services to the plan of every passenger.
Using connected objects and bundles of services, as well as pricing and yield strategies, airports will be able to anticipate and spread the passenger load at each different service point. This will allow optimization of airport facilities and resources and it will enhance customer satisfaction at the same time.

Digital transformation enables connected travel. For passengers, airports and all stakeholders, it offers a much better view of and control of the journey, minimizing disruptions and providing solutions based on data analytics.

As reliance on digital technologies increases, exposure to cyber threats and risks increases correspondingly. Systems should consider information-security requirements from the onset, beginning at the design and conceptual phase and progressing through every stage of system design, development and operation until the system is retired. The airport’s business process must also be resilient and the airport must have required business-continuity plans in place in case its digital technologies are compromised. Recovery of services is of prime importance during a system outage.
4. How to become a digital airport

Enabling technologies

Many companies in the aviation sector think they are digital-ready in offering a digital mobile app here, or a redesigned website there. However, this is only a small part of the overall transformation. Having learned why digital transformation matters and what this transformation actually is about, it is important to discuss the technologies and building blocks that can be applied to drive real change within your organization.

Figure 1 shows a possible path to becoming a digital ready airport. This path is not meant to be the only way of achieving this goal; the order of enablers may vary depending on your airport’s current situation. Nevertheless, it shows dependencies in a typical, reasonable sequence.
To assist airports further, the ACI Airport Digital Transformation work group has also produced a Digital Airport Survey, which includes the latest technologies. The intent is to enable self-assessments so you can identify your airport’s status along this evolution—see Figure 2 as an example. As of this paper’s publication date, the survey contains 55 questions, which are organized into the following categories:

- Infrastructure
- Open Data
- Personal Experience
- Digital Touchpoints and Biometrics
- Virtual Control Room and Virtual Control Room and IoT
- Innovations

The survey is available for download via the ACI Groups homepage. Its content is also the basis for Section 5, which will showcase some of the enablers for transformation.

### III PERSONAL EXPERIENCE

<table>
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<th>Category</th>
<th>Status</th>
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<td>Do you have digital channels available (web, app etc) and teams to support these?</td>
<td>Passenger Journey, Commercial Benefits</td>
<td>Digitally enabled</td>
<td>yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>no, not planned</td>
<td></td>
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<td>planned for 2017, 2018...</td>
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</tr>
<tr>
<td>1b</td>
<td>Have you secured that you offer an “omni channel experience with consistent message” across digital &amp; physical channels to the passenger?</td>
<td>Passenger Journey, Commercial Benefits</td>
<td>Full digital</td>
<td>yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>no, not planned</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>planned for 2017, 2018...</td>
<td>&lt;comment&gt;</td>
</tr>
<tr>
<td>1c</td>
<td>Is customer care delivered on digital channels, such as website and social media?</td>
<td>Passenger Journey, Commercial Benefits</td>
<td>Full digital</td>
<td>yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>no, not planned</td>
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<td></td>
<td>planned for 2017, 2018...</td>
<td>&lt;comment&gt;</td>
</tr>
<tr>
<td>1d</td>
<td>Which digital channels do you provide for consumers (B2C)?</td>
<td>Passenger Journey, Commercial Benefits</td>
<td>Full digital</td>
<td>Please list in comments</td>
</tr>
</tbody>
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Process

As described in Section 3, digital transformation is already happening. So airport managements at all levels should not be thinking about if it will happen, but rather how it will do so, in order to leverage technology to maximize business and operational objectives. This chapter focuses on key steps to help airports through their own digital transformations.

To begin, each airport must truly understand the full scope of the environment in which it operates. Next, it should align its business and operational objectives to the environment. Only then is it possible for an airport to understand how to leverage technology and transform itself to meet these objectives.

While each airport's outcome will be unique, the basic steps of digital transformation are common:

1. **Airport environment assessment**: A multi-dimensional review of the airport's characteristics, including but not limited to its physical, customer, market, local community and economic characteristics and socio-political influences upon it;

2. **Airport plans and objectives**: A specific step for airport C-level management to agree on the priority and actions of specific digital plans and identify areas where technology (existing or new) will improve the outcome or desired results; and,

3. **Internal organizational review and requirements**: An assessment of the current organization and competencies versus what is needed to remain flexible and agile through the digital transformation and beyond.

Finally, it is important to acknowledge that because speed of evaluation, trial, adoption, etc., is critical and technology evolves quickly, airports should review these steps every few years to ensure that the right solutions are in place to provide the best results (financial, business, operational, customer service, etc.).
Step 1 - Airport Environment Assessment

Digital transformation encompasses the entire scope of airport activities and must be viewed as a comprehensive business strategy to enable airports to reach their financial and operational objectives, by leveraging innovations in digital technologies. It is a tool to optimize an airport’s economics by increasing the capacity of existing facilities, reducing operational expenditures and boosting revenues, all of which should be closely linked with critical business objectives and strategic intent.

The assessment is not an additional step or task for airports but rather a bringing together of all key airport plans (i.e., Strategic, Security, Safety, Operations, Financial, IT, Master, Marketing), and determining where and how technology can help to achieve objectives and goals. The next step is to determine if the technology to enhance results exists and if it is already installed. As such, digital transformation must be managed at the level of the Airport Executive Committee to define and review priorities, as well as allocation of resources.

Where does an airport begin to apply digital transformation?

The short answer is everywhere; however, this is not realistic. Taking into account the airport’s current environment as well as its business context and objectives, the airport should prioritize and create specific digital transformation plans. Within each digital transformation plan, assessments of different areas such as potential functional areas of applications, internal team readiness and structure and the external market and partner landscape are recommended, in order to define where and how to begin the digital transformation journey.

Potential functional areas of application of digital transformation

Digital transformation impacts all aspects of the airport, so in order to focus on the most promising area it is critical to identify key domains where the digital strategy should be deployed to improve significantly processes and services such as:

- **Airport operations:** While “digital” is often interpreted as “business disruption,” it is important to understand that the digitalization of the core business is often a good way to start to realize benefits. A few examples of digital applications for core processes can illustrate some
of the benefits. A resource management system leveraging the IoTs can provide more comprehensive solutions as it considers systems beyond just aircraft estimated time of arrivals (ETA) and estimated time of departures (ETD). Employee efficiencies will increase by leveraging collaborative and web-services platforms; financial services to streamline and dematerialize Account Payables and Receivables processes will improve revenue recognition and fund availabilities; and intelligent building management will reduce electricity and gas usage and lower utility bills.

- **Security**: Security remains a high priority for all airports. In combination with video infrastructure, leveraging artificial intelligence can deliver significant enhancements such as biometric recognition, unusual behavior detection, profiling, unattended-baggage management and monitoring and control of building and fencing access.

- **Capacity management**: A deep understanding and monitoring of passenger flow can help to optimize the capacity of airport infrastructure and retail services offerings, as well as offering predictive maintenance that will reduce maintenance costs and maximize airport-asset utilization.

- **Passenger services and intimacy**: Customer-focused mobile applications coupled with big data and Customer Relationship Management (CRM) can help airports to provide personalized and differentiating e-services to passengers, allowing them to prepare and enhance their airport experience and enhance their consumption of airport services.

- **Stakeholder management**: A successful digital transformation can provide tangible and economic benefits to every airport stakeholder—airlines, passengers, investors, local communities and employees. Digital technologies can be a great help in enhancing airport stakeholders’ relationship management, using collaborative tools to provide and gather information.

- **External**: It is important to assess physical and functional areas not only inside an airport but also outside it, in the local and virtual communities in which the airport is situated. Airports are encouraged to leverage market innovation through strategic partnerships with key solution providers.
providers and service and/or technology providers, because these will help to accelerate digital transformation. This can be done in multiple ways depending on the airport's environment and local needs.

Building an open ecosystem will help to anticipate business-model evolution and increase the airport’s agility to respond to business needs and create more value for all stakeholders. This can be done through multiple channels such as strategic alliances, capital investments, joint ventures or even strong commercial relationships with key vendors in the market.

Step 2 – Airport strategic plan and objectives

This step is specifically for airport C-level management, in order to agree on the prioritization and actions of digital transformation plans. Here are a few words on how to narrow down and decide which ones to tackle first. Obviously, the step will depend on the airport’s external and internal factors—social, political, economic, local, regional, national and even virtual.

As mentioned previously, digital transformation occurs throughout the airport ecosystem, so it is important to prioritize the many activities required, taking into account business and operational objectives. One way to assist CXOs in determining priorities for applying digital transformation is to overlay the airport's digital transformation plan with its strategic plan.

As a reminder, airports are no longer focused only on infrastructure and master planning; instead they engage in strategic planning, including a thorough analysis of the conditions in which each airport operates. The results are included in a comprehensive, action-oriented plan which clearly defines the airport's mission and objectives, the process it will use to achieve the mission and objectives, methods of measuring results and performance and the impact the plan will have on the airport's resources. While operational-type plans—i.e., master, marketing and IT plans—contribute to building the strategic plan, the digital transformation plan helps to establish the execution of the strategic plan.

Prioritization of the activities in the digital transformation plan will naturally fall into place depending upon their impacts on the various components of the strategic plan. Of course, through collaborative discussions and periodic
reviews, it might be decided to change priorities, executive sponsorship or department ownership to ensure that objectives are met. Ultimately, all digital transformation plan activities should be adopted, because they will help the airport business to transform successfully in the digital world.

Step 3 – Internal organization, review and requirements

**Internal readiness**

Before embarking on the digital transformation journey it is important to assess the airport organization’s internal readiness. This will help the airport’s C-level management to understand the organization’s strengths and identify areas requiring additional focus and improvement, in order to benefit from the transformation:

- **Organization and culture:** It is important to understand up front the readiness of the organization to take on the digital transformation journey. Digital transformation will impact everyone, regardless of the organization, so digital transformation must be an organization-wide effort. The assessment, application and results do not belong just to IT or Finance or Operations; they belong to the entire airport team. The assessment should be performed across all functional areas, because talent for new skills arising from and required by digital technology may be found in non-traditional areas. The outcome will be an organization and culture that promotes speed and agility for all structures, governance and incentives, risk-taking and experimentation.

- **Process capabilities:** An assessment of the airport’s actual capabilities is necessary, in order to estimate the required effort to build working products and services and set up a prioritized delivery plan.

- **IT infrastructure:** Having a robust, flexible and scalable IT infrastructure is a must in order to deploy digital services. Specifically, attention should be on:
  - data management (network, storage, analytics), because evolving digital solutions are significantly increasing the volume of data to be managed;
  - the ability to interface the Airport Information System quickly and
easily with external partners; and,
  • security, because deploying digital solutions raises the business impact of information-system failure and dramatically increases the number of potential entry points.

  • **Technology portfolio:** As noted, digital transformation is not only about technology, but technology obviously is a key factor in enabling and sustaining successful deployment of a digital plan. In this area, it is necessary to gain a comprehensive view of the technologies available, to understand what can be leveraged and what should be changed or upgraded to enable and sustain the digital transformation plan.

  • **Fostering a culture of innovation within the organization:** Set up visible innovation governance to manage new proposals and initiatives, manage technology portfolios and federate an innovation ecosystem to allow open innovation. The airport should promote, recognize and value internal ideas and initiatives for innovation.

**Challenges**

As with every business strategy, digital transformation faces a large set of challenges which need to be understood up front, along with a corresponding mitigation plan. Each airport’s business context and strategy will be different, but some key challenges worth noting are:

  • **Reinventing the business model:** Engage the airport leadership team in the definition and review of the targeted business model, so that its requirements can be identified and anticipated and a strategy articulated, in order to engage with and gain support from the airport’s stakeholders.

  • **Coming up with a business case:** It can be quite difficult to establish business cases that are able to communicate clearly the benefits and added value of digital transformation. These are mainly internal cost savings and externally increased revenues.

  • **Positioning airports in the broader ecosystem:** A key challenge for an airport undergoing digital transformation is to ensure it opens its ecosystem and joins forces with other partners and stakeholders in the value chain. This will ensure the airport is able to benefit from market innovation and create more value for all its customers.
• **Recognizing data as an enterprise asset:** Data is the fuel of digitalization and must be valued and protected carefully. Each airport is advised to set-up a total-airport management structure for the enterprise’s data in order to leverage its value, manage its quality, promote its ethical usage and protect it.

• **Influencing regulation:** Digital transformation will require an update to existing standards and recommended practices, policies and best practice. This will involve global dialogue with civil aviation authorities, industry associations (ACI, IATA, etc.), industry partners and other airports.

• **Developing a digital culture across the enterprise:** Agility is a key factor in ensuring successful digital transformation, so it is important to promote a new way of working and managing projects by encouraging speed, risk-taking (fail fast) and experimentation (test and learn).

• **Acquiring and retaining talent:** This is, of course, true for most business operations, but in digital transformation the need is reinforced, because demand for digital talents is booming and competition to hire these talents is ferocious. Airports are recommended to identify key digital talents to acquire and train, as well as valuing and retaining internal resources who have both business and digital competencies.

• **Dealing with data privacy laws and regulations:** Airports handle massive amounts of passenger and customer data throughout the digital journey. The storage and usage of this dataset has to occur mindfully and in cognizance with data privacy laws and regulations imposed by different countries, such as the upcoming GDPR\(^6\) ruling.

**Risks**

The biggest risk to any airport will be to ignore digital transformation. Every business and organization will be impacted by digital transformation, either directly or indirectly, and airports are certainly not immune to digital disrupters.

In addition, airports should not believe that technology is the silver bullet of digital transformation: Digital transformation will not solve all issues, challenges and risks. ACI believes that successful digital transformation arises not from implementing new technologies but from transforming organizations so they can leverage the possibilities new technologies offer.
Cyber-security and data protection are high on the risk register, because digitalization of operational processes and customer interaction is reinforcing the negative impact of malfunction and is increasing the threats posed by cyber-criminality.

Finally, because digital transformation is touching all aspects of airport organizations and processes, it is important for the airport’s C-level managements to build and manage a digital transformation plan to define targets and priorities. This will help to prevent scattershot implementations and the risk of not delivering step changes.

Opportunities/Recommendations
As stated frequently in this Best Practice, digital opportunities vary from airport to airport and are dependent upon each airport’s business context, objectives and readiness.

Digital transformation is already well underway throughout the aviation industry globally, especially at airports where rapid adoption and digitalization of passenger self-services such as check-in kiosks, bag-drop and self-boarding is taking place. The rate of adoption of digital transformation is accelerating, so airports should engage with all their stakeholders and demonstrate proactivity in adapting to the real-time demands of all airport customers (internal and external.) In order to do this, it is important to:

- **Acknowledge** that airports have inherent business advantages which must be leveraged (i.e., capital, know-how, brand and customer base) to keep digital disrupters at a respectable distance and ensure control over their valuable assets.

- **Keep in mind** that successful digital transformation comes from the top, so the clear and deep involvement of C-level management is needed to lead and sustain change and promote a culture that celebrates risk-taking and rapid actions.

- **Understand** that digital transformation does not always mean creating a new organization, because there are often quick wins from reshaping the existing one and leveraging new ways of working. The airport should also take advantage of valuable strategic assets and gain value from investments already made.
Speed is more important than perfection. A recommended practice is to launch small-scale digital initiatives to validate their effectiveness. If they fail, move on quickly. Secure quick wins and then scale up successful initiatives to improve the customer experience, introduce new services, digitize internal processes or achieve whatever else is the objective.

Reinforce business and IT collaboration, because digital transformation is a team effort in which technologies play a key role.

Focus on IT architecture. The speed of technological evolution is increasing every day, so it is critical to master and manage the airport’s entire IT architecture. In order to be flexible, airports should adopt a modular approach, so that they can swap components as needed in an agile yet controlled way.
5. Best practice

From the Digital Airport Survey it is possible not only to generate a maturity path (as shown in Chapter 4, Figure 1), but also to derive direct influences on an airport’s IT strategy.

The ACI World Airport IT Standing Committee (WAITSC) believes that the best digital airport has an infrastructure in place on which to build all of its digital capabilities. It has embraced the concept of open data and shares data where this adds value and offers the airport’s passengers a personal experience in their journeys. Additionally, the best digital airport utilizes the power of digital touchpoints enabled with biometrics to make the passenger journey more seamless. Digital airports bring relevant data together for all stakeholders in a virtual control room and generate data through the IoT. At the same time, the best digital airport actively searches for and looks to apply innovation, to generate further value for its clients and monetize technological solutions in new business models.

Three levels of a digital airport can be distinguished:

- **Digitally enabled**: The airport has the basics in order, such as infrastructure and cyber-resilience, to be able to become a digital airport, in order to reach customers.

- **Fully digital**: The airport has implemented all the options that create a fully digital airport, based on mainstream and commonly available technologies.

- **Next-generation digital**: The airport has implemented all the advanced digital concepts that are not commonly available and tested in the aviation industry, such as seamless travel with single-token biometric touchpoints; new business models based on digital services such as blockchain; and personal and context-aware services.

Table 1 shows selected focus areas taken from the Digital Airport Survey to illustrate this categorization. From these areas, three examples (underlined) will be described in more detail as regards their meanings and their
consequences for digital transformation. The terms highlighted in blue can be found in the ‘Current topics’ section and include recommendations for implementing these enablers. It is ACI’s goal to have best practices and recommendations in place for all areas of digitalization, so this chapter will always be a work in progress.

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<td><strong>Innovations</strong></td>
<td>Innovation process and team</td>
<td>Active digitalization and innovation</td>
<td>Innovation pipeline</td>
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Tab. 1 - Digital Services (Matrix)
Example focus areas

Cyber threat resilience is paramount in being a digital airport. Data is becoming a key asset for an airport, steering its investments, capacity planning, operations and many other processes. If data is manipulated so that incorrect information is distilled, decisions may be influenced negatively. In addition, cyber-threat resilience ensures that sensitive information which is stored, such as biometrics, personal details and in-depth airline performances, is kept safe and will not leak to unauthorized parties. Ensuring that data and the systems producing it are safe is one of the basic hygiene tasks a digital airport must accomplish.

Customers expect products and services via multiple digital channels such as apps and APIs. A digital airport has various channels in place so it can deliver its products and services to meet its customers’ demands. Typically, each airport has an app intended for passengers which is specific to that airport. However, upon looking at initiatives to broaden access to apps in the travel industry such as FLIO, TripCase, etc., it appears certain this market will grow. This will shift the focus from having one dedicated airport app to having APIs feeding each airport’s app. The result will be an increased degree of customer reach that an airport’s own app probably would never achieve otherwise. In addition, the digital airport also focuses on its other major customers: its tenant airlines and service providers. Delivering digital channels to ensure that these customers also enjoy smooth operations may have a bigger business impact on airport performance than will consumer-facing digital channels.

Decisions at a digital airport should be made quickly and easily, preferably without human interference and without lengthy meetings and conference calls. A prerequisite to this vision is to offer trusted real-time information sharing among all stakeholders. Based on accurate, timely, relevant information, decisions based on facts can be made faster. This will result in more efficient business processes and better insight into the airport’s overall performance. Key processes such as collaborative decision-making are grounded on trusted, accurate, real-time information exchange. This concept should be extended to all airport processes.
Location-based services

Wayfinding and location-based services (LBS) are the foundation of many use cases to improve the passenger experience in the aviation sector. These digital data services drive value creation by means of optimizing time spent, self-control of the passenger’s journey through the airport and access to relevant information on an airport. Value created includes:

- Aviation can guide its passengers through the airline journey.
- The airport can guide its passengers and reduce their stress throughout the airport journey by managing expectations for routes and walking times. This leaves more time for passengers to enjoy time spent in the airport, e.g., shopping, eating and drinking or relaxing in a lounge.
- Passengers have a guide to commercial points of interest such as retail outlets and available parking spaces.
- Passengers receive relevant information and service offers based on their exact positions in the airport, and (eventually) based on their interests and preferences.
- The airport gain insights into passenger flow and behaviour.

LBS are typically integrated into mobile apps on platforms such as iOS and Android. Each airport can choose to offer these services through its own airport app or offer location-based services to airlines’ and/or booking agencies’ apps. Potentially higher numbers of passengers can be reached through the latter two types of apps. In addition, Apple and Google are developing location-based services for indoor way-finding, so it is important that their information remains current and does not create conflicts with airport-provided solutions.

To support location-based services an airport should install a Wi-Fi and/or a beacon network, creating reliable digital fingerprints. The digital fingerprint is the blueprint allowing software development kits (SDKs) to pinpoint the exact location of a user device, also known as the blue dot. The techniques and the number of suppliers developing SDK solutions is growing, so selecting a future-proof technique and an SDK supplier may be a challenge.
This challenge can be addressed by pursuing open standards that industry organizations such as ACI and the International Air Transport Association are defining to ensure interoperability within the airport ecosystem, as well as among all airports. This also ensures that LBS technology can be incorporated easily into new channels which have not yet been developed at the time of selecting a technology.

Data strategy and API platform

As of this paper’s publication, it is common for airports to publish up-to-date information (e.g., flight schedules, ETDs and ETAs) on their own Web presences (homepages) and for each airport to have a mobile application available for at least the two predominant operating systems on the portable-device market (Google’s Android and Apple’s iOS).
An important implication of this fact is that a passenger in a real-world scenario—say, traveling from Amsterdam to Auckland—would need seven different apps to get the best available information from each of the transportation providers involved in the trip:

1. Amsterdam Taxi
2. Amsterdam Airport Schiphol
3. KLM
4. Shanghai Pudong International Airport
5. Air New Zealand
6. Auckland Airport
7. Kiwi Transit

Looking at the numbers in Figure 3, it becomes obvious that this is probably not going to happen. Travelers are not willing to install and use a multitude of apps for their transportation needs. Therefore, they either opt to use only one, e.g., the main carrier’s app, and rely on the content shown there; or they use one of the many trip-aggregators’ apps instead, such as:

- TripCase
- TripIt
- Kayak
- FlightTrack
- GateGuru
- App in the Air
- Google Trips

These apps aim to bring together all pieces of travel information in one place, at the price of questionable data sources and quality. If travelers make use of travel-aggregators’ apps, it will mean that airports and airlines alike lose their chance of upselling and that they risk being accused of providing faulty or conflicting data (e.g., gate changes are not shown).

Another trend that has grown in popularity in the aviation industry since 2016 is the use of virtual assistants. General-purpose assistants—such as Apple’s Siri, Google’s Assistant, Microsoft’s Cortana or Amazon’s Alexa—and special-purpose travel assistants such as HelloGbye, Pana and Hello Hipmunk are able to provide travel information.
How should airports respond to these trends? One reasonable way is to have an Open API strategy in place. Figure 4 shows the API economy value chain—a cornerstone of the digital airport.

Airports own information assets. If they make these assets available as open or commercial APIs, developers can use the APIs for developing new apps and improve the quality of the airports’ existing services. These apps will deliver new experiences (i.e., B2C, B2B, B2E, B2B2C) for and to the airport, ensuring common information and reducing conflicts.

When setting up an API strategy consider these questions:

- Which data are you willing to share? E.g., flights, airport information, services offered, geolocation/maps.
- With whom do you want to share the data? E.g., selected partners such as airlines and tenants, or the general public.
- Do you want to charge for it? E.g., charge everyone, or have a freemium model with a service level agreement (SLA)/support available for a fee, or offer pricing based on a monthly fee or on used API-calls.
- Do you wish to use proprietary formats, or employ open data-exchange standards? ACI has developed a standard called Seamless Travel, which is already in place, for data exchange between airports and other aviation-industry partners within the ACRIS working group.

Once the information is available via APIs it is relatively simple to:
1. Improve the value of your airport’s homepage and/or apps by augmenting the data with information from other partners, e.g., arrival airport baggage-belt information for an outgoing flight.

2. Have your airport’s services displayed in other apps, e.g., by contractual agreements to share your flight data for free in exchange for displaying bookable services as well.

3. Make your information available through new channels such as chatbots (e.g., Facebook Messenger) or direct integration with assistants such as Amazon’s Alexa.

4. Join together with other airports to publish one multi-airport app, e.g., as Passngr is doing for German airports.

Summary

As our industry experiences this digital transformation, the WAITSC will continue to evaluate and pilot old and new technologies, recommend best practices and standards, and communicate findings so airports can benefit from this evolution. The Digital Transformation Best Practice and associated survey are the first steps in assisting airports to understand their digital requirements and plans, and the WAITSC welcomes all feedback and comments.
## Glossary of terms and abbreviations

<table>
<thead>
<tr>
<th>TERM</th>
<th>DEFINITION</th>
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<tbody>
<tr>
<td>ACRIS</td>
<td>ACI Airport Community Recommended Information Services</td>
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<tr>
<td>AI</td>
<td>Artificial Intelligence</td>
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<tr>
<td>AIS</td>
<td>Airport Information System: Airport software, including flight information display systems, airport billing and accounting systems, and ATC Systems</td>
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<td>AOC</td>
<td>Airport Operations Centre</td>
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<tr>
<td>API</td>
<td>Application Programming Interface: a set of subroutine definitions, protocols, and tools for building application software</td>
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<tr>
<td>APOC</td>
<td>Airport Operations Centre</td>
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<tr>
<td>B2B</td>
<td>Business to Business</td>
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<tr>
<td>B2B2C</td>
<td>Business to Business to Customers</td>
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<tr>
<td>B2C</td>
<td>Business to Customers</td>
</tr>
<tr>
<td>B2E</td>
<td>Business to Enterprise</td>
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<tr>
<td>BLOCKCHAIN</td>
<td>Digital transfer ledger</td>
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<td>BOTS</td>
<td>Auditory or tactile digital communication</td>
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<td>CDM</td>
<td>Collaborative Decision Making</td>
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<td>CRM</td>
<td>Customer Relationship Management: A system managing a company’s interaction with current and potential future customers that tries to analyze data about customers’ history with a company</td>
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<td>CXO</td>
<td>CEO/COO/CFO/CIO/CMO, etc.</td>
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<tr>
<td>DT</td>
<td>Digital Transformation is about business transformation in a digital world</td>
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<td>FIDS</td>
<td>Flight Information Display System: A system used to display flight information to passengers in real time via electronic display boards or TV screens</td>
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<td>ETA</td>
<td>Estimated Time of Arrival</td>
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<tr>
<td>ETD</td>
<td>Estimated Time of Departure</td>
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<tr>
<td>IOT</td>
<td>Internet of Things: Inter-networking of physical devices, buildings, and other items—embedded with electronics, software, sensors, actuators and network connectivity that enable these objects to collect and exchange data</td>
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<tr>
<td>KPI</td>
<td>Key Performance Indicator</td>
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<td>LBS</td>
<td>Location Based Service: A software-level service that uses location data to control features</td>
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<td>SDK</td>
<td>Software Development Kit: A set of software development tools that allows the creation of applications for a software package, software framework, hardware platform, computer system, video game console, operating system, or similar development platform.</td>
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<tr>
<td>SLA</td>
<td>Service Level Agreement: Quality, availability, responsibilities are officially committed between a service provider and the customer</td>
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<td>WAITSC</td>
<td>ACI World Airport IT Standing Committee.</td>
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