Future of Air Travel
About Arup
Arup helps aviation clients solve complex business, development and operational challenges through innovative planning, design, technology and management consultancy. We have provided integrated development services to operators, developers, investors, airlines and regulators at over 100 airports within the last five years – ranging from many of the world’s largest international hubs to award winning smaller regional airports.

This report is a product of Arup/Intel Corporation collaboration on research and development regarding the Future of Air Travel.

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The Future of Air Travel (FoAT) research initiative is based around a series of forums that bring together visionaries from a wide range of complementary areas across the aviation industry: operators, planners, developers, engineers, economists and technologists. These forums aim to encourage a more detailed and current understanding of the drivers shaping the future of air travel across socio-cultural, technological, economic, environmental and political domains. The interactive and ongoing quality of these conversations provide a contemporary view that embraces the high rate of change in this technology-driven environment.

The inaugural Arup-facilitated collaborative forum took place in February 2015, in San Francisco — an international hub known for its innovative practices, advanced technologies and proximity to the forward-thinking minds that established Silicon Valley. This forum focused on the passenger experience and how technology converges to affect the Future of the Airport, while investigating emerging trends and technologies in order to assess the potential opportunities and roadblocks for global aviation development.

In December 2015, the Istanbul Forum developed these initial findings with a focus on Humanizing the Airport Experience and taking a deeper look at the entire travel experience from end-to-end and key drivers such as passenger screening, the bag, the terminal of the future and the role of big data.
Executive Summary

The Future of Air Travel Istanbul Forum was an opportunity for a wide and deep appraisal of the issues and opportunities facing the air travel industry and its infrastructure:

1. **Physical inflexibility**
   Existing airports require labor-intensive physical planning and capital-intensive construction. But once delivered they are constantly challenged by environmental regulation, economic uncertainty, evolving security demands, changing airline business models, and the sheer physical inflexibility of concrete and steel to deal with changing demands.

2. **Demand for air travel is insatiable**
   Airport development growth plans in many regions of the world will likely fail to meet long-term demand – and many regions are already constrained in terms of building new capacity.

3. **Embrace new technology, not new building**
   Technological advances can complement physical planning to minimize building our way out of expected demand. However, even if technology theoretically allows airports to work smarter, there are risks and industry participants must share data. The benefits could however be substantial, including:
   - Data sharing by participants to facilitate end-to-end travel processes.
   - Reshaping security screening to screen for intent, which could reduce the need to screen for capability, which is the current practice.
   - Alternative baggage processes and technologies which could drive more efficient use of buildings.
   - Global entry measures to facilitate seamless international travel and reduce the need for traditional customs and immigration facilities.

4. **Shared data**
   The modern passenger experience is increasingly data-driven. But there are multiple data owners throughout the end-to-end passenger experience, and insufficient sharing.

5. **Screening: capability, intent and risk**
   Passenger screening currently checks for the capability to do harm, using substantial space and resources to screen for prohibited items. Risk-based screening that instead assesses intent to do harm, though still in its infancy (through TSA Pre✓ for example), offers the promise of reducing the need for the traditional checkpoint by screening in the virtual domain.

6. **Bags – going their own way?**
   Does the bag still need to accompany us along the entire journey? Emerging smart bag technologies coupled with remote drop/pickup and alternative shared economy transportation (e.g. Uber and Lyft) could mean that taking your luggage to the airport and standing around a carousel is a thing of the past. Supported by real-time tracking, this would reduce the need for in-airport bag handling systems, improve operational efficiency and lower passenger anxiety.

7. **Streamlined terminals**
   These concepts, when brought together, could lead to radically simplified terminals, with baggage handling systems located elsewhere, or vastly reduced passenger screening, border control and check-in areas. We can envisage a “one-check” concept through a smaller and more operationally flexible terminal footprint. Virtual ordering and individual pickup of consumer products could further reduce the need for traditionally configured concession space.

8. **Leading from within**
   A new golden age of air travel could be realised through a digitally smart and physically streamlined travel ecosystem. But change will be hard and significant change will require the industry to take tangible steps if this transformation is to be achieved.
The Trends

The following long-term mega trends are expected to be relevant as we consider the future:

• Urbanization — The rate of urbanization, its impending impact on traffic volumes, as well as increasing pressure on infrastructure capacity and resilience pose unprecedented challenges to urban mobility systems.

• Changing Demographics — An increase in life expectancy and declining birth rates are expected to skew the population towards an older demographic, introducing new demands on mobility systems to ensure convenience. The United Nations expects 21% of the global population, more than 2 billion people, to be 60 years old or over by 2050.

• Climate Change — As the effects of climate change are expected to pose unprecedented challenges to urban areas, cities must take responsibility for a large proportion of global greenhouse gas emissions.

• Global Terrorism — Global terrorism will continue to be a threat to the aviation sector and continued investment will be required to safeguard airport and aircraft assets and people.

• A major element in any growing travel market consists of people that have never travelled before. Today’s airports need to be designed for people that have no expectations caused by legacy processes nor understanding of how airports work — they just want to get on a plane.

Within the mega trend context, there are two key factors central to the passenger experience:

• Passenger Growth — increased long-term demand is expected to double by 2030.

• Technology Innovation — driven by data services and connectivity.

The Problem

Airport infrastructure in many busy regions is capacity-challenged, causing delays, crowding and poor service levels. Physical solutions through airport development plans will not be able to cope with expected long-term growth. Our industry cannot simply build its way out and the situation will only worsen as planned capacity is outstripped by demand. The inability to develop new runway and airspace capacity in many major markets is evidence of this.

“We stand on the brink of a technological revolution that will fundamentally alter the way we live, work, and relate to one another. In its scale, scope, and complexity, the transformation will be unlike anything humankind has experienced before”.

—Klaus Schwab, Founder and Executive Chairman, World Economic Forum
The Response — How Did FoAT Frame the Solutions?

The Istanbul Forum focused on the impact of these trends on the passenger experience from a human perspective – considering how technology and data could work across the air travel ecosystem.

Advancements in Technology and Big Data

The promise of technological innovations in the operation of passenger terminals, airfield and airspace provides a means to meet expected demand. Other industries — logistics, distribution, manufacturing — are able to apply technology to optimize capacity and throughput.

The data that is becoming available about passengers, staff and operations is increasing at an exponential rate. This data can be turned into actionable information that can be then used to improve the operational performance of aviation businesses, tailor and improve the services to passengers, increase business resilience and reduce operational risks.

The future opportunity in gathering data and turning it into information that can be used to make decisions is substantial, however the aviation business is not set up for this. The data is not being gathered and the technologies are not in place to consolidate, analyze, and display it. Where the data is being gathered effectively it is being done so in silos with individual organizations looking holistically to make individual gain rather than the aviation sector looking at how to deliver the right outcomes together.

There will also be some significant hurdles along the way in terms of data ownership, data security and privacy and these will need to be tackled collectively.

Develop the Air Travel Ecosystem

The current air travel ecosystem is fragmented and provides the passenger with a dislocated experience. It became apparent in the research stages of our work that the air travel experience is more than simply what happens to the traveler at an airport and in an aircraft. One must consider the entire end-to-end experience — collectively and as individual processes — starting from the decision to travel by air, through to the overall day-of-travel experience from origin to destination, to define the air travel ecosystem.

Key air travel decision criteria include:

- Price
- Brand loyalty
- Air service quality (e.g., frequency and schedule)
- Flight connection time
- Airport service quality and accessibility, especially in multi-airport communities

There are virtual and physical aspects of this ecosystem that must be considered as well.

The Virtual Ecosystem

The current travel experience starts virtually and online — the world of the internet is where travel decisions are increasingly made. Online travel agent and supplier websites have decimated the storefront travel agent industry over the last two decades and have created a new competitive space where the remaining “brick and mortar” air travel industry players — airlines, hotel companies, car rental companies — converge online to compete for patronage. This has changed participants’ economic behavior and also shifted the value of ecosystem data and provision of information to the traveling public. Information on who you are, why you are traveling and how travel purchases are made, are part of the information network that is being used by business intelligence, data mining, customer relations management systems as well as government authorities.

The Connected Ecosystem

Change will be driven through the convergence of this virtual air travel ecosystem with physical. The convergence of virtual and physical ecosystems will ideally produce a Connected Ecosystem that is driven by intelligent connectivity. Technical innovations such as the Internet of Things, urban mobility innovations (e.g. driverless vehicles) and Smart City infrastructure initiatives supported by the technology industry could pave the way for a complete reimagining of the end-to-end air travel experience.
Passenger terminal touchpoints such as check-in, screening and baggage reclaim represent the primary interfaces during the day-of-travel. The main objectives of a seamless air travel experience include:

- A handover of baggage at the earliest possible moment.
- A smooth and predictable experience passing through the airport to aircraft boarding.
- Confidence that your baggage will reach the destination.
- To make personal decisions in a relaxed manner.
- The ability to retrieve your baggage “on demand”, if possible.
- To exit the airport in the most expeditious manner.

If innovation is to occur in passenger terminal development, the entire process needs to be reconsidered and consolidated to meet future growth demands.
The Results of the Istanbul Forum

The forum attendees identified the following five elements of the air travel experience as being game changers to humanizing air travel and formed breakout groups to explore them:

1. The End-to-End Travel Experience
2. Passenger Terminal of the Future
3. The Checked Bag Reimagined
4. Eliminating the Passenger Screening Checkpoint
5. Big Data

The following sections summarize the key discussions, findings and recommendations.
The End-to-End Travel Experience (E2E)

The E2E session aimed to identify the key elements and improvement opportunities of the overall passenger and bag journey, given global trends towards intelligent connectivity and Smart City technology solutions. From a humanizing perspective, technology allows travelers to have greater control and more certainty in managing the stages of the E2E travel process.

Ultimately, seamless intelligent connectivity from home/office through to the passenger terminal and aircraft, onward to the final destination will allow for a complete redefinition of the air travel experience.

Key Conclusions

It is imperative to consider the entire journey starting from the traveler’s base — whether it be home, office, hotel or other locations.

Alternative executive jet travel and other high-end traveler offerings — such as Surfair and Flyblade — could continue to affect traditional airline First/Business class travel markets.

The need to remove terminal touchpoints. The terminal experience will be enhanced if the check-in/screening/border control processes can be combined into a single activity/location. The need for an end-to-end baggage solution that allows for real-time bag tracking from Origin to Destination that communicates directly with the passenger. Data sharing will be critical for a successful end-to-end process.

The viability of an effective E2E process that truly enhances the passenger experience will require some key elements:

| Real-time passenger and bag tracking solution that extends from origin to destination. | Consolidation of terminal process touchpoints to streamline the experience. | Data sharing and collaboration across entities managing the experience — including different countries/ agencies for international travel. |
| Integration with Smart City solutions, such as integrated city transportation and smart buildings. |

The technology trends driving hyper-personalization could initially be adopted by airlines using technologies such as social media integrated with indoor navigation solutions that allow real-time tracking of the passenger and bags to differentiate themselves competitively. This will have a real knock-on effect on how the passenger terminal is planned and designed as processing functions become more and more decentralized.
The Passenger Terminal of the Future

The future passenger terminal will provide experiences that are catered to individual passengers, based upon technology that is adapted to their specific preferences, as well as their ability to use that technology. Terminal development must be rethought to take full advantage of future technology solutions to facilitate 1) minimized capital investments, 2) optimized assets and operations and 3) a high level customer experience.

Key Conclusions

The research delivered by the group imagined the absolute minimum that was needed for an airport to function, proposing a “terminal-lite” approach that retains essential terminal processes and dramatically decentralizes as many terminal functions as possible. The current arduous terminal processing experience of waiting in multiple queues in a sequence of processes will be increasingly automated through ambient embedded technology with predictive capabilities. This smart-terminal automation will use a combination of biometrics, pre-set access clearance and wearable technology to provide information efficiently. We envisage a one-check concept that clears passengers through screening and airline check-in using biometric and advanced data collection techniques, permitting ongoing automated entry to the terminal building and aircraft. Many physical functions that are currently in-terminal (e.g. baggage processing) can be decentralized using supply chain and on-demand solutions found in other industries, providing a smaller terminal footprint that can be more flexibly configured to meet core operational requirements. The outline thinking to this new technologically-enabled terminal includes:

1. Identify which functions are mandatory at an airport terminal:
   - Support areas
   - Comfort facilities (restrooms, concessions)
   - Passenger and baggage transfer functions, including marshalling areas for normal and disrupted operations
   - Surface transport functions
   - Screening

2. Identify which functions occur at the aircraft — given pre-check capabilities:
   - ID check
   - Border control
   - Health checks
   - International arrivals border control

3. Identify functions that can occur off-airport:
   - Bag drop/check-in
   - Well-wishers/meet & greet
   - Baggage handling system
   - Commercial
   - Car parking
   - Ticketing, payment and other transactions
   - Baggage reclaim
The Passenger Terminal of the Future

This approach is a radical shift from current traditional terminal planning heuristics and poses implementation challenges. While managing passenger screening is a central concern, the other factors shown below must also be considered:

The group agreed that while a minimum approach was unlikely to be adopted, it provided a baseline of the minimum possible, and prompted other planning considerations:

- The mandatory terminal processing elements were mostly related to allowing space for passengers to be comfortable and to connect between transport modes.
- The “One-Check” concept envisages passengers providing enough data (whether proactively or through existing data sources) for the checks to be completed quickly at embarkation or disembarkation. Technology and government and society acceptance would need to evolve for this to be feasible.
- The goal of maximizing the extent of the off-airport functions was to free up valuable on-airport space and to reduce the need for support functions that do not necessarily need to be in high cost terminal facilities.

The group did not want to devise solutions that had a negative impact on the passenger experience — one of the advantages expected of the concept was reduced walking distances and the number of imposed processes.
The Checked Bag Reimagined

Passenger baggage handling, whether checked or carried on, is an essential aspect of the air travel experience. Current baggage processes are inefficient and inconvenient for the passenger, airport and airline. Regulatory constraints, long established practices and outdated infrastructure have hindered innovation and delivered a dehumanized experience.

Key Conclusions

This session explored potential opportunities to change the way passengers travel with baggage and to leverage advances seen in other time-sensitive, process-focused industries such as the sharing economy, hospitality, supply chain logistics and package delivery. For example, Disney and Orlando International Airport are exploring similar concepts. We reconsidered baggage processing from the moment the passenger books a flight to arrival at their destination. There are opportunities and solutions available to make the passenger bag experience more predictable and positive.

The challenge to the group was to investigate means to take advantage of technology solutions (e.g. Big Data and new screening technologies) to improve the passenger experience.

Certain basic guiding principles to rehumanize the baggage experience included:

- The checked bag process is an End-to-End travel experience.
- Checked bag status must be available to the passenger continually and in real time. A fundamental source of travel stress is an uncertain checked bag disposition.
- The traveler has the option for personal logistics — to control and direct the bag to and from a specific destination at a specific time.

These fundamental principles serve as the core objectives for delivering checked bag solutions that would provide a future air travel experience that is personalized and empowered. We are on the cusp of a transformational change in technology that could revolutionize the entire travel experience.

Bag Experience Scenarios

The following scenarios were considered as the basis for the future baggage experience:

The Bag Never Travels with the Passenger

Separating the passenger and the bag could eliminate traditional airport baggage handling facilities, treating checked baggage as cargo and developing established cargo freight networks such as Fedex, DHL or the emerging Amazon fleet.

Obvious benefits of this scenario include:
- Quicker aircraft turnarounds
- Smaller terminal building footprint and capital costs
- Airlines benefit from reduced aircraft payloads or available hold capacity
- Airport check-in timings are no longer reliant upon bag delivery to the airport
The Checked Bag Reimagined

Ultra-Smart Bag Travels with Passenger
The following technology-driven outcomes were identified:

Real-time personalized bag tracking
Bags have been tracked by airlines for years using barcode readers. This process provides no visibility to the passenger and is very labor intensive. The technology exists to automatically identify and report a bag’s location — early adopters such as Qantas and Delta are expected to motivate other airlines to embrace these solutions.

Baggage Reclaim On-Demand
The baggage reclaim process has largely been ignored by airport planners and airlines, despite being a significant pain point for passengers. Serious consideration to alternative on-demand reclaim methods is critical.

Bag Uberization and Task Rabbiting
Bag handling for the E2E journey lends itself towards bag pickup and drop off tasking, using on-demand outsourced labor such as Uber and Task Rabbit. A passenger, facilitated by an airline, requests bag pickup. The passenger has already checked in for the flight on his mobile phone and the airline asks if there any bags to check. The airline prefers to gain custody of the bag early to manage bag drop/check-in facilities and arranges to have the bag injected into the Baggage Handling System (BHS) during off-peak hours.

Some travelers may elect for their baggage to be delivered to a specific destination such as home, hotel or office. Using the same Uber/Task Rabbit approaches, the bag is tracked while a new pickup notification is transmitted to the individual charged with the delivery task. Like any courier service that exists today the bag is delivered to the desired destination.

Clone the Bag
Sharing economy principles could be applied where clothing and items used by a business traveler could be ordered and made available at a destination. Emirates, for instance, laser scan crew members and assemble uniforms for that crew member at any location required. The items would be waiting for you when you arrive at your hotel and would be left upon your departure.

Personal Logistics: Baggage Pickup from Anywhere to Anywhere
Solutions that allow for baggage pick-up and delivery from anywhere to anywhere could potentially reduce the amount of infrastructure required at the terminal building for both check-in and bag reclaim while offering a superior passenger experience. Uber and Task Rabbit solutions that are already working in other service areas are highly applicable and could be facilitated by airlines and airports, for example. Elements of this concept already exist today. The real challenge to creating this advanced checked bag experience will be data sharing, regulatory enhancement and collaboration among the airlines, the ground handler, the infrastructure and the control authorities for security and customs/immigration.

Key Conclusions
It is clear that there are emerging technology solutions that permit real-time tracking and connectivity for the passenger and their bags. The transition to some of the more far-reaching concepts proposed above will take time and will evolve, but the benefits to the passenger experience and in optimization of the use of baggage handling infrastructure are compelling.
Eliminating the Passenger Screening Checkpoint

Consistent with the forum’s spirit of exploration and innovation, this Breakout Group challenged the need for aviation security in its current form in the context of an evolving terrorism threat. Acknowledging this pursuit as being too radical for acceptance by authorities or society, on the basis that screening is a necessity, the group focused on challenging today’s model of delivery.

Risk Based Screening — A solution for the future?

Challenging today’s model of screening delivery is premised on the understanding that an individual is a threat if they:

– Intend to do harm, and
– Are capable of doing harm

Today’s security model focuses on capability — does the passenger have the capability to undertake an attack? Screening delivery relies entirely on detecting and denying all passengers the capability despite their intent, or lack thereof. There is however movement towards assessing intent, commonly referred to as risk based screening. Its advantage is that it eliminates the need to assess capability for the majority (probably close to 100%) of passengers. Today’s approach to risk based screening however is limited by the assumption that past behavior is an indication of future behaviour and therefore intent. Furthermore, it assumes that this past and future behavior relationship can be determined by considering information held primarily by the law enforcement system.

For the majority of people, including some known terrorists, their behavior is never recorded by the law enforcement system. The limitations of this approach are evident.

Accepting assessment of intent (risk based screening) is a valid form of detecting a potential threat to aviation — existing procedures such as TSA Pre✓ in the United States show that this is increasingly realistic.

The group explored options for overcoming the information-related limitations of today’s risk based screening.

The future risk assessment would need to be more comprehensive than it is today. The group hypothesized that assessment (against yet to be determined algorithms) of government and commercially held data, could determine intent and thus mitigate the need for screening entirely for those passengers deemed lacking intent. For those passengers with undetermined or known intent their capability would still need to be determined. Fixed screening locations in the form of banks of equipment however wouldn’t be required because the need to process large volumes of passengers would no longer exist. It is most likely a physical check — pat down and hand search of items, which is the most effective form of passenger screening — that could be used instead.
Use of Big Data for intent assessments requires technological capability, a legal framework and public acceptance. The technological capability most likely exists. The legal framework and public acceptance still has some way to go with current questions including:

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
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<tbody>
<tr>
<td>What are the parameters for determining intent?</td>
<td>What is the definition of intent?</td>
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<td></td>
<td>Who makes the assessment about intent?</td>
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<td></td>
<td>What are the thresholds for ‘no’ and ‘not-okay’ intent?</td>
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<tr>
<td></td>
<td>Where do you get the information to make the assessment about intent?</td>
</tr>
<tr>
<td></td>
<td>Is behavior a good measure of intent?</td>
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<tr>
<td></td>
<td>What ‘behavior’ are you looking for?</td>
</tr>
<tr>
<td></td>
<td>Where do you get the information to make the assessment about intent?</td>
</tr>
<tr>
<td></td>
<td>What is the grey area in trying to predict future behavior or intent?</td>
</tr>
<tr>
<td></td>
<td>Are we prepared to accept that level of risk of failing?</td>
</tr>
<tr>
<td></td>
<td>How does that risk compare with today’s risk of failure by screening processes and equipment?</td>
</tr>
<tr>
<td></td>
<td>Adoption by authorities — will it be possible to convince governments to deploy the use of such data? What are the jurisdiction issues?</td>
</tr>
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<td></td>
<td>Privacy issues — will the use of Big Data available in the public realm be considered an invasion of privacy?</td>
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<tr>
<td></td>
<td>Would elimination of physical search be acceptable to the travelling public? Eliminating physical search would be a huge cultural change and public buy-in would be needed.</td>
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These legal and social hurdles are significant. Time and effort will be required before they are overcome.
Key Conclusions

– Passenger screening currently conducted in the physical realm (determining capability by screening) could be moved to the virtual realm (determining intent through information assessment).

– The current assessment of intent is not sufficiently reliable to fully implement risk based screening. A more comprehensive assessment is needed and technology is critical to that end.

– Switching the manifestation of risk assessment from the physical to the virtual domain would be a significant challenge as it requires legal frameworks, social acceptance and technical capability. The latter is closer to realization. The former two require collaboration amongst varying authorities, including commercial and government agencies across international jurisdictions. Additionally, overcoming public acceptance and perception issues related to the lack of visible passenger screening.

– The move to a truly risk based screening model requires incremental change. In the meantime, technology can be used to overcome the anxiety caused by screening.

The benefits of shifting passenger screening into the virtual domain are significant for passengers and airports alike:

1. Elimination of the physical search for the majority (probably close to 100%) of the travelling public would improve the overall passenger experience. In essence, the passenger screening checkpoint would disappear.

2. The space made available could be reused for better functional or revenue enhancing opportunities.

3. Reduced physical screening infrastructure costs would benefit the overall airport development program from both an airline and airport perspective.
Role of Technology and Big Data

Historically, the aviation industry has adopted electronic data processing in a piecemeal manner, driven by individual entity considerations (e.g. airline online booking and e-ticketing, or retail operator transaction data), and such data is heavily siloed. Many industries have collaborated to move beyond this fragmented approach, notably banking and payment services (e.g. “Apple Pay”), and so the question of how the aviation industry can have a more collaborative data environment is timely.

Specific issues include:

- Who owns the data?
- Why share the data?
- What are comparable data collaboration examples: Apple Pay
- What “open source” data already exists, even if for purchase? e.g. personal bag tracking apps — such as LugLoc, TrakDot, Okoban.
- How do we unlock the data? How would it be managed and by whom?
- What are the data privacy issues?
- What is the value of data across the passenger travel process?
- Define the data and the data sources.
- Define outcomes to be achieved. ASQ ↑ Non-aeronautical Revenue ↑ Cost ↓

Data Participants and Uses

The diagram below summarizes the main participants and users of the key data categories.
Role of Technology and Big Data

Why is Collaboration Essential?
In general, the world of data is fast advancing and inefficiencies and lost opportunities are increasingly being recognized. Reasons for data collaboration include:
- It is the right thing to do; data collaboration will provide visibility and a better passenger experience.
- It will provide a more efficient operation as providers gain greater visibility as to various processes (e.g. passenger and bag tracking).
Similarly, setting quantification objectives (e.g. service quality, cost) is important.

- It will facilitate entire E2E data sharing using neutral platforms that could also permit opt-in by passengers.
- Open access data provides the opportunity to do more.
  - Drive innovation
  - Enables everything else
  - If you don’t do this, you will lose out!
  - Non-industry players with major data capabilities, such as Google, are interested in the aviation space and will take ownership if the industry does not.

Future Data World
The desired outcome from this shared data environment is principally data sharing by all with clearly defined outcomes and benefits, which supports an efficient E2E ecosystem. The traveler would be unified with their secure identity in data (the Token) and their bag would share their identity. Personalized, specific and location aware data that could be tracked by multiple entities would provide appropriate information along the journey, such as:

<table>
<thead>
<tr>
<th>Data Service</th>
<th>Transmitted by (a)</th>
<th>Receipt to</th>
</tr>
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<tbody>
<tr>
<td>Bag Tracking</td>
<td>Bag</td>
<td>Passenger, airline, customs</td>
</tr>
<tr>
<td>International arrivals process</td>
<td>Passenger</td>
<td>Arrivals airport, immigration, airline</td>
</tr>
<tr>
<td>Screening</td>
<td>Government</td>
<td>Airport, airline</td>
</tr>
<tr>
<td>a. May be automatic</td>
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The data interactions would be global and inter-jurisdictional, permitting international travel. The open nature of the data interaction would facilitate competition across the supply chain by multiple data providers and travel services operators.

The ecosystem would be developed cognizant of data privacy and the security environment.

- The traveler controls the right to opt in/out of certain unregulated functions (e.g. do they want to be visible to retailers?).

How do we Achieve This and What are the Next Steps?
There is expected to be significant resistance to this initiative, as well as coordination issues both across supply chains and geographic jurisdictions. So it is important that there is a clear action plan that establishes realistic and achievable steps.
- Define who owns what data and where.
  - Conduct data mapping exercise to establish key processes.
- Define the commercial value of data sharing.
- Use industry forums to promote data collaboration:
  - IATA
  - ACI
  - ICAO
- Bring/define examples from other industries.
  – Identify organizations that may be willing to offer data management services.
  – Engage with technology companies that are leading the way in data analytics.

- Provide small step actions and definable examples.
  – e.g. Aruba Happy Flow is a two-year pilot program developed by Aruba airport where departing passengers present their passports once and are thereafter tracked and cleared through boarding using biometric technology, involving the main hub airline (KLM) with cooperation from the local authorities and with implementation by Vision-Box.

- Identify test case airports and airlines in environments where there would be regulatory support.
  – Identify data platforms and management system.

- Use Test Cases to establish data sharing protocols and demonstrate sharing benefits. Contact airport and airline to establish interest in participating in a Test Case.
The Istanbul Forum assembled a diverse group of individuals, set aside preconceived ideas and for a short period shared ideas in an open creative environment. What has resulted is a vision for the future of air travel that provides specific ideas that realize the promise of emerging technologies to create a new Golden Age of Travel.

The vision of a Connected Ecosystem can be the catalyst for innovation in the relationship between the individual and the travel industry, unlocking the potential for transformative change in the way that we move through airports and cities. This vision includes new concepts for individual trip-making, better information for smarter decision-making, and system optimization to utilize infrastructure efficiently; all in service of fostering a seamless, safe and sustainable travel experience.

Intelligent connectivity enables the symbiotic exchange of data between individuals and smart systems. It facilitates new models of on-demand mobility services.

Achieving this vision requires creativity, trust in our technology and a fearless re-imagining of our current solutions. Providing this future of air travel offering requires cooperation between airports, airlines, municipalities and regulators; agile responses to shifting customer needs and expectations; and a relentless commitment to both security and sustainability.

The technologies exist to support all of these mandates and create a humanized air travel experience from home or office to wherever our destination may be.