Issue 3

Future of Air Travel

The Future Ready Airport

ARUP

GVK AIRPORTS INNOVATION LAB

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 services to operators, developers, investors, airlines and regulators at over 100 airports globally – ranging from many of the world's largest international hubs to award winning regional airports.

About GVK

GVK is a leading Indian multi-industry conglomerate. GVK's successful business in energy, airports, transportation, hospitality and life sciences have revolutionized these sectors. It has made a mark on Indian industry, with a host of firsts and remarkable achievements. Prime among these is the Chhatrapati Shivaji International Airport at Mumbai. GVK Airports Innovation Lab aims to provide an unparalleled travel experience at GVK's new greenfield International Airport at Navi Mumbai.

Attendees

Angkasa Pura Airports
AOE
Arup
Bahrain Airport Company
Bangalore International Airport
Fast Future Publishing
GVK Airports
GVK Partner Airports
India Stack
IATA
Jet Airways
Mumbai International Airport
ThoughtWorks

Preamble

This report is a product of Arup and GVK collaboration on research and development regarding the Future of Air Travel: the Future Ready Airport.

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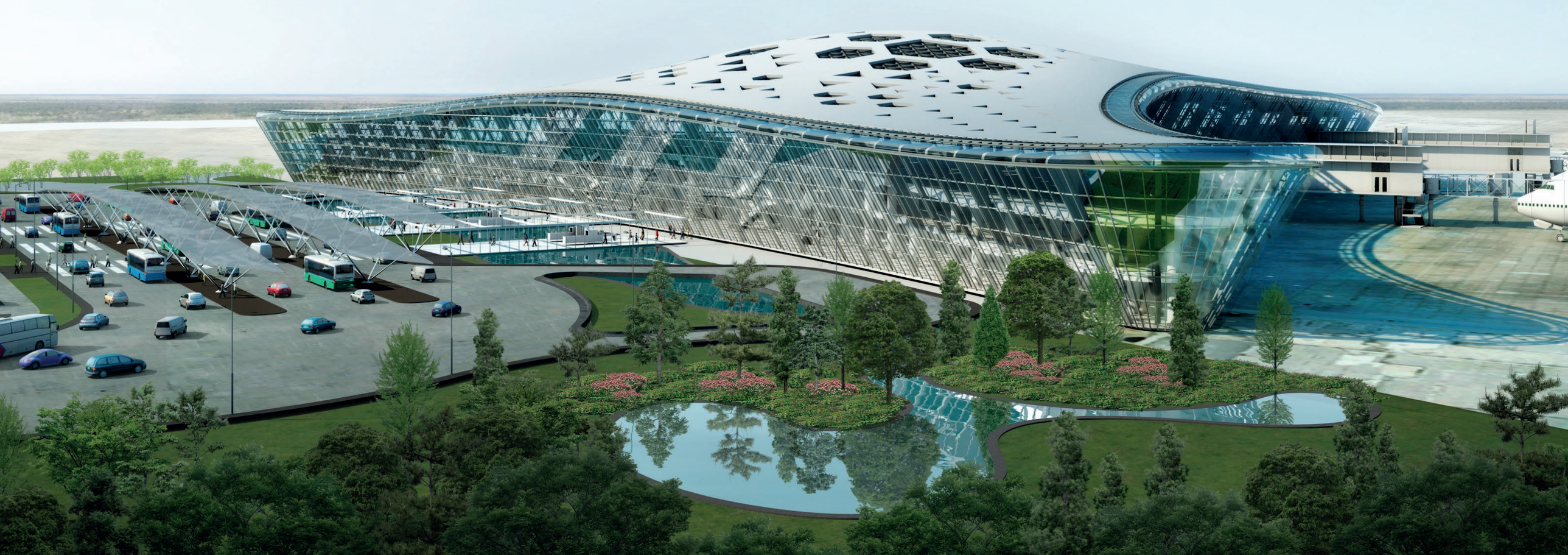


Overview

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 nature 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, a second forum was held in Istanbul with the express purpose developing the initial findings, with a focus on 'Humanizing the Airport Experience' and taking a deeper look at the entire end-to-end travel experience. 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.

Within the mega trend context, there were two key factors central to the passenger experience that emerged in the forum discussions, namely:

1. **Passenger Growth** – long-term demand is expected to double by 2030
2. **Technology Innovation** – driven by data services and connectivity

Airport infrastructure 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. The air transport industry cannot simply build its way out and the situation will only worsen as planned capacity is outstripped by demand.

Key areas of focus for the Istanbul forum included:

- The end-to-end travel experience
- The passenger terminal of the future
- The checked bag reimagined
- Eliminating the passenger screening checkpoint
- The role of big data

What resulted from the forum was a vision for the future of air travel that provides specific ideas that realize the promise of emerging technologies.

It is in this context that the third Future of Air Travel forum in Bangalore was conceived, with a key objective of taking this future vision of air travel and applying it to a real-world airport environment and identify the key near-term steps needed in this journey of transformation of the air travel experience.

Executive Summary

The Strategic Objective of the workshop was 'Making GVK Airports Future Ready'. The key themes explored in the two-day workshop were:

- Delivering a Zero Queue Terminal
- Reimagining Retail, Entertainment and Dining
- Designing the Future Terminal – One Space, multiple uses
- Cost Efficiency

Through the exploration of these themes, a series of implementable pilot programs were identified to stretch today's 'next 1-5 years' way of working towards the intent of each theme. These pilot programs would identify key objectives aligned to the theme, KPIs, Scope and Assumptions. These results serve as a framework towards the overall innovation strategy for GVK Airports.

The two-day workshop was conducted to encourage interaction and participation by all of the participants. Breakout groups were formed around each of the themes being explored, allowing for 'deep-dive' discussions and an opportunity to develop creative solutions.

In addition, special 'power sessions' were organised around specific topics to spur thought provoking ideas and encourage unconstrained thinking. These burst sessions addressed topics such as:

- Exponential developments in science and technology (eg; nano-technology, artificial intelligence, robotics, etc.)
- Seismic shifts; technology trends that will reshape how we live
- Global digital transformation challenges, including a case study overview of an omni-channel retail solution
- Challenges and opportunities in applying these innovation trends into airport development.

In short, the two-day session allowed for ideation in a collaborative structure. Ideas were shared and debated amongst participants in brainstorm sessions that were then reported back to the full group. Though a consensus building process, the most promising ideas were further developed with the emphasis on defining near-term pilot projects and action items required to implement the concepts.

This Report presents the key findings and action items resulting from this two-day forum.

Achieving FoAT: the journey

The Future of Air Travel

Determine the FoAT objective

Arup and GVK determined that GVK's FoAT objective is 'Making GVK Airports Future Ready'

Determine the change themes to achieve the FoAT objective

Arup and GVK agreed the FoAT objective must be founded on

1. A Zero Queue Terminal
2. Reimagining Retail, Entertainment and Dining (RED)
3. Redesigning the Future Terminal
4. Cost Efficiency

Ideation and prioritisation:
what ideas could contribute to the change and ultimately achieve the FoAT objective

For each theme we inspired the FoAT participants with Power Sessions and they worked together to develop a suite of innovative ideas for each theme. Collectively we prioritise those that were innovative but suitably practical to pilot and ideally implement in the next 1-5 years

Design the pilot

Arup facilitated the design of pilots to test the selected ideas

Deliver the pilot

GVK is now armed with the framework and Arup the skills to implement the pilots

First to market

Founded on FoAT GVK will be first to market with those ideas that will support the achievement of 'Making GVK Airports Future Ready'

The Future of Air Travel

Delivering a Zero Queue Terminal

Fundamentally, the traveller is seeking a smooth and predictable transition from their home or office to an airplane and from that airplane to their ultimate destination. The challenge is delighting those 3.6 billion passengers who travelled in 2016, who lost 390 billion hours waiting in airport queues.

The Zero Queue Terminal is an aspirational concept to be based on practical and implementable solutions to streamline the flow of the passenger and their bags, while at the same time optimising operations and reducing building footprint.

Key Conclusions

The Zero Queue Terminal concept requires that the travel process be holistically assessed from a customer's perspective. A guiding principal is to consider setting aside legacy passenger terminal models and development from a customer-centric perspective and to reinvent the processes (and supporting facilities) by taking advantage of the technological tools available. The processes involving enplaning and deplaning go beyond the activities contained within the footprint of the terminal building enabled by digital technology.

The Zero Queue Terminal concept must be developed from this perspective. The following summarizes some of the principal ideas from the breakout sessions addressing the challenges.

- Data presented once, with the airport acting as the integrator;
- Parallel processes – one stop processing pod e.g. check-in, emigration and screening all done all at once in one location ('pod')
- Significantly reducing the amount of checked bags coming into the check-in hall would have significant benefits in reducing the size of the facility and would provide a security benefit for screening
- Eliminate and combine processes through new technologies and / or combine off-line / virtual process
- Journey is planned end-to-end and processes are customized – the journey is seamless from home to destination and back
- Online check-in at home, off-site bag drop → pre-clearance
- Phased and segmented boarding
- Removal of unnecessary processes and streamlining those that remain

Pilot I: Zero Touch Terminal

Which multiple processes (and resultant queuing) can be eliminated in order to develop a seamless journey point-to-point?

Scope and Objective: The focus of this pilot program is to identify opportunities using current or emerging technologies, to eliminate or reduce queues at the terminal touchpoints. The overall objective will be to reduce stress / delay / uncertainties and wasted space due to multiple process and resulting queuing.

Key Performance Indicators (KPIs) identified to measure success:	Key Assumptions in developing the pilot program:
• Reduced perception of process • Reduction in cost due to efficient process • Increased certainty of journey experience • Increase of revenue / pax • Improved brand recognition	• Need for investment in technology • Has to cover entire journey from home to destination • Immigration will cooperate in sharing of information • Requires a proof of concept first • Requires a chip-based biometric passport

Pilot II: Airport as a Service

Can we better understand passengers through data and improve the service to them and the airlines?

Scope and Objective: The focus of this pilot program is to reimagine the entire airport experience as a service-oriented enterprise. The pilot program would explore:

1. Delivering class of service irrespective of class of travel
2. End-to-end passenger experience
3. Provision of all airport services to airlines
4. Commercial offers / ROI

The projects could include developing a robust reward card/package that integrates with airline and airport products as well as local transport and hospitality.

User case examples could include fast track parking, lounge access, arrival lounge, integrated journey plan, fast track security, retail offer, passenger personalized way finding using beacon overlay with GPS.

Key Performance Indicators (KPIs) identified to measure success:	Key Assumptions in developing the pilot program:
• Pax Data • Revenue (up) • Partners • ARPU (Average Revenue Per User) (up) • ASQ (up)	• Commercial model needs developing • IT back end / business & service support • Market positioning • Service catalogue

Reimagining Retail, Entertainment and Dining

There are global trends in retail resulting from the digital economy that will have a significant impact on the fundamental concept of terminal concession development programs, namely, online shopping. The future of retail is evolving rapidly. Shopping malls and retail outlets across the globe are being shuttered in response to this phenomenon. There are new Rules of Engagement for airport retail model, as the game has changed and the rules of the game have changed.

A successful airport concession program is crucial to maintain profitability. Central to this is the duty free, retail and food/beverage offering in the passenger terminal. This theme focuses on the need for travel retail to future proof and develop solutions that are experiential.

Key Conclusions

There is a direct relationship between commercial success and outstanding customer service. Happy and relaxed passengers spend more money. Process improvements in the departure flow, in particular security screening and other seamless connections, will lead to fewer queues and result in a greater retail financial uplift. The following summarizes some of the key conclusions during the ideation sessions:

- Best of Collection
- Continuous Aisle
- Extending the omni-channel retail concept into a real-time connectivity solution
- Utilising graphic data (gender, age, background, journey purposes, social media etc.) to create customized entertainment for individuals
- Information delivery / dissemination through tailored video and screen, and through personal devises such as smart phone;
- Integrated journey planning

Pilot III: Endless Aisle Showroom Retail

Does a showroom concept give a better passenger experience and increased revenue than a traditional retail concept?

Scope and Objective: The focus of this pilot program to develop solutions that enhance the retail experience from the passenger perspective by:

- Creating brand experience spaces in the terminal area
- Changing concession agreeing with / incentivising retailers to deliver enhanced solutions
- Logistics and inventory management; product fulfilment and delivery on a personalised basis

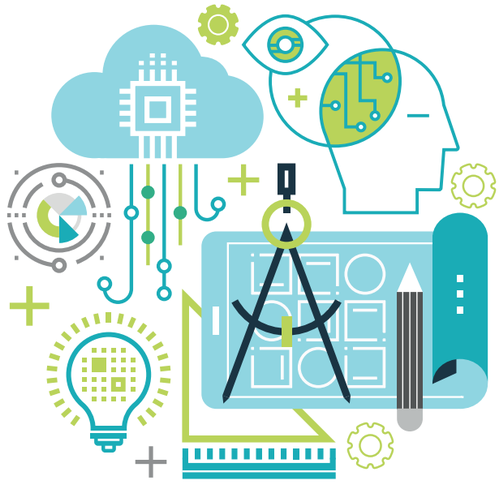
Key Performance Indicators (KPIs) identified to measure success:	Key Assumptions in developing the pilot program:
• Retail revenue per pax • Revenue per m^2 • Passenger satisfaction • Basket size	• Delivery channels already exist • Ability to track that the airport environment triggered purchase • Retailer is able to handle the inventory management • GVK and Retailer comes to an agreement on the need for compensation if the trial results in lower revenue • Current concession agreement allows for the trial e.g. can current agreement be ‘put on ice’ for the duration of the trial

Pilot IV: Creating the End-to-end Omni-Channel Terminal Experience

Can the omni-channel retail experience / solution integrated technology solution be extended into the airport terminal processes to: (1) optimize pax flows and reduce queuing and (2) provide an enhanced personalized experience including RED?

Scope and Objective: Omni-channel retail solutions are emerging as a successful multi-stakeholder data sharing solution. The focus of this pilot program is extend the omni-channel retail solution that leverages data sharing of the various terminal touchpoints such as check-in, immigration, visa services, etc. This solution will explore single-token solutions and explore opportunities for data sharing and integration to optimize operations.

Key Performance Indicators (KPIs) identified to measure success:	Key Assumptions in developing the pilot program:
Infrastructure / Airport KPIs: • Cost avoidance of Capex versus base case development program • Optimization of staff including control authorities (cost / pax / staff member) • LoS measures using ADRM throughput measures ***Passenger Experience KPIs:*** • Increase in dwell and happiness factor = spend more money ***Airline: KPIs*** • Passenger loyalty and product differentiation; better OTP as airline has real-time connectivity to pax ***Airline: Other KPIs*** • Possible new business opportunity (creates local jobs)	The integration of end-to-end solutions is an ambitious long-term strategic project. As such, a use case that could be readily deployed using the principles of the omni-channel concept would need to be worked through on a multi-stakeholder basis. In addition, recent developments in single-token identity solutions should be considered as part of the solution. (e.g. Happyflow and Schiphol and Changi Terminal 4)



Redesigning the Future Terminal

Tradition terminal planning and design continues to be based on rule of thumb calculations of requirements, based on functional process as they are done today. Redesigning the terminal needs to consider the potential impact of emerging digital solutions.

To explore dynamic terminals that expand to meet peak demand in a simple and seamless way with the help of digital technology.

Key Conclusions

The implications of the Digital Age for airport operators is that airports twenty years from now are likely to require less investment in physical infrastructure and more in enabling technology solutions to optimize operations and throughput.

It is clear that airports will operate very differently from how they do today, but why continue to plan in the same manner? It is difficult to ask airport planning departments or consultants to make recommendations on possible future physical outcomes that do not currently exist or are unproven. However, what can be done is explore possible outcomes and try to understand the implications through scenario planning and developing master plans and development programs with scenarios involving innovative technologies using 'what about if ?' planning techniques. The following summarizes some of the key conclusions during the ideation sessions:

- Consolidating processes and move to outcome based processes
- Establish allies by engaging regulators in the design
- Showcasing those airports which take risk to trial
- Open floor plates to create flexible connected spaces
- Move away from reactive to influencing regulators
- Take the pain points away within the regulated process
- Explore emerging changing wall technology
- Create 21st century version of mobile lounge concept using autonomous vehicle technology
- Use of AI to optimize use of terminal infrastructure during off-peak period
- One team experience with shared vision: treat passengers with respect and cross-function KPIs
- Ambassador program with different delivery formats: deploy robots for most touchpoints and provide interactive human experience for remaining ones
- Common baggage processing: common bag drop & reclaim, ARR bag reclaim on demand, offsite bag drop & reclaim
- Combine departing, immigration, security, luggage check-in, duty free shop, consequence, delegated counters etc. separate domestic and international ones
- Differentiate passengers who have or have not got luggage for check-in process
- Flexibility is existing during baggage drop-off and reclaim, and departure baggage is using more space and time
- Use bag drop and reclaim (space) more flexibly; take these spaces and make them one, scan the tag, and send it to the address where you want it.

Pilot V: Removing 'walls'

Which 'walls' can be removed so that we can flex space over time to respond to demand? The 'walls' to be considered include regulation and traditional sequence and processes

Pilot VI: Infrastructure functionality changes with demand

Which new and emerging technology solutions could be developed to morph touchpoints and spaces to serve multiple purposes in response to passenger demand flows?

Scope and Objective: Pilot Projects V and VI are interrelated, as their focus is to explore opportunities in design and technology advances in the use of building materials. The objectives would be to:

- Investigate technology that can enable co-location of process functions with virtual delineation (holographic)
- Develop terminal processes that respond to removing or shifting walls
- Determined space savings (if any) and develop commercial viability
- Understand and adapt regulatory requirements, especially around security

Key Performance Indicators (KPIs) identified to measure success:	Key Assumptions in developing the pilot program:
Infrastructure-related • Cost avoidance of Capex versus base case development program • Optimization of staff including control authorities (cost / pax / staff member). ***Airline-related*** • Reduction of infrastructure cost base to reduce landing fees	• Requires research in emerging technology and engagement with start-ups to explore potential ideas

Pilot VII: Reimagining baggage arrivals in the terminal

How can we provide a facility in the terminal where the passenger can pick up their baggage using a pick up facility connected to an arrival baggage store?

Scope and Objective: The focus of this pilot program is to explore the feasibility of a baggage reclaim on demand concept.

Key Performance Indicators (KPIs) identified to measure success:	Key Assumptions in developing the pilot program:
• Passenger wait time is reduced • Revenue enhancement	• Airline and airport will share passenger data • Integrated solution developed initially through simulation modelling to ascertain effectiveness of solution

Cost Efficiency

The lack of effective stakeholder collaboration is a significant implement to achieving cost effective digital solutions that consider the full spectrum of operating requirements and constraints amongst the stakeholder community.

Making air travel affordable with good design sense that delivers good business. An airport operator's initiative to orchestrate the airport experience along with airlines, service providers and its other stakeholders.

Key Conclusions

Creating an innovation collaborative ecosystem will be required to implement multi-stakeholder digital solutions. The following summarizes some of the key conclusions during the ideation sessions:

- Using risk based design, design out risks and in turn reducing the need for security = totex saving
- Involve security early in the design process to avoid the commensurately more costly need to retrofit
- Develop fact-based evaluation tool to assess the overall business case and benefits of a proposed innovation concept
- The CUSS & CUTE model, across the process & functions (common use self-service, common use terminal equipment); considering cost, from the perspective of value, we should give the value to the passengers which they want to pay, e.g. airport lounge
- Process changes need to reduce the cost of process / people, terminal in the whole life cycle
- Expanding common use of principles, process, services, facilities, resources
- Shared Service Model – sharing resources, process, infrastructure, space, IT, line maintenance model to determine productivity of human resources
- Lean operation model
- Right person for the right job

Pilot VIII: Investment Evaluation Framework

Defining a value framework to be used for all GVK potential investments.

Scope and Objective: The focus of this pilot program is to develop a methodology for measuring the overall value proposition for the various pilot projects being proposed. This would consist of an evaluation tool that address business case from a multi-stakeholder perspective. The objective is to develop a 'fact-based' evaluation model that all stakeholders would buy-in to the results.

Key Performance Indicators (KPIs) identified to measure success:	Key Assumptions in developing the pilot program:
• Stakeholder acceptance that the framework's recommendation is sound and fact-based • Methodology's credibility is proved as outcomes matched expectations	• All multi-stakeholder KPIs can be transparent and measureable (totex model)

Pilot IX: Shared service model

Reducing cost and increase service + efficiency and value

Scope and Objective: The focus of this pilot program is to explore opportunities of shared services that could be provided to the passenger based on the leveraging of emerging technology. The objective of this pilot is to encourage collaboration and breakdown institutionalised silo driven legacy business models that inhibit efficient value-based solutions.

Key Performance Indicators (KPIs) identified to measure success:	Key Assumptions in developing the pilot program:
• Value (cost + services)	• Challenge – regulatory model and competition

Conclusion

The Bangalore FoAT session facilitated a deep-dive exploration of possible futures for the passenger terminal experience, based around the core themes. An overarching conclusion became apparent; namely that pilot projects designed to have impact on how the passenger terminal operates more effectively, or be designed to offer a delightful experience, must be multi-stakeholder. Any solution involving digital technology will inevitably involve data sharing. It is in this area where the greatest rewards exist and present the most significant challenge.

It is through the pilot projects that airport management along with their key stakeholders can manage risk and gain the best understanding of the potential benefits of an innovative solution before making major investments into the existing infrastructure and changes in data management policy.

Though the pilot program could result in the deployment of a near-term solution with measurable benefits and KPIs, there also needs to be further consideration for the long-term implications and potential future outcomes resulting from the pilot program. The pilot programs will be the seed bed of change.

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