AUTOMATED BORDER CONTROL

IMPLEMENTATION GUIDE
<table>
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<th>Document History</th>
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<tbody>
<tr>
<td><strong>Version</strong></td>
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<tr>
<td>1st Edition</td>
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**Contribution**

This section acknowledges the support and contribution to the 1st and 2nd edition:

### Airlines

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<th>Company</th>
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<tr>
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<td>Arturo</td>
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### Governments

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<tr>
<td>Australian Customs &amp; Border Protection</td>
<td>Michael</td>
<td>Odgers</td>
</tr>
<tr>
<td>Government of Aruba</td>
<td>Annet</td>
<td>Steenbergen</td>
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<tr>
<td>FRONTEX</td>
<td>Ignacio</td>
<td>Zozaya</td>
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<tr>
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<td>Bakker</td>
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<td>Looren de Jong - Vonk</td>
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<tr>
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<td>Jeremy</td>
<td>Stokes</td>
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<td>US Department of Homeland Security</td>
<td>David</td>
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### Strategic Partners

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<tr>
<td>Vision Box</td>
<td>Joao</td>
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Table of Contents

1 FOREWORD ........................................................................................................................................... 8

2 INTRODUCTION .................................................................................................................................... 8

2.1 THE PROBLEM ................................................................................................................................... 8

2.2 THE SOLUTION ................................................................................................................................... 9

2.3 THE BENEFITS ................................................................................................................................... 9

2.4 WHAT SUPPORT IS AVAILABLE TO AIRPORTS, GOVERNMENTS AND AIRLINES? ....... 10

2.4.1 IATA .............................................................................................................................................. 10

2.4.2 ACI ............................................................................................................................................... 13

2.4.3 FRONTEX ..................................................................................................................................... 16

3 ABOUT AUTOMATED BORDER CONTROL ..................................................................................... 17

3.1 FACTS AND FIGURES ................................................................................................................... 17

3.2 MARKET TRENDS .......................................................................................................................... 18

3.3 OPTIONS FOR DIFFERENT TYPES OF AUTOMATIONS ................................................................. 20

3.3.1 Registered Traveler Scheme ...................................................................................................... 20

3.3.2 Non-Registered Traveler Schemes ............................................................................................ 22

3.3.3 Emergence of ESTA-type programs ........................................................................................... 24

3.3.4 Mobile Passport Control ............................................................................................................ 24

4 THE DECISION MAKING PROCESS / RISK ASSESSMENT ............................................................ 25

4.1 OWNERSHIP ................................................................................................................................... 25

4.2 AIRPORT .......................................................................................................................................... 27

4.3 GOVERNMENT ................................................................................................................................ 28

4.4 AIRLINES ........................................................................................................................................ 29

4.5 DECISION-MAKING SUPPORT TOOL ......................................................................................... 29

4.5.1 ABC Operational Research Tool ............................................................................................... 30

4.5.2 ABC Cost Benefit Analysis Tool ............................................................................................... 32

4.6 BUSINESS CASE AND FINANCING MODELS .............................................................................. 35

4.6.1 Main parameters influencing an ABC business case ................................................................. 35

5 STAKEHOLDER MANAGEMENT ....................................................................................................... 41

5.1 STAKEHOLDERS IN THE ABC PROJECT .................................................................................... 41

5.2 GOVERNMENTS AGENCIES ......................................................................................................... 41

5.3 AIRPORT OPERATORS ................................................................................................................... 41

5.4 AIRLINES ...................................................................................................................................... 41

5.5 OTHER STAKEHOLDERS ............................................................................................................... 42

5.5.1 Baggage Handling ....................................................................................................................... 42

5.5.2 Airport Development Managers / Architects ........................................................................... 42

5.5.3 Infrastructure Providers ............................................................................................................... 42

5.5.4 Service Providers ....................................................................................................................... 42

5.5.5 Airport Services Department ...................................................................................................... 42

6 IMPLEMENTING AN ABC PROJECT .................................................................................................. 43

6.1 THE PROJECT ROLES AND RESPONSIBILITIES ..................................................................... 44

6.1.1 The Project Team ...................................................................................................................... 45

6.2 PROJECT TRACKING ...................................................................................................................... 45

6.3 ROLLOUT ....................................................................................................................................... 46

6.4 CHECKLIST .................................................................................................................................... 46

6.5 TIMEFRAME .................................................................................................................................. 46

6.5.1 Factors that can influence the timeframe .................................................................................. 46

6.5.2 The following timeframe is meant as guidance to Project Managers ................................. 46

7 KEY ABC COMPONENTS .................................................................................................................... 48
## 8 PASSENGER PROCESSING

8.1 **CAPACITY ISSUE** ........................................................................................................ 49
8.2 **HUMAN FACTORS** ........................................................................................................ 51
  8.2.1 **People with Disabilities** ....................................................................................... 51
  8.2.2 **Families** .................................................................................................................. 51
  8.2.3 **Culture** .................................................................................................................... 51
  8.2.4 **Other Considerations** ............................................................................................ 51
8.3 **PROMOTION OF ABC SCHEMES** ............................................................................. 52
  8.3.1 **Examples of promotions:** ....................................................................................... 53
8.4 **SIGNAGE** .................................................................................................................... 54
8.5 **WAY FINDING** ............................................................................................................. 54
8.6 **HOW TO USE THE EQUIPMENT** .............................................................................. 55

## 9 FUTURE RELATED TECHNOLOGIES

9.1 **BIOMETRICS THROUGHOUT THE 14 STEPS PASSENGER PROCESS** ....................... 57
  9.1.1 **Smart Security** ...................................................................................................... 59
  9.1.2 **Self-boarding using Biometrics** ............................................................................. 59
  9.1.3 **Operational considerations** .................................................................................. 61
  9.1.4 **The financial dimension** ...................................................................................... 62

## 10 STANDARD MAKING BODIES

10.1 **ICAO** .......................................................................................................................... 65
10.2 **ISO STANDARDS** ....................................................................................................... 65
  10.2.1 **ISO 7001 Public Information Symbols** ............................................................... 65
  10.2.2 **ISO Series 19794** ............................................................................................... 65
10.3 **BUSINESS REQUIREMENTS FOR NATIONAL AND REGIONAL ABC SCHEMES** ... 65
  10.3.1 **EU Regulation 562/2006 Schengen Borders Code** ........................................... 65
  10.3.2 **EU Smart Border Package** ................................................................................ 66
  10.3.3 **US Customs and Border Protection APC** ......................................................... 66
10.4 **DISABILITY LEGISLATION** ....................................................................................... 66
10.5 **AIRPORT DESIGN STANDARDS** ............................................................................. 66

## 11 PREFERRED IATA PARTNERS

12 **APPENDIX CASE STUDIES** .......................................................................................... 71
  1. **CASE STUDY UNITED KINGDOM GOVERNMENT** ............................................... 71
  2. **CASE STUDY PORTUGUESE GOVERNMENT** ....................................................... 71
  3. **CASE STUDY CANADIAN GOVERNMENT** ................................................................ 71
  4. **CASE STUDY INDONESIAN GOVERNMENT** ............................................................. 71
  5. **CASE STUDY UNITED STATES GOVERNMENT (MOBILE PASSPORT CONTROL)** 71

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**Examples of promotions:**

Diverse example scenarios related to promotions:

- **Culture**
- **Families**
- **People with Disabilities**

**The financial dimension:**

- **Smart Security**
- **Self-boarding using Biometrics**

---

**Smart Security**

- **ICAO**
- **ISO STANDARDS**
  - **ISO 7001 Public Information Symbols**
  - **ISO Series 19794**

**Business Requirements**

- **EU Regulation 562/2006 Schengen Borders Code**
- **EU Smart Border Package**
- **US Customs and Border Protection APC**

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**Disability Legislation**

**Airport Design Standards**

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**Preferred IATA Partners**

**Case Study Examples:**

1. **United Kingdom Government**
2. **Portuguese Government**
3. **Canadian Government**
4. **Indonesian Government**
5. **United States Government (Mobile Passport Control)**

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**Appendix Case Studies**

- **Examples of Key Components**
- **Case Studies**

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**Implementation Guide**

Page 5

December 2015
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<td>Automated Border Control</td>
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<td>ACI</td>
<td>Airport Council International</td>
<td>Association of the world’s airports</td>
</tr>
<tr>
<td>AEA</td>
<td>Association of European Airlines</td>
<td></td>
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<tr>
<td>ASIAPAC</td>
<td>Asia Pacific</td>
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</tr>
<tr>
<td>ASQ</td>
<td>Aviation Service Quality</td>
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</tr>
<tr>
<td>BCP</td>
<td>Border Crossing Point</td>
<td></td>
</tr>
<tr>
<td>BMWG</td>
<td>Biometrics Multidisciplinary Working Group</td>
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<td>CAWG</td>
<td>Control Authorities Working Group</td>
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<td>Cost Benefit Analysis</td>
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<td>e-MRTD</td>
<td>Electronic Machine Readable Travel Document</td>
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<td>Frontières Extérieures</td>
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<td>IATA</td>
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<td>Airline association</td>
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<td>Middle East and North Africa</td>
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<td>MPC</td>
<td>Mobile Passport Control</td>
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<td>Passenger Facilitation Working Group</td>
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<td>Public Key Directory</td>
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<td>PKI</td>
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<tr>
<td>RT</td>
<td>Registered Traveler</td>
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<tr>
<td>SBG</td>
<td>Self Boarding Gate</td>
<td></td>
</tr>
<tr>
<td>StB</td>
<td>Simplifying the Business</td>
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1 FOREWORD

This document was established in close cooperation with ACI and FRONTEX. In developing the Automated Border Control (ABC) Implementation Guide it has become apparent that there are a number of topics that are fundamental to obtaining a clear understanding of how ABC can be implemented.

Further, given the variety of stakeholders, there appears to be significant benefit in documenting various aspects of the overall processes to promote a common understanding and standardized approach to ABC implementation. Consequently, this ‘Implementation Guide explains the ABC functionalities and provides guidelines, checklists and case studies.

This publication is intended for the project manager in charge of the implementation of ABC at an airport. Specifically, it should be noted that this publication is not a binding document.

Any comments, suggestions or proposals for enhancements, especially best practices, are welcome and should be directed to:

Lisa ANGIOLELLI-MEYER  
Project Manager Passenger Facilitation  
e-mail: angiolelli@iata.org

2 INTRODUCTION

2.1 The problem

It has long been regarded that the travelers’ journey begins when they book their trip and ends when they exit the airport at their final destination. Engagement with Public Authorities at border crossing points represents just one aspect of this journey.

While much has been done to simplify the traveler journey, work continues by States to balance the integrity of their borders with the identification and facilitation of travelers against a backdrop of anticipated growth in international aviation traffic. The requirement to facilitate swift and secure border crossings will continue to rise significantly, especially at airports. The global aviation industry will transport over 3 billion passenger in 2015 and is expected to double in the next 15 to 20 years.

Seeking to increase security and speed up travel flows by increasing the number of border guards alone is not a viable option for the majority of States. Long queues at airports present a poor image to visitors. Both airport operators and airline companies consistently request faster and smoother passenger flows for increasingly shorter and more predictable connection times.
2.2 The Solution

The rapid increase in the number of electronic machine readable travel documents (e-MRTDs) containing biometric data facilitates innovative automation concepts and enables integrated secure processes at borders that rely on machine-assisted control.

With international travel and the exchange of goods constantly growing, increasing throughput capacity is vital for border control authorities, airlines and airport operators. New technologies can be used not only to increase security but also to enhance convenience, e.g. to reduce queuing time at border control.

An Automated Border Control (ABC) system can improve the management and control of travel flows at the border by reinforcing checks while speeding up border crossing of regular travelers. This can enable border guards to cope with the ever-rising number of border crossing without compromising security. Some Governments have even suggested that security is enhanced because additional border officers’ resources can be focused on potentially higher risk travelers.

2.3 The Benefits

Aircraft Operators will benefit from

- Improved value proposition through shorter and more predictable connection times, especially when air travel competes with other transport modes
- Improved on-time departure through reduced queues when border crossing is required in transit
- Cost avoidance through unnecessary increase of take-off delays
- Improved value for their passengers

Airports will benefit from

- Reduction in queue length and times which will facilitate a more efficient use of space and a possible deferment of infrastructure requirements and cost
- Process optimization within existing infrastructure which will support passenger growth
- Shorter processing times offers the opportunity for increased dwell time
- Competitive advantage for airports able to offer a quicker and more passenger-friendly experience

Passengers will benefit from

- Reduced queuing times and expedited exit for passengers with hand luggage only
- Self-service option; the passenger is in more control
- Increased predictability of process and queuing time
- Less stress for passengers in transit
Governments will benefit from

- Processing increased numbers of low-risk passengers quickly, conveniently and cost-effectively whilst maintaining the security and integrity of the borders
- Automated approach will help to optimize the process and allows resources to be focused on potentially higher-risk travelers
- Enhanced security through the use of biometrics
- Improved image can translate into economic benefit and attractiveness to tourists and business travelers

2.4 What support is available to Airports, Governments and Airlines?

2.4.1 IATA

In order to support stakeholders in the implementation of ABC initiatives, Passenger Facilitation has developed a support model that includes industry suppliers, events, materials, campaigns and consultancy. Information can be accessed through the iata.org website, which provides links to materials, reports and campaign results.

IATA’s Approach

IATA’s field offices are used to mobilize and engage local stakeholders (primarily governments), industry experts and strategic partners. This is achieved through regular campaigns, visits, phone calls and e-mails. This communication strategy builds awareness about IATA Passenger Facilitation as an enabler to industry growth for a seamless, efficient and secure end-to-end passenger journey.

IATA’s main communication strategy is based on the following channels and actions:

www.iata.org

A central project information page is available on the internet under http://www.iata.org/whatwedo/passenger/Pages/passenger-facilitation.aspx. The information page contains recommended practices, campaign results and implementation guides for each project.

Interactive Map

On the main page there is a link to an interactive map to visually display ABC deployments globally. http://www.iata.org/whatwedo/stb/maps/Pages/automated-border-control.aspx

Social Media

IATA Passenger Facilitation is a special interest group within LinkedIn under the broad umbrella of Passenger Experience. LinkedIn is the world’s largest professional network with over 120 million members and is growing rapidly. LinkedIn provides an open platform to exchange knowledge, ideas and opportunities with a broader network of professionals and can generate discussions on Passenger Facilitation topics.

Industry Conferences

Regular participation within events such as Future Travel Experience, World Passenger Symposium, Airport Exchange etc. to build awareness, showcase innovation and provide latest updates.

Regional Awareness Workshops

The regional workshops are based on the 14-step passenger process developed by IATA. These events gather local stakeholders with the aim of raising awareness and providing support for the regions to speed up engagement and implementation.

ICAO/ECAC Panels

Attendance at key meetings of ICAO Panels and ECAC meetings to provide updates on project status.
**Newsletter**
Information via the Newsletter, reaching out to members and partners.

**Webinars**
With industry media or partners.

**IATA Project Team**
The project team focuses on delivering the following mandate:

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Actions</th>
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<tbody>
<tr>
<td>Provide the basis for implementation</td>
<td>Publish recommended practice, implementation guide and case studies</td>
</tr>
<tr>
<td>Raise awareness and educate</td>
<td>Organize workshops, promote initiative at industry meetings and conferences</td>
</tr>
<tr>
<td>Contribute to business cases</td>
<td>Collect market data and publish market trends</td>
</tr>
<tr>
<td>Facilitate implementation</td>
<td>Pairing of governments, airports and airlines</td>
</tr>
<tr>
<td>Speed-up deployment</td>
<td>Develop tools to collect airport and airline implementation request</td>
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The IATA project team will not interfere with the following:

<table>
<thead>
<tr>
<th>IATA Project team will NOT</th>
<th>IATA would rather</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implement the project</td>
<td>Introduce preferred partners that provide the service</td>
</tr>
<tr>
<td>Consult on a project</td>
<td>Introduce preferred partners including IATA consulting that provide the service</td>
</tr>
<tr>
<td>Finance a project</td>
<td>Provide tools and data that supports the establishment of a business case</td>
</tr>
<tr>
<td>Recommend a vendor</td>
<td>Organize workgroup meetings, conferences workshops with Strategic Partners</td>
</tr>
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2.4.2 ACI

2.4.2.1 Introduction to Airports Council International (ACI)

Airports Council International (ACI) is the association of the world’s airports. It advances the collective interests of, and acts as the voice of, the world’s airports and the communities they serve.

ACI’s main objectives and roles are:

- Maximize the contributions of airports to maintaining and developing a safe, secure, environmentally compatible and efficient air transport system.
- Achieve co-operation among all segments of the aviation industry and their stakeholders as well as with governments and international organizations.
- Influence international and national legislation, rules, policies, standards and practices based on established policies representing airports’ interests and priorities.
- Advance the development of the aviation system by enhancing public awareness of the economic and social importance of airport development.
- Maximize co-operation and mutual assistance among airports.
- Provide members with industry knowledge, advice and assistance, and foster professional excellence in airport management and operations.
- Build ACI’s worldwide organizational capacity and resources to serve all members effectively and efficiently.

ACI pursues airports’ interests in discussions with international organizations. The most important relationship is with the International Civil Aviation Organization (ICAO), where international standards for air transport are debated and developed.

ACI has five Regional Offices, who play a very important role in the relationship with ACI members and the spread of best practices. The five regional offices are:

- ACI Africa in Casablanca (Morocco)
- ACI Asia-Pacific in Hong-Kong (China)
- ACI Europe in Brussels (Belgium)
- ACI Latin America-Caribbean in Panama (Panama)
- ACI North America in Washington, DC (USA)
ACI has six standing committees. These committees were mandated by the ACI Governing Board to provide guidance and council, and help shape current policy issues for Governing Board endorsement in their areas of expertise. They are also required to assist the Governing Board, Executive Committee and Secretariat, as appropriate.

2.4.2.2 The ACI World Facilitation and Services Standing Committees (WFSSC)

Airport facilitation consists of the efficient management of the flow of passengers, baggage, cargo and mail through the airport facilities, ensuring that services are delivered in a healthy, safe and secure environment, and meeting and exceeding when possible the needs and expectations of customers. This should be applicable for all scenarios, during good days and bad days, under normal operations and situations of flight disruption.

Passenger facilitation is not just achieved by airport operators in isolation. It requires a high level of interaction and co-ordination with partners and stakeholders that have different responsibilities in each step of the overall passenger process, from the time of booking to the time the passengers arrive at their final destination.

ACI World, through its Facilitation and Services Standing Committee, is determined to help airports improve their terminal flows and processes by providing a set of recommendations, guidelines and best practices, together with measuring and benchmarking opportunities provided through the Airport Service Quality (ASQ) programs.

ACI has identified the following strategic objectives for its Passenger Facilitation Strategy:

- To provide safe, secure and efficient processing of passengers and baggage;
- To provide a hassle-free travel experience that meets the needs and expectations of the different types of passenger traveling;
- To safeguard the interests of passengers and airports from inappropriate regulatory policies and airline (industry) business practices;
- To optimise the use of airport infrastructure and facilities to meet passenger growth and end-user requirements; and
- To build resilience into the passenger facilitation process to provide continuity of services during both normal and irregular operations.

In order to automate and expedite the clearance of passengers through government controls with increased security, Automated Border Control (ABC) has been identified as a fundamental concept that embraces the above mentioned strategic objectives. ACI supports the deployment of ABC processes in a coordinated way to achieve the following business drivers:

- Improvement of the integrity of passport control processes
- Flexibility and efficient use of existing airport infrastructure
- Reduction of passenger waiting time and increase perceived service quality
- Reduction of operating costs
ACI supports the adoption of the principles contained in ICAO’s Annex 9 and Doc. 9303, Part. 1, Vol. 2: “Specifications for Electronically Enabled Passports with Biometric Identification Capability Document”.

2.4.2.3 Contribution from ACI to ABC implementation and deployment

As a founding member of the Simplifying Passenger Travel (SPT) Interest Group (the precursor of the Passenger Facilitation Working Group), ACI has always supported the Ideal Process Flow (IPF). Automated Border Control is a critical component of the IPF.

In 2009, an ACI Europe Task Force, composed by airport specialists from the most important European airports, developed the “Position on Use of Automated Means for Border Control at European Airports and Technical Annex”, recommending that government authorities of EU Member Countries work together with international border control agencies and airports, in order to minimize risk, expedite passenger flow, and develop efficient and intelligence-driven operations for automated border control.

These recommendations are applicable to all ACI regions and ACI member airports. ACI member airports strongly believe that making use of innovative technology for controlling airport borders worldwide is essential for continuous safety, security, and customer service.

In alignment with the principles set in ACI Europe’s Position and Technical Annex, ACI is contributing to the development and spread of this ABC Implementation Guide, together with IATA and FRONTEX, in close co-ordination with ICAO and other stakeholders.
2.4.3 FRONTEX

The mission of Frontex is to facilitate and render more effective current and future European Union measures relating to the management of external borders, in particular the application of the Schengen Borders Code. Frontex plays a key role in analyzing and defining the capability needs of border control and in supporting the European Union Member States in developing these capabilities. Furthermore, Frontex is responsible for providing qualified expertise to support European policy development in the area of border control.

The core mission of Frontex’s Capacity Building Division is to drive the process of harmonization and standardization, thereby promoting greater interoperability. At the core of the work of the Frontex Research and Development Unit (FRDU) is the exploration of potential solutions offered by new border management technologies to meet the dual objectives of enhancing security and facilitating travel. As part of the Capacity Building Division, FRDU is tasked with developing best practices and procedures, both technical and operational, for border control; and to keep Member States informed concerning new technical/technological developments in the field of border control.

Following this remit FRDU is continuously publishing operational and technical documents and hosting events related to ABC. These include:

- ABC Best Practice Operational Guidelines v 2.0
- ABC Best Practice Technical Guidelines v 2.0
- Study on Technical and Operational Security of Electronic Passports.
- ABC Operational Research simulation tool for optimal dimensioning and configuration of a border checks filter combining manual and ABC checks, attending to service level, performance and cost effectiveness criteria.
- ABC cost-benefit analysis tool to support the decision-making process when planning an automated border control system at border crossing points (BCPs).
- Program of workshops, combined with practical demonstration, on ABC systems in Europe based on ePassports with the aim of raising awareness about ABC solutions and disseminating best practices.
- Establishing the ABC Working Group and program of ABC WG meetings
- Engaging with international organizations and standardization bodies such as ICAO, ISO, IATA, ECAC, CEN
- Organizing the Global ABC Conference and Exhibition - an initiative to support harmonization and inter-operability of ABC solutions globally.
- Conducting an ABC survey on state-of-the-art as well as plans for ABC applications in the EU Member States 2012-2015
3 About Automated Border Control

3.1 Facts and Figures

Many States currently deploy ABCs which can be based on registration or non-registration principles. There are several approaches to eligibility including possession of an eMRTD, a permanent resident's card or through a national registered traveler scheme card. An interactive map was developed to display airports that have implemented ABCs. The icons with the different colors show the type of schemes deployed. By clicking on the icon additional information such as scheme name, airport name, eligibility to use the ABC, biometrics used, terminal and location within the airport is displayed.

http://www.iata.org/whatwedo/stb/maps/Pages/automated-border-control.aspx
3.2 Market Trends

The first implementations of ABC started around 2005, with a number of small trials. Since many States had not commenced ePassport issuance at that time, these early pilots utilized national ID cards as a biometric token or required pre-enrolment, rendering them usable by national citizens only. Fingerprint and/or iris were typically chosen as biometrics.

Usage of those early ABC systems was low, but it enabled governments to assess the capabilities of the technology, whilst making life easier for a small number of low-risk nationals from their own countries. Only in Asia Pacific was ABC installed as the default method of border crossing - 360 gates were installed in 2005 on the China/Hong Kong border using the Hong Kong ID card, on which a fingerprint was stored on a contact chip.

In 2006, Portugal became the first country in Europe to achieve the deployment of ABC eGates at an airport, based on face matching verification against an ePassport.

Since these first pilots a number of trends have emerged:

The emergence of non-enrolled systems

Many countries have now reached the point where there are enough passengers holding ePassports to justify the investment using this as the credential for ABC. Other countries are choosing to operate non-enrolled systems alongside enrolled registration based schemes. As an exception the US Global Entry scheme is the largest enrolled system.
Increasing consideration towards facilitation

When operating border control there is always a balance to be struck between security and facilitation. Security remains paramount but much more consideration is given to facilitation, to enable as many passengers as possible to use ABC and to make it a user-friendly experience.

Growing reliance on ABC at airports, now viewed as the default method for future border crossing

A number of governments are targeting more than 50% of passengers using ABCs. ABCs are becoming the main method of processing passengers through border control.

Permitting foreign nationals to use their system, leading to standardization and interoperability

In order to achieve that previous objective, many governments are allowing citizens from other countries to use their ABC system. In the EU it has become the norm for any EU citizen to be able to use the ABC system of any EU country. Elsewhere many bilateral agreements between individual States are being signed or are in operation. These are likely to be members of a Registered Traveler Scheme, which the other country has evaluated and approved.

From single to multiple biometrics

In the early days of ABC, fingerprint and iris were considered more secure than facial recognition. However in recent years the technological gap has closed considerably and any of the three may be preferred in different parts of the world. In Europe, facial recognition has emerged as the biometric of choice. In Asia Pacific, fingerprint and face are the main biometrics used, whilst in the US fingerprint is specified. In the Middle East, a preference for iris recognition remains. Organizations considering installing ABC should consider that if citizens of different states are to use the system, the e Gates may need to be multimodal to provide the necessary flexibility and support a range of biometric options.

Integration with other national systems

With increasing reliance on ABC comes an increased focus on a closer integration with platform that will connect the entire country’s entry/exit points to create a unified border that includes airports, land borders and seaports.

Border agencies can use state-of-the-art technology (i.e. biometrics, surveillance, digital ID, frequent traveler programs etc.), to facilitate centralized intelligence gathering, improve the quality of information, enable more targeted control and enhance immigration system integrity. This may make it possible, for example, to identify an individual who enters the country through a land border and exits through an airport, or who overstay their visit without a legal visa status. This capability should not necessarily compromise the ease of travel and trade.
Experiments with different gate configurations

The earliest autogate designs were typically the two-gate variety creating a man-trap once the traveler had scanned his travel document outside the first gate to gain entry inside to a second-gate. This is still a popular model today. However there are other models, for example where kiosks may be used to perform the first of a two-step process before the passenger enters the gate and another model where a single-gate system is used. Different vendors have the capability to deliver different models. Potential customers should evaluate the advantages and disadvantages of each model, taking account of the shape of the space available for installation.

Need for a mobile solution to compliment the fixed solution

As ABC becomes more mainstream, there has been recognition that not all passengers can be processed in this way. If a passenger is rejected by the system, they will need to be manually processed by an officer. Children travelling with parents may not be able or permitted to use the system. Persons of reduced mobility may not be able to use the system. Such scenarios have led to the consideration of a mobile or handheld device that can be used as an alternative, rather than sending that passenger or family to the back of queue for manual border control. Devices with ePassport reading enabled with combinations of biometric data capture are now available.

3.3 Options for different types of automations

3.3.1 Registered Traveler Scheme

Registered (sometimes known as trusted) traveler schemes facilitate the entry of low-risk, registered travelers at ports of entry, typically by allowing members to access dedicated lanes for expedited processing through immigration, customs and agriculture. In turn, border agencies can better allocate their resources to focus on unknown, potentially higher-risk, travelers.

The development of a registered traveler scheme should include common principles on key issues such as vetting, information sharing, and the collection and use of biometrics for screening and identity verification.

The characteristics of a registered traveler program include, but are not limited to:

- Providing members facilitative benefits at ports of entry;
- Meeting eligibility requirements;
- Application and enrolment process; and
- Vetting and re-vetting members

Facilitation benefits

The intent of registered traveler programs is to provide approved members with facilitation benefits at ports of entry. Entry processing may be expedited through the entire border process - through immigration, customs, and agriculture. Typically, this is accomplished by providing access to automated kiosks or automated gates in order for members to by-pass traditional queues.
Eligibility Requirements

Eligibility requirements are the qualifications members must meet in order to be accepted into the program. Eligibility requirements for program members may include, but are not limited to:

- Holding citizenship or residency in the country of which the applicant is applying, or, if applicable, meeting other requirements of immigration status;
- Holding citizenship of another country which has a bilateral agreement;
- Passing background checks and vetting standards; and
- Maintaining a low-risk status.

To participate in a registered traveler program, interested individuals first need to apply. The application process seeks to verify that applicants are low-risk before granting them a “trusted” status. The application process includes:

- Completing an application – Biographic information is collected in the application, such as name, gender, date of birth, nationality, travel document information, residence history, and employment history. This information may be used to query databases to conduct background checks.
- Conducting in-person interviews – Interviewing applicants enables authorities to verify an applicants travel documents and review the information provided in the application. In addition, the interview provides an opportunity for officials to collect an applicant’s biometrics. Biometrics (typically fingerprints, face and iris) can be used to confirm the identity of the individual applying. Furthermore, biometrics can be queried through biometric databases to check for derogatory information.
- Final approval – The last step in the application process is for the participating country to make a determination whether the applicant meets its criteria as a low-risk traveler. If so, the participating country may approve the applicant for participation. If the applicant is approved, the biographic and biometric information collected during the application provides the basis for a record of the participating member. This record enables the authority to re-vet members and confirm their participation when entering through the port of entry.

Vetting Standards

Vetting standards are a key component for establishing member eligibility in registered traveler programs. Utilizing quality data that covers a wide range of areas is imperative in conducting the background checks that determine if an applicant is low-risk. Biographic and biometric information should be used as the foundation for conducting vetting. As such, it is necessary to check applicants against databases including, but not limited to:

- Law enforcement and criminal databases;
- Immigration databases;
- Customs databases; and
- Intelligence databases.
Typically members will need to not have been convicted of a criminal offense; have not violated any immigration, customs, or agriculture laws; and not be subjects of an ongoing criminal investigation.

Re-vetting

Members of a registered traveler programs should be re-vetted periodically to ensure that no new derogatory information is discovered. Re-vetting can occur automatically on a periodic basis or at the time of renewal. If derogatory information is discovered, the member would no longer be eligible to participate in the program.

Information sharing

The process of vetting applicants may require information sharing between government agencies. For example, if an immigration department manages a registered traveler program, it may need to verify an applicant’s eligibility against information maintained by its national police, justice departments, customs authorities and investigation agencies.

Members of registered traveler programs verify their identity at automated kiosks/gates by providing biometrics such as fingerprints, face or iris and maybe passport/ID card, membership card etc.

3.3.2 Non-Registered Traveler Schemes

ePassport Gates utilize eMRTDs. They may operate on the basis of ePassports alone but may also use eID cards and eResidence permits as tokens when considering entry or exit. Data contained within these eMRTDs is read by the gate system and used to aid verification of identity. In some instances, the gate will also assess the traveler’s entitlement to entry.

Eligibility requirements

All ePassport gates operate on the principle of considering the traveler’s entitlement to enter or exit a State. However variances in national legislation have led to differences in eligibility requirements. Whilst States may accept different eMRTDs, nationalities and ages of travelers, there is one requirement that is consistent; that the traveler must be in possession of a valid biometric travel document in order to utilize the gates.

Process

Although no pre-registration is required, in order to ensure that the ePassport system delivers high levels of accurate verification it is important that the biometric image taken at the time of applying for the eMRTD is of the highest quality. Although the facial image is acknowledged as the primary biometric, documents may additionally hold fingerprints or even an image of the holder’s iris.
eMRTDs store the user’s biometric and biographic data within the electronic chip. As part of the validation process (i.e. to open the chip and read the data), States may share Public Key Infrastructure certificates. It is important that both the exchange and revocation of certificates is conducted in a timely manner. To aid this process, States may join the ICAO Public Key Directory.

Upon opening the chip, checks are undertaken to ascertain whether the document is genuine, has been tampered with or has been reported lost, stolen or withdrawn by the issuing authority. The system will compare the traveler’s biometric with that contained within the eMRTD presented to establish whether they are the rightful holder. For those systems requiring fingerprints, the system will check the fingerprint image, and sometimes may check the digit for a pulse (liveness check). The system will also cross-check the traveler’s biographic and, in some instances biometric, data against relevant databases.

Some States may require additional information or a declaration to be provided by the traveler prior to entry or exit. Unless the ePassport gate system has been designed to accept this information electronically, manual intervention by a customs or agriculture official may be required.

All gates should be supervised by an official whilst operational. This ensures that safety and integrity concerns are addressed in the event of a system malfunction. A visual assessment of travelers when utilizing the gates may also lead to the identification of vulnerable persons or fraudulent applicants in possession of genuine eMRTDs. Once these processes have been completed satisfactorily, the traveler is permitted to exit the gates. If checks are inconclusive or the gates are unresponsive the traveler is referred for a manual check.

3.3.2.1 Semi-Automated System

In order to improve the fluidity of the passenger process and increase passenger throughput, some governments have installed semi-automated systems not requiring biometric travel documents. Such semi-automated systems consist of a two-step process, where as a first step the passenger uses a kiosk/gate to confirm their identity and make a customs/agriculture declaration before as step two presenting to a border officer to validate their declaration.

Eligibility Requirements

Eligibility may be based on citizenship and a non-biometric token containing a Machine Readable Zone such as a permanent residence card. Some schemes even permit foreign nationals to use the system through bilateral agreements.

Process

As an example of such a scheme, once the traveler has inserted the token into the document scanner, the machine readable zone of the token is checked against the government’s database. These are the same database checks that are conducted at the regular Primary Inspection Line.

The traveler will then insert the completed custom declaration card into the scanner and thereby declare any goods, currency and/or monetary instruments they are bringing into the Country. It is the traveler’s responsibility to ensure that the information they provided
on the customs declaration card matches the information they input at the ABC kiosk. The kiosk retains the original custom declaration card.

Once all documents have been scanned, a release/referral code will be printed on a separate kiosk-generated receipt.

All travelers processed through ABC kiosks are required to report to a border services officer who performs the document verification function and directs the travelers in accordance with local procedures.

3.3.3 Emergence of ESTA-type programs

Although ESTA programs are not directly related to Automated Border Control, governments have introduced them in order to provide information about the traveler which can be pre-screened and potentially qualify a passenger to use ABC facilities on arrival. Their use has tended to be for nationals from visa-waiver countries, who are nonetheless unknown to the border control authority at the airport of arrival. The provision of ESTA information on a voluntary basis can give the border control authority the answers to the questions that would have been asked at a border control counter, so that at the airport only the document check remains to be performed. This could then be done at an ABC gate or kiosk.

Passengers apply for ESTAs online, usually from home. In parts of the world where home internet is not widespread, ESTA applications may be made from public areas or at airline ticket sales offices, using dedicated kiosks.

3.3.4 Mobile Passport Control

Mobile Passport Control (MPC) is an authorized U.S. Customs and Border Protection (CBP) smartphone or tablet app that expedites the entry process for U.S. citizens and Canadian visitors by providing an automated process through the CBP Primary Inspection area.

Passengers will be prompted to create a profile via the app with their passport information. The profile includes the passenger’s name, gender, date of birth, and country of citizenship. Upon landing in the United States, travelers will complete the “New Trip” section by selecting their arrival airport and airline, taking a self-photo, and answering a series of custom declaration questions. Once the traveler submits their customs declaration form through the app, the traveler will receive an electronic receipt with an Encrypted Quick Response (QR) code. This receipt will expire four hours after being issued. Travelers then bring their passport and mobile device with their digital bar-coded receipt to a CBP officer to finalize their inspection for entry into the United States.
4 The decision making process / Risk Assessment

4.1 Ownership

The first challenge in any ABC project is deciding who will participate in the decision-making process and how it will be structured.

It is advisable to have a project team and a decision team. The decision team (or management team) is responsible for framing the problem and adopting the final decision, whilst the project team (or technical team) will explore, evaluate and document the feasible alternatives to be considered by the decision team.

According to the above, the decision-making process can be structured in four distinct steps:

1. Analysis of project context and goals
2. Development of alternatives
3. Evaluation of alternatives
4. Committing on a decision
In a good ABC project decision-making process, each of the above steps is not carried out in isolation by one of the teams, but rather involves a dialogue between the project team and the decision team. This is required to ensure a common understanding and steering of the process, if required. Also, each step should produce a concrete output and have clear entry and exit criteria.

1. **Project Analysis and Framing Dialogue**

The first step is about ensuring that all participating stakeholders “see the same project and see it in the same way”.

The goal of this step is to define the purpose and goals of the decision being sought, and clarify relevant priorities and criteria.

At this stage, relevant discussion has to take place regarding the scope of the project i.e. will it consider security, facilitation, cost reductions, and with what weight and constraints? What are the design and performance boundary conditions (physical space, False Acceptance Rate, Average Checks Time, False Rejection Rate, etc.)? This inevitably requires that the decision team and the project team have an honest and fluid dialogue, as otherwise any misunderstandings at this stage can later jeopardize the whole process.

2. **Develop Alternatives and Alternatives Dialogue**

The second step consists of “identifying a good set of alternatives to choose from”.

The goal of this step is to develop a manageable but reasonably exhaustive set of meaningful alternatives (including sourcing options) for the ABC system. This typically covers both implementation aspects (e.g. gate topology, dimensioning and configuration), as well as alternatives regarding its ownership modality and financing options (e.g. buy/rent/lease, preferred or eligible vendors, shared costs, etc.).

3. **Evaluate Alternatives and Analysis Dialogue**

In this step, the different alternatives to be considered for the ABC system are scrutinized in order to “understand the merit of each alternative for the goals of the project”.

The work to be carried out at this stage involves producing insights, not answers, on the different alternatives. This is primarily a task for the project team with punctual assistance or guidance from the decision team.

The alternatives will be assessed against a set of previously agreed criteria. The most common ones used are those that relate to service level delivered to travelers (e.g. queuing times), complete life cycle cost of the solution, labor effort savings and increased security through the border.

Because of the many variables to be considered, it is easy to soon reach a level of complexity that can be quite difficult to manage. This complexity has to be tracked in an organized manner, and limited to only those aspects that are strictly necessary.
4. Make Decision and Decision Dialogue

The final step is about making an informed decision and “choosing what to do”.

In this step the different alternatives are presented to the decision team in a manageable way. These should clearly show merit, trade-offs and risks in a way that makes a comparative analysis as easy and efficient as possible.

The decision team may engage in further discussion with the project team if there is a need to clarify some aspects or explore a complementary set of alternatives. Eventually, the decision team will choose the best alternative(s) and communicate these to the relevant parties in order to get implementation planned and started. The decision adopted should be complemented with guidelines on how to proceed.

4.2 Airport

The decision-making process can be very long and hard at airports and can differ from one airport to another, depending on the airport operator. Some airports are completely run by the government while others are operated by privately owned companies. Those government-owned airports often require a more complicated procedure (i.e. a tender) for an investment such as ABC gates. No matter who runs the airport, an investment such as ABC will not be undertaken unless the benefits of the project are valued higher than the cost. In both cases it is very important to have all the stakeholders involved in the process.

Border control authorities are run by the government. Therefore, privately owned airports and government have to work together to find the beneficial actors for each party. This is particularly important if the ABC project is government funded.

The first step towards implementing an ABC project is to construct a business case. It is necessary to identify and define the problems that an Airport is facing. 4 common reasons that justify investment in installing ABCs are as follows:

1. Faster processing time for passengers. The decrease in processing time will lead to travelers having more time, either to spend at the duty free arrival store before their baggage arrives, or for transfer passengers, more time in the Transit area for shopping. This also helps airlines that use the airport as a hub to be able to maintain a minimum transfer time.

2. Border Control authorities can reduce their operating costs. The cost of border control personnel can be significant. ABC offers potential for reducing labor costs.

3. The airport may have an opportunity to delay significant investment in expanding the Immigration hall, by implementing ABC gates. Many airports face the problem of not having enough land space to be able to accommodate increased traffic. In those cases ABC can help significantly in getting a better usage of the area already used for border control. This can be seen with a simple simulation and should be tested before implementation.

4. An airport needs to fulfil some service level (e.g. ASQ / IATA Level C). Some airports have to fulfil level of standards, either set by the government or set by their board of directors. Examples of this could be maximum waiting times, or whether or not a passenger can utilize technology without having to interact with a human being when going through the airport.
Each airport has to find its own goals and objectives and must undertake a detailed cost-benefit analysis, taking into account factors such as those above, so that they can make an informed decision on whether the ABC gate justifies the investment.

The cost-benefit analysis is the most vital part in the decision-making process. Since technology is continuously improving, it could be the investment cannot be justified now, but may do so in future. Evaluation should therefore be a continuous process.

Airports which have been through such projects strongly recommend simulation modeling, to predict the impact of ABC on passenger flow through immigration before committing to the investment.

Finally, like all large projects, ABC projects require a detailed and robust risk assessment.

4.3 Government

Although ABCs have the ability to identify and facilitate border crossings to low-risk travelers, it is vital that the checks conducted by such systems are at least as robust as traditional procedures at border control points. In order to ensure effective monitoring and governance, each task undertaken by an ABC should be regularly assessed in order to understand how automation has impacted on existing or new risks and ensure that the appropriate reaction can be undertaken.

States will have different ways of measuring system performance but these should incorporate both quantitative and qualitative assessments. Quantitative assessments may include the number of passengers successfully processed, the number of passengers requiring further interaction, average processing time, percentage of eligible arrivals that have used the ABC, the number of passengers processing to staff ratio etc. Qualitative assessments may pertain to reputational risk and regulatory compliance but could also be associated with traveler satisfaction.

It is important that risks and both quantitative and qualitative assessments are monitored closely. These will demonstrate whether there has been an improvement or deterioration in ABC system performance. As well as demonstrating that a State has the ability to identify and deal with potential risk, they should promote better and more informed decision making and can also contribute to a State’s strategic business objectives. Transactions at the ABC can be broken down further into acceptance or rejection rates, which may provide an indication that the number of travelers that systems are rejecting or accepting could be considered to be too high/low by States. This also allows States the opportunity to monitor any unusual trends.

The physical environment in which the system is located may contribute to a high number of false rejection rates e.g. the environment may be too bright or too dark to provide an effective biometric reading. Equally the system itself may have limitations i.e. there may be height or age restrictions associated with usage.

False acceptance rates are generally considered far more serious than false rejection rates in that these could give an unauthorized traveler access through ABC gates. Typically associated with the level of probability accepted by an ABC system, most States ensure that an operator is on hand to maintain border integrity.
States should additionally remain vigilant to the risks to their border that ABCs will be unable to detect, such as a genuine documents held by a fraudulent applicants, possible drug smugglers or facilitators. Many States deploying ABCs still conduct risk assessments or evaluations on travelers utilizing gates. This role may be undertaken by the border control officers.

A border control officer must be in attendance when the ABCs are active to ensure that travelers do not pass through ABCs unchecked. If a situation occurs which requires that the border control officer leaves the monitoring station unmanned, then all the ABC gates they are responsible for should be locked first to uphold the integrity of the State’s border control system.

**4.4 Airlines**

Airlines are not involved in the decision making process. However they should work as an active stakeholder to support implementation and usage:

- Communicate the changes to employees and passengers.
- Support passenger familiarity with the product and usage.
- Offer to pay the enrolment fee for their premium passengers if ABC is based on pre-enrolment/registration.
- Ensure that there is support in the area to facilitate usage and to monitor and resolve potential issues.
- Communicate and/market the product through onboard announcements, inflight entertainment, inflight magazine, frequent flyer database, website, etc

**4.5 Decision-making support tool**

Due to their inherent complexity and uncertainty, border security projects are not easily amenable for performance measurement. This section is intended to bridge such a gap and facilitate the decision-making process on the deployment of an ABC system. It proposes a method, models and techniques - based on Decision Analysis theory - that will support stakeholders in making a better-informed decision.

Most ABC projects are first faced with the challenge of providing insight to decision makers around recurrent questions like:

- What is the optimal design and dimensioning?
- What are the costs and benefits for each stakeholder?
- What are the possible outcomes and their likelihood?
- Should we buy, rent or pay per use?
- What uncertainties and risks are really relevant in this project?
- Should we run a pilot first? How much should we spend in it?
- Does it pay off to invest in the project?
- What if…?
Providing answers to these questions is not really that difficult, if good methodology and tools are used. Practice has demonstrated that a good quality decision can be made when the analysis in the decision making process is broken down in two major steps:

1. What is the ABC system and configuration that meets stakeholder requirements at minimum cost?

2. Does it actually create overall economic value and for whom? (i.e. Does it make sense to fund the project)

To facilitate the analysis process, Frontex has developed two specific tools respectively targeted to each of the steps above. These are an Operational Research (OR) tool and a Cost Benefit Analysis (CBA) tool, which are presented below.

### 4.5.1 ABC Operational Research Tool

In order to assess the impact of a given ABC system in a specific operational context, an operational research simulation can be used to quantify service levels, queuing times, queuing lengths and workload on border staff.

The purpose of the present ABC OR model is to help design, dimension and configure an ABC installation, that meet specific needs such as service level, queuing times and resource constraints at the border crossing point.

The model has been developed by Frontex Research & Development Unit (RDU), and is offered free of charge to the general public and without any guarantee, given or implied. It can be modified and distributed as needed. Frontex will also provide reasonable support to EU Member States, IATA and industry within availability of resources. Frontex RDU is also very interested in receiving feedback from users in order to continuously improve it.
The model simulates what happens at the border checks filter during a given period of time (typically a calendar day of the busiest month of the year). It models the operation of a filter where ABC gates and manual passport control booths co-exist, by implementing a discrete sequence of events in time (pax arrivals, pax entering and leaving a gate, rejections, queue balking, etc). The model uses information from historical passenger arrivals flow, traveler profiles and their preferences, the number of gates and gate and manual performance, to compute queuing dynamics, service level achieved, staff requirements and a myriad of other operational parameters.

There are two major versions of the model: the Single Scenario and the Multiple Scenario. The Single Scenario model is used to analyze a given configuration and observe the operational results in a straightforward manner. It is very useful for developing a case and playing with different What-If cases.

As an example of a typical output from a Single Scenario analysis, the above plot presents queuing travelers behind each ABC gate during a given day in a given ABC configuration. This information could be used to dimension the queuing area behind the filter, or to establish an optimal schedule (i.e. opening hours) for the gates.

The Multiple Scenario, on the other hand, automatically explores thousands of possible combinations in the input parameters and design choices in order to help identify the dominant combinations that satisfy service level goals and resource constraints at minimal cost. It is mainly intended to carry out trade off analysis on the different design alternatives.
As an example of a typical output from a Multiple Scenario analysis, the above chart presents the % of ABC users whose dwell time (time spent in the queue plus time spent at the gate) was within a service level agreement of 5 minutes at a given terminal in one specific airport. Similar charts can easily be produced for queueing times, queueing lengths, labor effort and other magnitudes as needed. This information could be used to dimension the ABC filter according to passenger forecast and service level agreement, or to assess when an upgrade will be required.

4.5.2 ABC Cost Benefit Analysis Tool

As explained above, the introduction of an ABC system is expected to have an impact at different operational levels for the stakeholders involved. The purpose of the CBA is to identify and quantify the main costs and benefits that can be expected from the implementation of an ABC project and produce a single figure of merit for the project in terms of economic value creation.

While costs of an ABC system are reasonably easy to estimate, benefits are not. Benefits are to be understood as perceptible, substantiated and tangible improvements for a partner accruing from organizational, institutional, attitude, operational and/or technical changes inherent to the implementation of the project by the respective stakeholder/partner. It should be noted that a benefit need not be quantifiable to be recognized as a real benefit.

In order to develop a credible list of benefits around a particular ABC project, benefit mechanisms have to be well understood and agreed upon. Benefit mechanisms are causality diagrams that document the changes a given project is anticipated to introduce in the BCP environment and how those changes lead to benefits for the various partners. They provide a conceptual framework to work out the links between application / new service and benefits.
Indicator – The specific characteristic of the BCP environment (measurable or not) that will be affected.

Mechanism – The rationale for the causality connection between two indicators. Often includes assumptions and/or options.

The following diagram summarizes the general ABC case:

The colored arrows describe the causality and relevance between two connected indicators. The direction indicates the correlation sign (e.g. an upward arrow indicates that an increase in the preceding indicator causes an increase in the second indicator), while color indicates the relevance of the change (e.g. a green arrow means that the change in its direction is a desired one, while red means it is an undesired one). Dashed connecting lines indicate that the causality is of a qualitative nature and thus difficult to quantify or estimate.

Once the relevant benefit mechanisms have been agreed, and along with it the specific set of indicators, the next step is to analyze the potential economic reward of the ABC project.

The economic reward of an investment (its economic value) is represented by the Net Present Value (NPV) of the investment. Basically, the NPV is the time-risk adjusted difference between the differential opportunity cash flows accrued from the considered investment. Other Cost Benefit Analysis indicators can be derived from the inputs entering in the NPV: Benefit to Cost Ratio (B/C), Break-even point, Pay Back Period and Internal Rate of Return (IRR).
The CBA model presented here is implemented in an Excel spreadsheet that has been automatically generated from an influence diagram developed in Decision Advisor™. The model computes the net present value of the differential opportunity cash flows associated with the project, between benefits and costs of a scenario with the investment -New Situation- and a scenario without the investment –Baseline-. The Baseline scenario is the “do nothing option” or “business as usual”; it estimates how the business is expected to run during the evaluation period of the project under the assumption that the project is not implemented. On the other hand, the New Situation scenario assumes that the project is implemented and estimates its impact in the business at operational, financial and investment levels. This CBA model consists of a number of sub-models as per figure below:

Note that the results of the operational research (investment requirements and operational improvements) feed directly into the CBA (through the dotted line).

Normally the practice of assessing the NPV of a project is well established both in airports and within border authorities, and for that purpose they have their own models and standard inputs. It is advisable that any existing project valuation framework is used in order to deliver consistency when benchmarking the ABC project against other competing projects. For those cases where such internal framework does not exist, Frontex has developed one which can be used out of the box.
4.6 Business case and financing models

4.6.1 Main parameters influencing an ABC business case

Introduction

The present section intends to outline an overview of the main parameters impacting an ABC business case.

In real life, the actual values of these parameters will depend typically of the ABC solutions at stake as well as the specific context where these solutions are installed (specific throughput of passengers crossing a border, specific floor space and number of lanes available for border control applications, stakeholder’s responsibilities and labor regulations in the considered countries and so on).

ABC solution vendors, airport operators, border control agencies may have their own types of models to analyze the business cases at stake. Frontex on its side has been designing a comprehensive model with a view to being able to adapt it to each context and situation (‘Cost Benefit Analysis Tool’, mentioned above in the present document).

It is not the scope of the present ABC Implementation Guide to analyze a specific business case that may require the disclosure of sensitive commercial information, both from the perspective of vendors involved and from the perspective of the airports or border control agencies specific operations. It is not the place either to describe a too comprehensive and complex model.

Hence, this section will not focus on specific values of parameters extracted from a real business case nor will describe a full scale comprehensive model. It will rather describe the main generic types of data and parameters that in all cases drive the cost analysis of an ABC solution project and its return on investment.

Core principles of the business case analysis

Typically the business case analysis will ultimately consist of comparing the net present value of the ABC solution overall project to a baseline scenario which would be not implementing an ABC solution – i.e. applying a manual process by border guards only.

The net present value is a typical output allowing the assessment of a project from the overall economic perspective and will take into account the summation of all the expenses incurred by the project as well as the benefits triggered by the project in comparison to the baseline scenario.

A discount rate is typically applied to reflect the stronger impact of expenses or benefits closer into the future as well as some uncertainty attached to future expenses or benefits.

The comparison of the project NPV to the baseline scenario NPV needs to take into account several years. There is a return on investment if the NPV of the project is superior to which of the baseline scenario.
Another illustration of this analysis which is commonly used is to sum the differential expenses between both scenarios as well as the benefits (which are differential by definition) and to compute the differential NPV accordingly. If positive, then there is a return on investment. This differential analysis allows crisp illustrations over time of the economic interest of the project year per year and is typically illustrated by such kind of figures:

(in blue : non discounted benefits, in red: discounted benefits)

Here the differential expenses and the benefits of the ABC scenario is collected in ‘algebraic’ benefits (which can be negative when the differential expenses incurred by the project are superior to the benefit allowed by the project). The moment when the ‘algebraic’ summed benefits (which can be derived easily from the benefits) turn positive is the time when a return on investment is granted (which increases then in the future). For consistency with the NPV criterion analysis, discounted benefits should be taken into consideration (here in red).

Multiple parameters will come into play within this analysis, which can be split into 2 broad categories:

- Operational parameters attached to the ABC solution in operation, in comparison to the operational parameters of the baseline scenario
- Investment parameters attached to the investments needed to implement the ABC project, compared with the baseline scenario (where there would be by definition no investment attached to the project, but potential investments may be needed also in the baseline scenario for instance investment on infrastructures to keep pace with increasing number of passengers)

Note: in this kind of analysis presented here no ‘value’ in the economical sense is given to the differential security level allowed between the ABC scenario and the baseline scenario. A key point is that an ABC solution will provide an improved security in authenticating a credential holder biometrically and that may of course also drive stakeholders in their decision, along with the economic analysis.
Operational parameters

The business case analysis in each case will need to be applied to an envisaged ABC process, and an envisaged floor configuration.

The two figures below present a typical simplified process and configuration that may apply to a majority of field cases.

In most cases (to date) border control booths and ABC solutions (eGate) are co-existing in the vicinity of each other. As shown in the simplified process below, all passengers may not be eligible to use eGates (third country nationals in most cases are not eligible, nor are children under a certain age) and/or may not have eligible credentials (i.e. biometric passports and recent ID cards in some countries). Besides, a proportion of passengers being directed or directing themselves to the ABC solutions (eligible or not eligible in some cases) are denied access through the eGates (for several possible reasons described further) and should be re-directed to a border control booth.
ABC Simplified Configuration

From the consideration of the actual process and physical configuration of a given use case, several important parameters will be derived to feed the business case modeling and analysis, for instance:

- Number of passengers crossing the border at the considered place. As the analysis is performed over several years, evolution passenger numbers should be taken into consideration.

- Intra-day and seasonal schedules of passengers. This has an impact on the number of lanes needed and the human resources needed as the systems are dimensioned to cope with peaks. The flexibility to decrease the human resources expenses when off-peak periods arise will impact the overall operational costs (especially in the baseline scenario, which requires more human resources).

- Available floor space derived into available number of lanes (eGates and border control booths) and potential opportunity to extend it (which would come with an investment cost) if needed.

- Available floor space derived into maximum number of passengers potentially waiting in the area (this will help definea ceiling value over which, combined with a maximum waiting time, a risk of disruption is considered from the airport operations as well as from the passenger’s perspective)

- Specific processes may be envisaged, such as:
  - processing ‘exceptions’ and alerts issued from the ABC solution,
  - dealing with a passenger facing trouble with the eGate and depending on the encountered situation (non eligible passport or age, or trouble to interact with the eGate, or real security alert on the passenger)
How border guards will eventually validate a passenger rejected from an eGate, and with how many steps. These points are derived into parameter values reflecting various transactions times needed post rejection by an eGate.

Operational parameters attached to the ABC solution itself, such as:

- Maintenance and training linked to the ABC solution.
- Transaction times, which can be refined depending on assumptions on the solution itself and also on passengers comfort with such ABC solutions (age, frequent travelers vs occasional travelers...). To be compared with manual transaction times of the baseline scenario.
- Rejection rate of the solution which will depend on multiple factors: errors to read the passport (due to presentation of non biometric passports, to some failures of biometric passports, to errors of the passport reader and not marginally to inability of the passengers to correctly handle their passports to the readers which can be itself dependent on the man-to-machine interfaces clarity of the solution), errors of passengers in interacting with the solution (proceeding with the biometric sensor for instance), or biometric false rejection from the solution (denying biometric match to an authenticate holder of the biometric passport)
- Eligibility rate, depending on multiple factors such as: age, share of biometric passports, share of biometric passports of states for which there is a compatibility to use them in the considered country.
- Effective share of eligible passengers who will indeed proceed to the eGates (some may still proceed to the border guards, whether they don’t know they are eligible or they don’t wish to proceed to an eGate).
- Note: This last point impacts considerably on the business case, as it directly drives the number of passengers who will actually use the ABC solutions (hence their rentability). This is difficult to assess in advance and is highly dependent on cultural biases and educational efforts carried on at the airport to explain the benefits of using the eGates.

Operational parameters attached to the human resources involved in the ABC solution scenario: the remaining border guards in manual booths, the border guards involved in monitoring the ABC solution (the level of security features of the ABC solutions in controlling unicity, tailgating and spoofing attempts will drive the human resources needed to supervise the ABC solution and hence operational costing), the potential human resources needed to guide passengers through the eGates, especially in the early stages of the deployment.

Operational benefits are an output of the expected more efficient use of human resources, rather than parameters in themselves. On the other hand additional economic benefits can be considered as parameters of the analysis such as:

- Additional commercial profit pursuant to more floor space available in the ABC scenario (this is a typical output but must be checked in the given situation)
Additional commercial profit due attached to lower queueing time (a typical output of ABC solutions) and then additional available time for commercial spending in the airport.

Additional profit due to better image attached to use of modern ABC solutions, additional profit due to more passenger processing potential and hence potential opening of additional flights (if the border control process is the bottleneck for the airport growth).

Note: taking account of these additional profits depends on the specifics of each situation as well as the perspective of the stakeholder directly customer of the ABC solution. Points of view of border control agencies may of course differ from which of a private airport operator.

Investment parameters

Typical investment parameter categories to consider are:

- Hardware and software purchase directly linked to the ABC solution
- Program costs
  - Vendors: one-off project management costs, customization and adaptation costs incurred by the ABC project and charged to the customer
  - Stakeholders, customers: one-off program management costs attached to the project, including initial training
- Capital costs
- Infrastructure investments: one-off expenses needed to accommodate the ABC solutions and change of processes.

Operational simulation and business case analysis

All the parameters mentioned above will be fed into a business case analysis model and will result in NPV and ROI calculations.

Operational simulation steps will be required in most cases as intermediate steps. For instance, such operational simulations will typically be used to compute waiting times for passengers, queue length evolution within time and so on. These kind of outputs will be used to calculate – for instance - optimal number of lanes and eGate (constrained by the floor space) which will feed the business case analysis.

In order to take into account some uncertainty linked to most of parameters, and especially the critical ones, such as eligibility and effective share of eligible people proceeding to the eGates, use of Mote-Carlo statistical modeling (or other similar methods) are useful in order to have a statistical perspective over the output of such analysis and help in the decision-making process.

As seen, business case analysis of an ABC solution project is a complex process, not so much due to the complexity of the models themselves but rather to the high number of parameters and the level of uncertainty that may be attached to some of them, especially in a long-term analysis.
5 STAKEHOLDER MANAGEMENT

5.1 Stakeholders in the ABC Project

There are multiple stakeholders involved, either directly or indirectly, when implementing an ABC Project. The primary stakeholder groups consist of:

- Government Agencies
- Airport Operator
- Airlines

There are a number of interdependencies that exist within the airport environment which require effective stakeholder management for the successful implementation of an ABC project. Airports, Governments and Airlines will need to work effectively together through the development and implementation of an ABC project to ensure that all stakeholders’ needs are met and expected benefits delivered.

5.2 Governments Agencies

The legislative requirements of the individual State will identify which Government agency has prime responsibility for the implementation and management of the ABC. Depending on the operating model at the airport, multiple government agencies including Customs, Immigration, Agriculture, Police and Transport/Civil Aviation will be stakeholders.

It is important to ensure that the design, development and testing of the ABC meets all legislative and operational requirements for effective border control. This will include procedures where the ABC refers a passenger for manual processing.

5.3 Airport Operators

The airport authority will need to engage with key stakeholders including government agencies to understand what type of ABC is being installed and what specific infrastructure requirements are needed. The design and location of ABC’s can have an impact on passenger flow through the terminal. Any change in passenger flow may impact on the transit or connection times, airport concessions and queue dwell times at border control.

The selection of the hardware (kiosk/e-gate) for the ABC will influence the location and layout within the airport. This also works both ways, in that government may need to modify their concept to reflect the infrastructure of the airport.

5.4 Airlines

Although airlines are not involved in the decision making process they should work as an active stakeholder to support implementation and usage. The chief concern is any delays for passengers will be predictable or guaranteed.
5.5 Other Stakeholders

5.5.1 Baggage Handling

Automated Border Controls will speed up borderer passage and may defer waiting times to baggage reclaim. It is therefore recommended to include the baggage handling service provider to optimize baggage delivery accordingly.

5.5.2 Airport Development Managers / Architects

When starting an ABC project within an airport it should not be forgotten that an airport usually has a specific “house style” giving the development managers/architects a very strong position. The effect can be that the design of the e-gates has to be in line with this house style. The placement will be decided upon by the architects. This can in the end effect big issues with lighting in case face matching is used as the main biometrics. This stakeholder should be asked in an early project stage to give input for the program of requirements and the willing to be flexible in their Airport environment.

Other things to bear in mind are the messages/animations or any other way to communicate with the passenger. These also often have to be in line with the house style.

Keeping in touch with Development Managers and Architects therefore should be one of the top priorities. Without their help it will be very difficult to prepare a program of requirements or to actually place the gates.

5.5.3 Infrastructure Providers

Usually an airport has specific contractors that are allowed to do works in the airport. In order to be able to place an e-gate you’ll need someone to provide cables and electricity. Usually it is necessary to have a third party that is allowed to work with cables in the protected government environment. You’ll need another party to drill holes in the ground or to seal the gates due to fire constrictions or water tightness. This same contractor or another contractor has to be the one building the supervisor booth.

It is also very important to have a company helping with the way the lights are placed above the e-gates, and if the amount of light is enough.

Other things to bear in mind that need help of infrastructure provider: signage, emergency signals

5.5.4 Service Providers

Service Providers should be included as early as possible to build up as much knowledge as possible and to set up a service contract.

5.5.5 Airport Services Department

The airport service department may be the first point of contact for technology malfunctioning. It is therefore recommended to involve them at very early stage in order to establish a Service Level Agreement.
6 IMPLEMENTING AN ABC PROJECT

This section provides recommendations for managing the ABC implementation project. One key element is to have a project team in place responsible for planning and executing the project. It consists of a Project Manager and a variable number of Project Team members, who are brought in to deliver their tasks according to the project schedule. ABC implementation involves multiple stakeholders with different goals and motivations. Stakeholders are all those groups, units, individuals, or organizations, internal or external to the organization, which are impacted by, or can impact, the outcomes of the project. The lists of stakeholders are described in Chapter 6.1.

To successfully lead the project it is recommended to establish a statement of work including the following:

- Project background (recap from the business case)
- Project boundaries describing what is in scope and what is out of scope
- Work breakdown structure; high level overview of work executed by the project team to accomplish the project
- Detailed work breakdown structure that allows for effective management, schedule development, cost estimating, resource allocation, meaningful communication, and control
- Assumptions and constraints
6.1 The Project Roles and Responsibilities

An ABC project requires various skills and expertise. It is of utmost importance that resources are available for the project and that the roles and the responsibilities of each participant are clearly defined.

The Project Manager is the person responsible for ensuring that the Project Team completes the project. The Project Manager develops the Project Plan with the team and manages the team’s performance of project tasks. It is also the responsibility of the Project Manager to secure acceptance and approval of deliverables from the Project Sponsor and Stakeholders. The Project Manager is responsible for communication, including status reporting, risk management, escalation of issues that cannot be resolved in the team, and, in general, making sure the project is delivered in budget, on schedule, and within scope.

The Project Team Members are responsible for executing tasks and producing deliverables as outlined in the Project Plan and directed by the Project Manager.

The Project Sponsor is a manager with demonstrable interest in the outcome of the project who is responsible for securing spending authority and resources for the project. The Project Sponsor acts as a vocal and visible champion, legitimizes the project’s goals and objectives, keeps abreast of major project activities, and is a decision-maker for the project. The Project Sponsor provides support for the Project Manager; assists with major issues, problems, and policy conflicts; removes obstacles; is active in planning the scope; approves scope changes; signs off on major deliverables; and signs off on approvals to proceed to each succeeding project phase.

The Steering Committee generally includes management representatives from the key organizations involved in the project oversight and control, and any other key stakeholder groups that have special interest in the outcome of the project. The Steering committee acts individually and collectively as a vocal and visible project champion throughout their representative organizations. They approve project deliverables, help resolve issues and policy decisions approve scope changes, and provide direction and guidance to the project.

Vendors are contracted to provide products or services the project will require.

Key Stakeholders are a subset of stakeholders who, if their support were to be withdrawn, would cause the project to fail.
6.1.1 The Project Team

The role of the participants should cover the main project tasks. Most roles are straightforward to assign as they relate to participants’ jobs or activities.

<table>
<thead>
<tr>
<th>Function</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Manager</td>
<td>Deliver the project within time and budget</td>
</tr>
<tr>
<td>Project Secretary</td>
<td>Help out Project Manager as much as possible, since he will be too busy to do all the paperwork that’s needed</td>
</tr>
<tr>
<td>Infrastructure Manager</td>
<td>In charge of organizing everything necessary to build the infrastructure so the system will work. This includes security measures, cables, network, stream, connection etc.</td>
</tr>
<tr>
<td>Change Management Manager</td>
<td>Introducing ABC will have a big impact on the staff, a focus on Change management is very important.</td>
</tr>
<tr>
<td>Temporary Measurements Manager</td>
<td>When the gates are constructed it might be necessary to have temporarily different rules, walkways, etc.</td>
</tr>
<tr>
<td>Communication Manager</td>
<td>In charge of all the communication, press, etc around the project.</td>
</tr>
<tr>
<td>Implementation Manager</td>
<td>In charge of the implementation phase. This starts the moment the gates are ready to arrive. All preparation around it and all arrangements needed to get gates into production (ex. Organize flow tests).</td>
</tr>
</tbody>
</table>

6.2 Project Tracking

Each task or activity managed by the project team should also be tracked. The progress-tracking table ensures a good level of coordination and facilitates reporting to internal stakeholders.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Status</th>
<th>Deadline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Software</td>
<td>completed</td>
<td>10.02.2015</td>
</tr>
<tr>
<td>Design</td>
<td>In progress</td>
<td>20.09.2015</td>
</tr>
<tr>
<td>User Documentation</td>
<td>Initiated</td>
<td>31.12.2015</td>
</tr>
<tr>
<td>Staff Training</td>
<td>To be initiated</td>
<td>31.01.2016</td>
</tr>
</tbody>
</table>
6.3 Rollout

To roll out implementation various steps need to be followed:

1. Make sure that all requirements are available to install the Gates
2. Once the gates are installed, they need to be tested.
3. The test phase will include validation of the acceptance criteria, process and flow testing.
4. Roll out Phase - Production

6.4 Checklist

It is recommended to develop checklists. Each Project Leaders should develop a subset of checklist that is part of their delivery. The checklists should cover all activities and should go beyond the requirements set in the tender.

6.5 Timeframe

6.5.1 Factors that can influence the timeframe

The following factors may influence the time frame which may slow down decision making and rollout: Regulation, Financials, Infrastructure, Labor buy-in, Change Management which may involve change of role, pilots to be conducted forehand (average six months to capture representative data but may be shorter or longer), technical solution, politics, bundling of different services, etc.

6.5.2 The following timeframe is meant as guidance to Project Managers

<table>
<thead>
<tr>
<th>Phase</th>
<th>Time</th>
<th>Tasks, Steps, Achievements</th>
<th>Estimated lengths</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>T = 0</td>
<td>Building a Team</td>
<td>1 month</td>
</tr>
<tr>
<td>Evaluate</td>
<td>T + 1 month</td>
<td>Project Team ready</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Start Evaluation</td>
<td>2 months</td>
</tr>
<tr>
<td>Plan</td>
<td>T + 3 months</td>
<td>Evaluation ready</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Start cost / benefit analysis</td>
<td>2 months</td>
</tr>
<tr>
<td></td>
<td>T + 5 months</td>
<td>Cost benefit analysis ready</td>
<td></td>
</tr>
<tr>
<td>--------------------------</td>
<td>--------------</td>
<td>----------------------------</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Decision making process 1 months</td>
<td></td>
</tr>
<tr>
<td><strong>Specification and Tender</strong></td>
<td>T + 6 months</td>
<td>Tender strategy</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Selection Process 6 months</td>
<td></td>
</tr>
<tr>
<td><strong>Contract</strong></td>
<td>T + 12 months</td>
<td>Contract assignments</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Contract signature 4 months</td>
<td></td>
</tr>
<tr>
<td><strong>Prototype</strong></td>
<td>T + 16 months</td>
<td>Review</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Accept 1 months</td>
<td></td>
</tr>
<tr>
<td><strong>Production</strong></td>
<td>T + 17 months</td>
<td>Production</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Prepare infrastructure for installation 4 months</td>
<td></td>
</tr>
<tr>
<td><strong>Installing</strong></td>
<td>T + 21 months</td>
<td>Installation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 month</td>
<td></td>
</tr>
<tr>
<td><strong>Testing the gates</strong></td>
<td>T + 22 months</td>
<td>Test process, flow and acceptance criteria</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Decide on roll out 2 months</td>
<td></td>
</tr>
<tr>
<td><strong>Roll out</strong></td>
<td>T + 24 months</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:** Plan several iterations between 6 – 12 months after roll out
7 KEY ABC COMPONENTS

Key ABC components may vary from one service provider to another and may depend on the requirements established by the key stakeholder; the Government.

7.1 Examples of key components

With the courtesy of 3M

With the courtesy of vision-box
7.2 Case studies

See appendix

8 PASSENGER PROCESSING

8.1 Capacity issue

The methodologies used to conduct capacity and level of service assessment can be more or less elaborated depending on the complexity of the system and the problem studied. Mathematical capacity assessment methods can be employed to determine relevant facility requirements where actual or forecast throughput figures are known. The capacity assessment of a terminal building is a highly complex exercise involving elements such as queuing theory, simulation and statistical analysis, together with detailed studies of people movement patterns to, within, and between these elements. Those responsible for initiating a capacity analysis, or for sizing facilities, should carry out the exercise in as much detail as possible in order to eliminate likely sources of errors and bias that can result from neglecting interaction from and to upstream and downstream systems.

However in some instances it may be necessary to obtain fairly quickly some ideas of either the capacity of an existing facility or the size that a facility needs to be in order to handle a given throughput. A variety of simplified formulae have been developed for this purpose. The equilibrium between supply, demand and level of service is expressed in these formulae. It must be emphasized that such formulae employ many simplifications and approximations and are not intended as a substitute for the detailed evaluation referred to above. Not all formulae will be applicable to all airports since not all local factors are included.
Queuing space

When considering where the ABC equipment should be located, expected queue length is an important factor. This does not just mean the length of the queue ahead of the ABC gate, but in the case of a two-step process, it also means the queue between the kiosk and the primary inspection line. The length of the queue is a factor of the expected process time, expected down time of the equipment and whether or not gates are specific to particular groups of passengers or interoperable. Having calculated these factors, the main criterion for determining the queue length for multiple queuing systems is the average distance between two individuals waiting in the same line (inter-person spacing). The comfort distance varies from person to person and from culture to culture. In an ideal world, for planning purposes it is recommended to use 0.8 to 0.9 meters if site-specific standards are not available. Less than 0.8 meters is possible, but could conflict with other passengers or carry-on luggage.

ABC System Requirements:

The following rule of thumb is used to determine the number of ABCs required:

**Step A: Calculate passenger throughput requirements**

Define groups of passengers eligible for using ABC.

Quantify these groups.

Estimate proportion of these who will use the equipment. Quantify the numbers of passengers who will be using the ABC equipment in peak periods.

**Step B: Estimate the ABC process time**

Formulae to be determined by taking maximum queuing times (in minutes), number of ABCs and average processing times into consideration

**Step C: Calculate space for ABC**

Optimize space and resource allocation between ABC and non-ABC users.

Determine if a personal zone is required between the person using the equipment and the next user.

**Step D: Queue Time**

Determine if there are any local government/airport service levels or maximum queue times that need to be taken account of.
8.2 Human Factors

8.2.1 People with Disabilities

Any ABC system must take into account local regulations pertaining to people with disabilities. In general, where the standard system cannot be used by some passengers, a reasonable alternative should be provided. This could be a modified ABC channel or a manned alternative.

8.2.2 Families

It is assumed that families will be processed through border control as one unit. This would imply that if one member of the family cannot use the system, none can. The minimum requirement is that all members hold a suitable travel document and that all members are above the minimum age where such exists.

8.2.3 Culture

There are a number of cultural issues that need to be taken into account. These include:

- All equipment should be intuitive to use.
- Unless government requirements demand it, ABC processes should be language neutral and use icons, videos and/or pictograms.
- Some biometric verifications may be impacted by clothing, head gear, eyewear.

8.2.4 Other Considerations

In some countries, there may be negative perceptions associated with certain biometric processes. It is for this reason that this guide does not strongly recommend one biometric over another.
8.3 Promotion of ABC Schemes

Those countries that were amongst the first ones implementing automated border control systems have seen a steady increase in usage. Over years, passengers became more familiar with ABC systems.

![Average ABC Usage Chart](image)

*Source: IATA global ABC Campaign (all numbers are aggregated and are based on Government response)*

The success of an ABC scheme relies on passenger awareness. Airports, governments and airlines all have a role of informing passengers of benefits, enrollment and eligibility requirements.
8.3.1 Examples of promotions:

**TAP Air Portugal online booking**

British Airways frequent flyer program
8.4 Signage

The placement and choice of signage are critical to the uptake of ABC in an airport environment. Signage takes many forms:

- Way finding for ABC systems
- Clear branding of the different ABC systems available
- Clear signage of how to use the equipment
- Signage of eligibility and non-eligibility for the system

8.5 Way finding

With the courtesy of IBM
8.6 How to use the equipment

The following pictograms illustrate on how to use the equipment

**Boarding Pass recognition**

*With the courtesy of vision-box*

**ePassport (iris and face recognition)**

*With the courtesy of vision-box*
eID Card (fingerprint recognition)

With the courtesy of vision-box

Gate passage

With the courtesy of vision-box
9  FUTURE RELATED TECHNOLOGIES

9.1 Biometrics throughout the 14 steps passenger process

The end-to-end passenger process was mapped out by the Passenger Facilitation Working Group former Simplifying Passenger Travel. A detailed process flow with more than 100 steps was created, from which pressure points and duplications could be identified. This detailed map was then reduced into a simplified form, leaving a 14 step process that starts with Pre-Travel and finishes with Customs control at the airport of arrival. This 14 step map is the one IATA uses in its various workshop groups under the umbrella of Passenger Experience.

The subject matter of this ABC Implementation Guide is focused on steps 7 and 12, Immigration Exit and Entry Control. However, authenticating and verifying the passenger’s ID is also essential at other steps. IATA’s Smart Security (former Checkpoint of the Future) project is focused around step 9, Security Screening, and relies on biometric capture and verification at the first point of contact at the airport, which is likely to be either at step 3 Check-in (kiosk) or at step 6 Baggage Processing.

Equally step 11 Boarding, when applied to international flights, requires an inspection of travel documents to check that the face on the photograph of the travel document matches that of the passenger. For self-boarding this match may require biometric verification of some kind.

In recent years ideas have been discussed to explore how to reach the full potential of ABC through integration with other systems, both inside the airport and with other government operations. For example, the identity verification step that is performed at the ABC gate could be used to automate the separation of passengers for security purposes and provide the link between biometrics and risk assessment.

In order to maximize the benefits of biometric technology the passenger’s identity would need to be authenticated as early as possible in the airport process, so that biometric verification can then be used in all subsequent interaction points, e.g. bag drop, access to security, outbound immigration, boarding, etc. This would of course require the appropriate legislative framework as well as cooperation between different stakeholders (airline, airport, border agency, etc.)
In future, further integration with other government systems such as Advance Passenger Information and risk assessment tools may enable not only the automated immigration processing to be more secure, but also opens the possibility of further facilitation. This starts through enabling a wider spectrum of passengers and nationalities to use the ABC systems, all the way to opening the possibility of a border without physical barriers, where all passengers have been risk assessed before landing and can be identified through face recognition from a distance upon arrival. This would be the ultimate ABC experience, and from a technology standpoint this is possible today, but better governmental support and integration are still required.

Such integration inside the airport environment brings benefits to multiple stakeholders. Passengers benefit from reduced individual document checks and more automation, decreasing uncertainty in the journey through the airport and speeding up processing at each individual stage. The airport benefits from a smoother and more efficient operation with self-service, and from more visibility of the passenger progress through the airport and useful operational data. Airlines benefit from automation of the identity checks at boarding, making operations more efficient and eliminating fines due to non-compliance of document checking requirements for international passengers.

Using biometric verification throughout various steps in the airport process would require that the biometric is stored and that the legislative framework would allow for it to be used for clearly defined operational purposes, with safeguards and limitations such as permitted time for data retention (e.g. until completion of journey or after 24 hours).

These three biometric-using processes – ABC, Smart Security and Self Boarding – may be owned by three different process owners, namely government authorities, the airport and the airline. Looking at the passenger journey again as a 14 step process, the challenge is to ensure that the requirements of the 3 biometric-using processes on the passenger are not so different as to confuse or alienate the passenger, such that they are unable to use the equipment or prefer not to use the self-service route. The choice of biometric(s) and equipment to be used will vary from project to project, but we can imagine that the differences in processing the passenger could include:

- Is the boarding pass required or not?
- If so, should the passenger be looking to place it on or under a scanner or should he looking to locate the passport reader?
- How long should the passenger wait when holding the passport on the document reader?
- Which biometrics will be used at each process?
- If fingerprint, how many fingers will need to be captured?
- If facial recognition, should the passenger be looking to locate the camera, and if so, what will it look like?
- If face or Iris, will the passenger need to stop and stand still? For how long?
- And will he need to take off any hats or spectacles?

Generally speaking, the airline/airport are not in a great position to standardize these processes because the governments may influence which biometrics they prefer to use. However, what airlines and airports can do is be aware of these differences, think about how the passenger might perceive them, standardize as much as possible and design their signage accordingly.
**Smart Security**

Smart Security is an IATA/ACI initiative that brings governments, airlines, airports, solution providers and other stakeholders around the table to conceptualize, test and evaluate solutions for next generation passenger and cabin baggage screening at airport security checkpoints.

The objectives are to strengthen security, increase operational efficiency, and improve the passenger experience. This will be possible through a combination of the following:

a) Risk-based security and differentiated screening.

b) Advanced screening technology for better threat detection while minimizing the need for the passenger to remove clothing and belongings.

c) Process improvements for increased operational efficiency.

Risk-based security means that passengers and their belongings are screened according to risk, i.e. to focus efforts and resources on where the greatest perceived risk is – both in terms of the objects and the people carrying them. Thus, according to the concept, screening will be “differentiated” in that passengers will be screened to a greater or lesser extent, and in different manners, according to risk assessment. Such differentiated screening does not per se have to be visible; it is entirely conceivable that screening procedures and sensitivity of screening equipment could be varied dynamically, and within the same screening lane, according to the risk profile of the passenger.

Differentiated screening implies the need to be able to identify passengers, and authenticate their identity, for the purpose of security screening. The most efficient way to achieve this is through the use of biometric technology.

The choice of biometrics to be used is restricted by the tokens available. ePassports appear to be the obvious option, as there is an ICAO standard for ePassport design, as ePassports are already wide-spread. This would support facial recognition technology for smart security, as all ePassports contain a digital photograph on the chip, but not all of them contain other biometrics such as fingerprint or iris. Nonetheless, a hybrid approach can be used, whereby facial recognition is used for authentication against the ePassports, while at the same time a different biometric (e.g. iris) could be enrolled for use during subsequent verification steps if this proved advantageous.

**Self-boarding using Biometrics**

The trend for offering self-service in the air transportation industry started more than two decades ago, initially by offering on-line reservation facilities to passengers. Over time, web or kiosk check-in and self-service bag drop have become common practice in most airports on all continents. Home printed or mobile 2DBC boarding passes are becoming the norm.
According to SITA’s 2013 Airline IT survey, airline IT investment priorities continue to focus on mobilizing the passenger journey. The landscape for self-service check-in is shifting as mobile phones become a serious option for passengers and airlines explore the possibility of eliminating the check-in process altogether. Early adopters are focusing attention on alternative approaches such as automatic check-in systems that can give passengers a “nothing to do” role in the check-in process, with seats allocated automatically based on predefined preferences. Self-service has also found its way to the gate, where quick boarding gates are proving their efficiency in several large airports, allowing for a combination of enhanced airline boarding staff productivity with increased passenger comfort.

Where airlines may mainly look at self-service from a cost/benefit and operational efficiency perspective, this continuous extension of self-service was only possible because the trend was enthusiastically endorsed by the traveler community. The feeling of being in control, combined with a swifter and more predictable journey through the airport, have greatly contributed to the success. This trend is ongoing. The 2015 IATA Global Passenger Survey indicated that internet and automated check-in are widely appreciated; while over 63% of the passenger population indicates they would welcome self-boarding gates and self-scan their mobile boarding passes. 90% of passengers are satisfied with the use of Automated Border Control where their biometrics is matched against their ePassport and 20% would be happy to use biometrics throughout the ground process. If properly managed and communicated, privacy concerns seem to be lessened for the vast passenger community.

Where this self-service approach offers much appreciated convenience to travelers and allows airlines and airports to reduce costs and speed up the passenger flow, an end-to-end self-service process for the passenger risks creating an unacceptable security risk if the identity of the boarding passenger cannot be established in a reliable way. The challenge for further expansion of self service in the future will be to maintain an acceptable equilibrium in the facilitation/security balance. The unavoidable consequence will be an increasing need for accurate, automated identification of passengers during the different stages of their journey through the airport. Biometrics is one of the very few technologies that promises this in a reliable way.

However, although automated border control has become widespread at airports all over the world, biometric passenger identification for other steps has not been adopted as widely to date. The paramount question is to predict how the current use of biometrics in the border management context will be mirrored in other steps in the passenger process.

Lack of passenger adoption to date will not prevent the widespread use of biometric data in the future. The well-known mi-Sense trial, set up in 2006/7 in the UK, was the first large scale experiment that indicated passengers’ willingness to use this kind of innovation. The traveler reaction to the use of biometrics was very positive. The overwhelming majority of participants testified that it was adding real benefit to their travel experience and that they would recommend the use of such system to colleagues and other travelers. The latest IATA passenger survey confirms that passengers are ready to provide personal information if it makes their travel more smoothly and would prefer to have their passport and visa validated ahead of travel.

This leaves us with the question about operational and financial drivers that will push the extension of biometrics throughout airports.
9.1.1 Operational considerations

In spite of an enthusiastic passenger attitude, the robustness of the technology still must be proven in the airport environment before airlines will rely on it for mission critical processes such as boarding. The growing success of the government controlled automated border control, with millions of passengers successfully processed so far and a growing number of e-gates deployed in airports on all continents provides initial assurance. Continuously improving technologies, such as ‘biometrics on the go’ will further enhance the usability of different types if biometrics in the coming years.

Biometric self-service becomes efficient when a sufficiently large group of passengers participate in the process, with biometric identities can be checked against travel documents and database information. Three ways of providing this information can be envisaged. A biometric component can be added as part of registered traveler programs, with a one-time enrolment effort, reusable many times. A second, promising way forward to spread the use of biometrics is using existing data from government issued travel documents. With the increased collaboration between governments and the travel industry, biometric passenger data could be shared on a temporary basis for the distinct purpose of automating the passenger journey.

Today, there is limited data sharing between border control authorities, airport authorities and airlines, but there is a significant value and opportunity for this scenario to change. By using as a token the biometric information stored on the travel document it is possible to establish the passenger identity both at the border and also at boarding through the implementation, for example, of a Traveler Data Envelope (TDE). The TDE would be the sum of the transaction data resulting from the traveler’s interactions and is temporarily stored during the passenger journey through the airport. This would allow the definition of dependencies; not allowing, for example, a passenger to board a plane if there is no information concerning their border crossing or if a passenger arrives at the border crossing check point, x minutes from boarding then, instead of moving forward, he/she will be redirected to check-in since there may not be enough time to board the plane.
A third option will be the one-time enrolment of passengers at an early step in the journey, e.g. at dedicated enrolment kiosks or as part of an existing identification process at security checkpoints. In this scenario, the TDE will be established in the early stages of the passenger journey at the airport and can be used for the different touch and control points allowing the creation of a timeline, from check-in to boarding. The TDE can either be stored for future use or deleted once the passenger leaves the airport and the process is closed.

While this process may offer a lower degree of reliability, it offers the advantage of being usable by the whole passenger community. In this scenario one can imagine that government operated pre-clearance kiosks could pave the way for an increasing popularity of one-time enrollment infrastructure at departure hall in airports. The expectation is that initially, like for border management, biometric self service will be available on a voluntary basis, but in order to be economically viable, it will be essential to build a steep adoption curve, allowing airlines to realize an economical benefit.

The third operational parameter is the fact that any innovation affecting the passenger process must simultaneously simplify and speed up the passenger flow, realizing the full economical benefit for airlines, airport and ground handlers. With ICAO compliant face, iris and fingerprint verification competing for market share, uniformity in the passenger identification process may not be a straightforward objective to be achieved, possibly limiting the early use of biometrics to experienced frequent travelers. Obviously, the use of standard (ISO) formats, but even more important a standardized, uniform user interface to different technologies will be needed to open up the system to the wider passenger community. Compared with the current stand-alone use in border management, a heavily regulated air transportation industry will require an additional standardization dimension as the industry is organized around common use infrastructure. AEA compliance in the communication between applications and devices as well as standardized interfaces will airline DCS’s will be a condition, because a common use dimension of biometric infrastructure is the only way to reach a generalized use. Solution providers will need to work with airports and airlines to prove feasibility.

### 9.1.2 The financial dimension

So far, the financial case for self-boarding has been harder to prove than it has for ABC at immigration. Nonetheless, some financial benefits are evident:

- If the boarding process can further be streamlined by implementing biometrics, support staff during the boarding process can be reduced to a minimum, a quicker boarding process will lead to less delayed departures, and strict biometric identification of passengers will significantly reduce the number of unauthorized passengers.

- Airports and ground handlers will benefit the time gain resulting from the quicker and more predictable passenger journey. The resulting increased capacity will not only provide a direct financial benefit, it will also allow postponing investments in additional terminal capacity. The positive effect on passenger spending (more passengers with predictable dwell time) is another factor gaining importance over time.
Increased airport efficiency has an impact on the general economic climate of a country. Governments have a legitimate interest in stimulating this evolution. Additionally, a generalized use of biometric passenger identity management will contribute to an enhanced security level at the border without investment in additional human resources.

Although a number of individual airlines/airports are trialing the principle of biometric self-boarding on an individual base, collaboration and sharing the cost will be key in the future, driving down the cost per passenger to a level where the benefit becomes more obvious. This may include the need for infrastructure such as check in, bag drop and/or boarding to be common use at those terminals which have it, to serve passengers from all airlines. The expectation is that standardization will drive the integration process to an economically viable level in the years to come.

Conclusions

Self-service will drive the need for enhanced identity management in the overall passenger process. Unless biometrics are widely deployed, the extension of self-service will remain limited.

Solution providers have a joint responsibility to offer standardized applications and infrastructure that can easily be added to existing platforms.

A gradual increased use of biometrics can be expected. One solution is to upgrade existing 2D BCBP self-service boarding gates with a biometric component.

The business case for biometrics will be driven by direct cost benefits for multiple stakeholders. Joining forces and creating synergy will lead to a ‘win-win’ situation.

If properly implemented, biometric identity management will simultaneously simplify the passenger journey and increase the cost efficiency of the industry, while providing an additional security component that should also stimulate governments to support the evolution.

In summary

As the trend for self-service in airports continues to increase, the need for deploying biometrics will become even more robust.
9.1.3 The Aruba end-to-end Pilot

Aruba Happy Flow is an innovative passenger process in which the passenger is only required to show his or her passport once throughout the journey at the airport. The use of facial recognition then allows the passenger to proceed to check-in, baggage drop off, pass the border and board the aircraft, all without being asked to show a passport or boarding pass again.

At check-in, the passenger enrolls his biometric data and travel documents, whilst a virtual Passenger Data Envelope is created. Across their journey at the airport, at each subsequent step, namely bag drop, immigration and boarding, passengers are recognized via a face camera in just a few seconds, receiving approval to move forward, while the envelope is continuously updated with the relevant information such as biometric captures, real-time passenger status, among others. The stored information is then processed and shared selectively and privately with the relevant authorities, for each specific transaction.

This process also gives opportunity to simplify the passenger facilitation process by combining identity checks. Airside access and immigration exit check are combined in one. As a passenger is enrolled in the Happy Flow the flight reservation is evident. Furthermore the immigration exit border check is transformed in to a two-step process. At check in the identity of the passenger's travel document is authenticated and verified and the passenger’s biometrics are matched to the biometric data in the ePassport. The biographical data is checked against the immigration authorities systems and watch lists, thereby performing the first step of the border exit check. The immigration authorities do not act on the information yet towards the passenger, but are able to anticipate the deployment of their resources at the actual border crossing point for passengers that need further questioning or are not allowed to exit the country.

The Happy Flow system aims to be the first pre-clearance border control process for passengers travelling to the EU-Schengen area. Passengers departing from Aruba and intending to enter the EU-Schengen space will pre-cleared by Dutch immigration and Customs before take-off. In case a passenger does not fulfill the requirements needed to enter the EU or is unable to fly because of other safety concerns, the appropriate measures are immediately triggered and the respective authorities are notified anticipatively.
This new framework combines all the complex, security-critical Border Control and Common Use solutions into a comprehensive set of intelligent layers, where data can be shared among the different stakeholders in a privacy responsible manner.

10  STANDARD MAKING BODIES

This is not an exhaustive list but can act as a guide to advice airports on some of the standards that should be considered before implementing an ABC project.

10.1  ICAO

The ICAO documents 9303 versions 1 to 3 define how passports and e-passports and other travel documents should be constructed and read electronically. Provided a document reader is used which reads ICAO 9303 documents. This is not a concern for the airport implementing the project.

10.2  ISO Standards

10.2.1 ISO 7001 Public Information Symbols

This general standard is written for user guidance based on icons and pictographs rather than requiring language. Using symbols from this standard should assist passengers using ABC systems around the world.

10.2.2 ISO Series 19794

There are ISO Standards that govern biometric data formats for facial, finger and iris recognition. This standard is a concern for the biometric vendors but not for the airport directly.

10.3  Business Requirements for National and Regional ABC Schemes

Many countries have their own ABC requirements document that must be followed. These are some of the larger/first ones.

10.3.1 EU Regulation 562/2006 Schengen Borders Code

The Schengen Borders Code describes EU regulation on automated border control and biometrics. This document includes some signage standards in part D of annex 3.
10.3.2 EU Smart Border Package

The Smart Border Package aims to improve the management of the external borders of the Schengen Member States, fight against irregular immigration and provide information on overstayers, as well as facilitate border crossings for pre-vetted frequent third country national (TCN) travelers.


10.3.3 US Customs and Border Protection APC

The purpose of the APC Business requirements and Technical Reference Manual is to identify, at a high level, the business requirements for APC and to provide the interface specifications between the Kiosk System and the U.S. Customs and Border Protection Automated Passport Control Service. The document provides a high-level overview of the technical architecture, describes the message request and response dialogues, outlines message components, and provides data validation rules.

https://help.cbp.gov/app/answers/detail/a_id/1753/~/automated-passport-control-(apc)-technical-requirements-manual

10.4 Disability Legislation

Each country has its own laws and recommended practices/standards around disabled users, which need to be addressed for such self-service systems. These requirements may impact placement, interface, design and symbols.

10.5 Airport Design Standards

ABC design should be in accordance with local airport standards which will take account of national health and safety requirements.
11 PREFERRED IATA PARTNERS

Simplifying the Business (StB) is the industry's top priority and as such requires the involvement of all key stakeholders including vendors and service providers. Their business knowledge, expertise and solutions provide tangible benefits and are crucial in the successful implementation of the Simplifying the Business program. Organizations that provide solutions might be interested in becoming a Passenger Experience or Passenger Facilitation Strategic Partner and take advantage of the privileged business opportunities linked to these projects.

Strategic Partners offering ABC products and services are presented in alphabetical order:

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<tr>
<th>Company</th>
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<tr>
<td>3M</td>
<td>Website <a href="http://www.3M.com/identitymanagement">http://www.3M.com/identitymanagement</a></td>
<td>3M Identity Management is a world leader in biometrics, secure document production, travel document readers and authentication systems, as well as border management systems including ABC solutions. 3M solutions can be found on check-in desks, in self-service kiosks, at security checkpoints and on border control desks in more than 100 countries. 3M operates globally with turnover of $30Bn.</td>
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<tr>
<td>Arinc</td>
<td>Website <a href="http://www.rockwellcollins.com/">http://www.rockwellcollins.com/</a></td>
<td>ARINC Incorporated is the world leader in transportation communications and systems engineering. The company develops and operates communications and information processing systems and provides systems engineering and integrated solutions to five key industries: airports, aviation, defense, government and surface transportation. ARINC’s key products include passenger and baggage check-in systems, including a CUPPS Certified Platform, CUSS kiosk solutions, and a global data communications network. ARINC is the vendor member of the IATA Passenger Experience Management Committee. Incorporated in 1929 to provide reliable and efficient radio communications for the airlines, ARINC is headquartered in Annapolis, Maryland, with over 3000 employees worldwide. ARINC is ISO 9001:2008 certified.</td>
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| IBM Corporation           | **Website**
http://www.ibm.com/industries/travel  
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beorourk@us.ibm.com | IBM is a leading provider of business consulting, IT services, solutions, and products to all segments of the travel and transportation industry, including airlines, airports, and global distribution systems. IBM has the industry experience and business consulting capabilities to help airlines transform and differentiate themselves in this demanding environment to help in setting priorities, finding leverage and innovation points, putting theory into practice, and delivering short-term ROI while planning for long-term effectiveness. IBM currently provides leading-edge technology, high-level consultancy and business process re-engineering, as well as management of IT operations on behalf of many major airlines through strategic outsourcing arrangements. |
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imarion@ier.fr | IER, a leading player in the air transportation industry for over 30 years, proposes a full range of solutions to safely and quickly process passengers and baggage from check-in to boarding. IER proposes desk check-in printers for tickets and boarding passes, a Common Use Self-service platform including kiosk, CUSS Middleware, application software and monitoring system and self-service check-in on mobile phones and online applications. IER also develops a self-service baggage drop off systems and proposes RFID baggage tracking solutions. To improve the boarding process and ensure safe and smooth passenger access control at the different checkpoints in the airport, IER solutions include automated access control systems, boarding gate readers and automatic boarding gate. IER ensures sales, services and technical support to its customers throughout the world with its networks of subsidiaries and offices. |
| Kaba Gallenschütz GmbH    | **Website**
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**Sales Contact**
Lars Rosenberger  
Head of Business Manager  
Airport & Airline Solutions  
International Business Development  
Nikolaus-Otto-Straße 1  
Bühl / Germany  
Tel.: 49 7223 286 415  
Mob: 49 1525 7965084  
Fax: 49 7223 286 111  
lrosenberger@kaba.com | Kaba Gallenschuetz GmbH is the leading suppliers in the field of physical access control and access control solutions for airports. The company develops, manufactures, and distributes tripod barriers, turnstiles, manlocks, and revolving doors. All these products are equipped with intelligent drives suitable for the connection to electronic access control systems. They may be equipped with various interfaces and sophisticated sensor systems, according to the individual security level demanded. Kaba Gallenschütz GmbH has equipped many major airports worldwide with self-boarding and airside separation solutions as well as other physical access control solutions for staff access and passenger handling. |
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<td>Morpho</td>
<td><strong>Web site</strong> <a href="http://www.morpho.com">http://www.morpho.com</a></td>
<td>Morpho, as a pioneer in identification and detection systems, and a major player in e-documents based on biometrics, is committed to developing new technologies to satisfactorily and efficiently process passengers integrating both operational and security perspectives: travel e-credential scanning; passenger, baggage and cargo screening with efficient threat detection; e-gate solutions.</td>
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<td><strong>Sales Contact</strong> Cyril Dujardin</td>
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<td>Issy-les-Moulineaux / France Tel.: 33 1 58 11 25 00 <a href="mailto:info@morpho.com">info@morpho.com</a></td>
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<td>Mühlbauer</td>
<td><strong>Web site</strong> <a href="http://www.muehlbauer.de">http://www.muehlbauer.de</a></td>
<td>In its business line Cards &amp; TECURITY®, Mühlbauer is the only company in the world that offers its customers a complete technology platform for the production of innovative card applications and security documents from a single source – starting with the hard- and software to fully automatic and biometric access and border controls through to complete turnkey solutions.</td>
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<td>In the sector Semiconductor Related Products, Mühlbauer</td>
<td>Mühlbauer offers a complete Smart Label factory for the production and personalization of RFID inlays. Furthermore, the company develops and produces innovative systems for specific niche applications in the semiconductor backend area. The product portfolio comprises carrier tape systems, sorting systems and systems for flip chip bonding. Moreover, Mühlbauer has recently been utilizing its competence to develop modern production concepts for the flexible thin-film solar technology.</td>
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<td>offers highly precise individual parts to meet the extremely high demands towards quality and precision.</td>
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<td>Within Precision Parts &amp; Systems, Mühlbauer produces highly precise individual parts to meet the extremely high demands towards quality and precision.</td>
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<tr>
<td>SITA</td>
<td><strong>Web site</strong> <a href="http://www.sita.aero">http://www.sita.aero</a></td>
<td>SITA is a world leading provider of global information and telecommunications solutions to the air transport industry. With more than 60 years of experience, it offers ICT solutions to over 550 air transport industry members and 3,200 customers, supporting them globally in 220 countries and territories. SITA aims to transform the industry, by solving multi-stakeholder common industry issues through the use of communication and IT solutions. To achieve this, SITA adopts innovative approaches, such as common use solutions, community systems, and shared infrastructures. The company offers a total IT service, providing value-added solutions which are available across the globe through a single supplier relationship. Uniquely SITA is focused on providing an integrated portfolio of IT and communication solutions, managed end-to-end globally.</td>
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<td><strong>Sales Contact</strong> Nigel Pickford</td>
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<td>Director Portfolio Marketing</td>
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<td>London UB3 1HA United Kingdom Tel.: 44 20 87 56 86 29 <a href="mailto:Nigle.Pickford@sita.aero">Nigle.Pickford@sita.aero</a></td>
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<td>Unisys is a leading provider of consulting, solutions, services and technologies to airlines, airports, logistics, travel and distribution enterprises. Unisys is a leading provider of consulting, solutions, services and technologies to airlines and airports. Their clients comprise over 200 airlines, including 21 of the top 25 and more than 600 airports. Unisys systems process 29% of all passengers. They are leaders in providing security solutions for air transport and for the global supply chain. China's aviation industry relies on Unisys as its leading supplier of solutions and technology. Their air transport solutions include AirCore, their next generation passenger services solution and Logistics Management System. Additionally, Unisys provides market-driven initiatives and technologies for: Enterprise Security, Outsourcing, Real-time Infrastructure, Open Source Solutions &amp; Support, and Applications Services. They offer a powerful advantage by combining Unisys 3D Blueprinting methodology along with their capabilities and solutions. They focus on secure business operations with their core competencies of Consulting, Systems Integration, Outsourcing, Infrastructure and Systems and Technology and industry solutions.</td>
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<tr>
<td>vision-box</td>
<td><strong>Web site</strong>&lt;br&gt;<a href="http://www.vision-box.com">http://www.vision-box.com</a>&lt;br&gt;&lt;br&gt;<strong>Sales Contact</strong>&lt;br&gt;Jean-François Lennon&lt;br&gt;Director of International Business Development&lt;br&gt;Rua Casal do Canas n.2&lt;br&gt;Zona Industrial de Alfragide&lt;br&gt;Carnaxide /Portugal&lt;br&gt;Tel.: +351 21 154 3900&lt;br&gt;Fax: +351 21 154 3901&lt;br&gt;<a href="mailto:Jean-Francois.Lennon@vision-box.com">Jean-Francois.Lennon@vision-box.com</a></td>
<td>Vision-Box is the leading provider of automated border control systems and electronic identity solutions. The product portfolio ranges from live biometric enrolment stations, document verification kiosks, digital document dispensers and personalization systems, ranging from portable and hand held biometric units through to smart biometric ABC, security check-point and self-boarding gates</td>
</tr>
</tbody>
</table>
12 APPENDIX Case Studies

1. Case Study United Kingdom Government

2. Case Study Portuguese Government

3. Case Study Canadian Government

4. Case Study Indonesian Government

5. Case Study United States Government (Mobile Passport Control)