

Digitally Unified Seamless Travel (DUST) Experience

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Abstract. This paper explains one of the possible methods where today's mobile technology advancement can be implemented in the seamless air travel airport experience. From mobile boarding cards to biometric passports, we are already experiencing a more personalised flight experience. The success of online check-in has served as a positive precursor to digitisation. Greater technology and use of connected data mean's experiences such as passenger security and baggage handling are becoming far more streamlined. The forefront of innovation in this aviation space, pushing boundaries and bringing new touchpoint opportunities to the forefront to give a new passenger experience in the growing Aviation market. "Technology and data are giving rise to new personalised and connected air travel experiences."

Keywords: seamless travel experience, digitally unified seamless travel system

Introduction

The International Air Transport Association (IATA) has revealed the results of its 2018 Global Passenger Survey (GPS), which shows that passengers are looking to new technology to give them more control, information and improve efficiency when they travel. Based on 10,408 responses from 145 countries, the survey provides insight into what passengers would like from their air travel experience. Overall, passengers said that they want:

1. Real time journey information delivered to their personal devices
2. Biometric identification to facilitate their travel processes
3. Automation of more airport processes
4. Wait times of less than 10 minutes at security/immigration
5. Their bags tracked throughout their journey
6. A human touch when things go wrong

Those passengers surveyed identified airport security/border control and boarding processes as two of their biggest pain points when travelling. The top frustrations with security were the intrusiveness of having to remove personal items (57%), the removal of laptops/large electronic devices from cabin bags (48%), and the lack of consistency in screening procedures at different airports (41%). To improve the boarding experience, the top three desires of passengers are more efficient queuing at boarding gates (64%), the availability of overhead space on the aircraft (42%), and not having to queue on the air bridge (33%).

The survey shows that passengers want more self-service options. Automated check-in was preferred by 84% of passengers. 47% prefer to check in online using a smartphone and only 16% prefer traditional check-in. Some 70% of passengers want self-service baggage check-in. The electronic bag tag is growing in popularity favoured by 39% of passengers (up 8% from 2017). The overall experience with automated immigration procedures was rated favorably by 74% of passengers, while 72% believe that automated immigration processes are faster and 65% believe they enhance security.

Growth in Aviation Industry

According to International Air Transport Association (IATA), Air transport passenger could double to 8.2 billion by 2037. The Asia pacific region will be supporting 2.35 billion

passengers annually out of 3.9 billion global passengers annually with the highest Compound Annual Growth Rate(CAGR) of 4.8%. Europe and North America will grow by a CAGR of 2.0% and 2.4% CAGR respectively. While North America will see 527 million new passenger following Europe with 611 million new passengers. Middle East and Africa will also examine one of the highest CAGR of 4.4% and 4.6% respectively. The total market size of annual passenger will be 501 million passengers for Middle East while 334 million passengers for Africa.

Aviation Industry with Tremendous growth also face an infrastructure crisis. Many of the airports are increasing their capacity to handle passenger but has always faced with several debates on the financial restrictions of building a new airport. According to De Juniac,” The world stands to benefit greatly from better connectivity. However, at this rate, airports and air traffic control will not be able to handle demand. Governments and infrastructure operators must strategically plan for the future. Decisions made now will have an impact on the value created by aviation for their regions”(Juniac, 2018).

The largest transfer hubs handle more than 2,500 departures and landings and enplane more than 75,000 passengers per day. Large hubs airport is quite smaller to handle such huge number of passengers. Passenger facility like check in counters and departure lawns are not in a condition to handle so much of crowd, as the demand for the air travel increasing steadily the

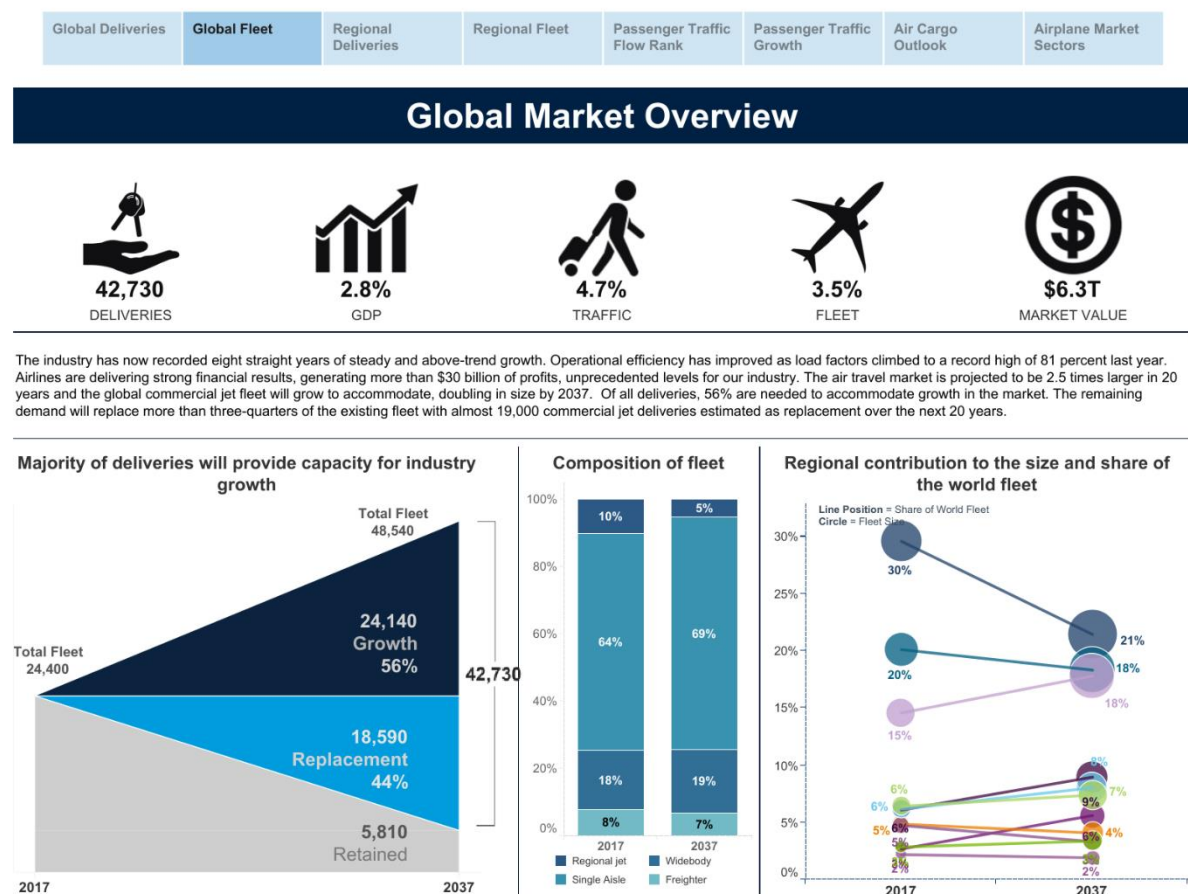


Fig-1 Global Market Overview by Boeing (Boeing 2018-2037)

flight experience has the potential to become more frustrating and inefficient, but in fact the availability of new technology and data streams is transforming air travel into a seamless, more personalised and connected experience a new golden era for travel.

Fastest growing aviation markets in terms of annual additional O-D passengers from 2017 to 2037 (constant policies scenario):

1. China: 1 billion new passengers for a total of 1.6 billion
2. US: 481 million new passengers for a total of 1.3 billion
3. India: 414 million new passengers for a total of 572 million
4. Indonesia: 282 million new passengers for a total of 411 million
5. Thailand: 116 million new passengers for a total of 214 million

Regional growth ('constant policies' scenario) in 2037

1. Routes to, from and within Asia-Pacific will see an extra 2.35 billion annual passengers by 2037, for a total market size of 3.9 billion passengers. Its CAGR of 4.8 per cent is the highest, followed by Africa and the Middle East.
2. The North American region will grow by a CAGR of 2.4 per cent annually and in 2037 will carry a total of 1.4 billion passengers, an additional 527 million passengers.
3. Europe will grow at a CAGR of 2.0 per cent and will see an additional 611 million passengers. The total market will be 1.9 billion passengers.
4. Latin American markets will grow by a CAGR of 3.6 per cent, serving a total of 731 million passengers, an additional 371 million passengers annually compared to today.
5. The Middle East will grow strongly with a CAGR of 4.4 per cent and will see an extra 290 million passengers on routes to, from and within the region by 2037. The total market size will be 501 million passengers.
6. Africa will grow by a CAGR of 4.6 per cent. By 2037 it will see an extra 199 million passengers for a total market of 334 million passengers

According to The Future is Connected (Pereira, 2017). the latest industry report from SITA, a leading global IT provider to the air transport industry. The report said that with 83% of passengers currently carrying a smartphone it is now the unifying technology in transport, which will provide a connected end-to-end experience and reshape travel behavior. "With growth rates of around 80% or more at the check-in and boarding pass stages it is clear passengers are keen to use their own technology." The air transport industry is already establishing the infrastructure and processes to enable more seamless travel experiences.

New technology at airports promises to dramatically transform the travel experience for passengers.

The Path to Continuous Improvement

It's never too late for Airlines/Airport to start tackling some of the challenges passengers face to achieve a 'seamless' experience one that provides unified, simple and stress-free interactions that support the individual passenger's journey across environment to environment, device to device, and places more control in their hands. The recent International Air Transport Association's (IATA) 2018 Global Passenger Survey shows that customers want increased automation to smooth over the more stressful parts of a trip. The survey, which polled 10,408 global respondents, took place from April to June of 2018. In terms of sharing personal data with airlines, the wave seems to have crested in terms of willing adoption by travelers. In 2017, 70 percent of travelers were willing to share personal information to speed up processing at the airport. When it comes to biometric technology, 45 percent of those polled would choose biometric identification instead of having to carry a passport around.

"As we move more and more towards digital processes, passengers need to be confident that their personal data is safe. IATA is working to establish a trust framework that ensures secure data sharing, legal compliance, and privacy," said Nick Careen, IATA's senior vice president for airport, passenger, cargo, and security. The data show that travelers are less

satisfied with their trip through the airport itself this year, from security to customs and boarding itself, while slightly more satisfied with airlines' in-flight entertainment offerings.

Seamless Travel Concept

Air travel is now defined by ensuring seamless travel, tailored and personalized for each and every passenger. Seamless travel is ultimately defined by an absence. Seamless travel is the absence of disruption, the noticeable facility of moving from A to B without issue. Seamless travel is an expectation for the modern passenger. The seamless traveler doesn't necessarily need retail options, restauration or help with security checks. Crucially however, passenger might desire these options. A seamless experience is therefore personal to each passenger. Therefore, tailoring of experience is essential. There is no one-size-fits all approach possible. Seamless travel is definitely the use of technology to ensure security checks are as quick and efficient as possible. But this use of technology to ensure seamless travel is just one part of the overarching experience. The aviation and airport industry now need to convince passengers around the world that the responsible and transparent collection of their data is in their own interests. In order to create this seamless experience when travelling by air, data collection is essential.

This digitally unified seamless travel (DUST) system design will provide seamless integration with an airline's and airport's AI based Backend system for passenger processing. Passenger processing and departure control is a part of creating a fully integrated system. The key feature of this system design is to have a unified, central airport operations database, an information hub that controls the accuracy and the flow of data between airport central systems, airline and Mobile Phone Signal service provider experience in system integration helps airports optimize their Passenger Flow and reducing the security risk and improves the performance of the airport and increase the Economical factor by decreasing the Passenger Processing Time.

Baggage can be tracked more precisely for more efficient handling and better security. Real time management of passenger data opens opportunities to streamline passenger movement, while ensuring efficient security checks.

Whether in the terminal, on the ramp, in the back office, or even at surrounding areas such as hotels and car parks, this system has every aspect of airport operation covered. All of our integrated processing systems are designed to work seamlessly with existing technological infrastructure; they are highly scalable and designed for high availability and resilience;

Digital Identity

Airlines and airports currently operate as separate entities, resulting in two alternative views of the passenger journey which is hindering industry progression in terms of customer service. The integration of airline and airport data through passenger automation technology is imperative to markedly improve the situation. Data-sharing enables a holistic view of the passenger's end-to-end journey, which can be used to maximize operational efficiency through a reduction in queues and delays, and, perhaps most importantly, improve customer satisfaction a valuable end goal for all parties.

This goal can be achieved through utilizing the 'Passenger Operational Database' (PODB) data automation technology that holds information in real-time about each passenger. Through this 'digital passenger', airports can treat the passenger as an individual and offer a truly personalized service. In turn, this provides increased scope to enable on time departures

Using this data management system, airports and airlines can proactively engage with the passenger. Take a standard journey of a passenger through an airport. The PODB will pick the passenger Mobile Phone GSM upon entry to the airport, inform them about the check-in counter for their respective travel ,queues in security and which gate they will need to go to, help direct them through the airport smoothly to maximize their time in the retail environment at the airport

and even encourage spend with special offers. Armed with more information, the passenger can decide how to spend their time in the departure lounge rather than queuing. The challenge here is overcoming the ownership issue of the passenger, do they belong to the airport or the airline or both? Deciding to jointly own a passenger will improve services and feedback for both parties.

The industry needs to re-think its current customer service strategies in line with what the passenger expects. The service industry is moving quickly to personalize every step of the process, but the aviation sector is a step-change behind. For the industry to progress, passenger data must be shared between the airline and the airport to provide in-depth insight into passenger preferences and expectations and bring the digital passenger to life.

This DUST Design system will improve the unity of the experience, smooth out bumps and bridge some of the gaps that may exist in passenger's overall experiences toward a truly seamless experience.

FLYERS WANT BETTER INFORMATION

Mobile travel tools have redefined the travel experience, smartphones are now the preferred device for connecting online, moving ahead of laptops. It's now natural for customers to be using their mobile devices whilst they travel to check on traffic, bookings and updates as they move. With consumers becoming increasingly tech-savvy, the time has come for the travel industry to embrace the technology at hand, to take advantage of the continued growth of big data, to put customers first. Only then can travelers across the globe enjoy a fully seamless and personalized experience, the combined consumer data and connectivity can form the basis of a personalized, seamless travel experience, facilitated by emerging technologies.

The Path to Efficient and Enjoyable Travel

Today, passengers encounter a series of required steps that shape their journey from home base to destination: booking, check-in, baggage drop, ground transportation, security, and customs and immigration. Booking and check-in have already been streamlined by online and mobile device capabilities as well as self-service kiosks. Innovative software applications, investments in airport building and technology infrastructure, and utilization of new technologies are driving further improvements in the passenger journey. Location-based technologies are enabling more passengers to easily pinpoint then be digitally led to diverse locations in airports.

Mobile Signal Tracking — Cell Site Simulator

The cell site simulator (a portable fake cell phone tower that pretends to be a real one, in order to "catch" particular users' mobile phones and detect their physical presence, also sometimes called an IMSI Catcher or Stingray). IMSI refers to the International Mobile Subscriber Identity number that identifies a subscriber's SIM card, though an IMSI catcher may target a device using other properties of the device as well. The IMSI catcher needs to be taken to a particular location in order to find or monitor devices at that location.

Using this technology, the Airport building should be defined as Various Pseudo cell sites,

1. Entrance Pseudo Cell site
2. Check-in Pseudo Cell site
3. Immigration Pseudo Cell site
4. Security Pseudo Cell site
5. Concourse Pseudo Cell site
6. Departure waiting Pseudo Cell site

For example, in the entrance of the airport there should be a pseudo Tower and that tower should be integrated to the access door. when the Signal from your mobile is detected by this Pseudo tower in the entrance this GSM signal would be cross checked with the Passenger Operations Database, if your details are in the passenger operations data base is valid and verified then the accesses to the entry of the airport is permitted .

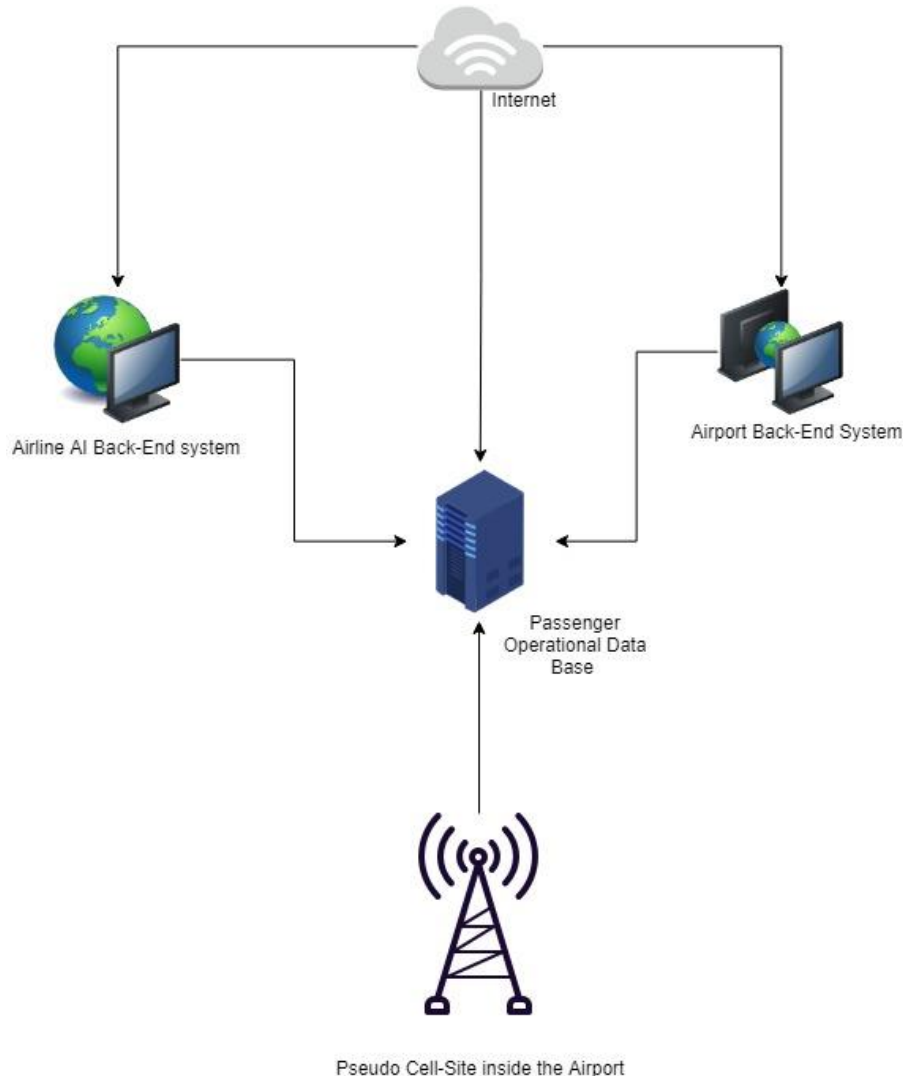


Fig-2. Architect of DUST System (Authors)

1. All the citizens should have one Official Mobile Number linked to Passport
2. During the ticket Booking the passenger had to give the Mobile number for Ticket Booking Processes
3. Passenger Operational Database (PODB) should be Developed and data base of the PODB should be compliment by the airline Ai back end system and the airport Ai backend system, Security System of the Airport.
4. Pseudo Cell sites should be defined and structured accordingly based of the access area in the airport Terminal, G.S.M sensors connected to the Pseudo site should be installed in the designated access places inside the Airport Terminal
5. The visa should also be linked to the Mobile phone number of the person in the passport

Description of Digitally Unified Seamless Travel System (DUST)

Assuming with the All the 5 above Conditions are implemented and all the Pseudo Cell site are defined and structured, with this controlled environment we will see how this Digitally Unified Seamless Travel (DUST) system works

Step 1 Creation of Travelers Data in Passenger Operational Database

1. Purchase of the Air-Ticket by any means i.e. either by any airline or third-party website or mobile application app
2. While Purchasing the Air-Ticket its mandatory requirement of the passenger to provide the Official Mobile Number Linked to your Passport
3. Once the purchase is finalized and PNR number is issued to the passenger,
4. The Airline Ai Backend system will communicate to the Passenger operational Data base of the Departure airport of that particular passenger and creates a Data slot storing the details of the travel which will initiated by the passenger who purchased the ticket

Step 2 Seamless Operations Experience in the Airport

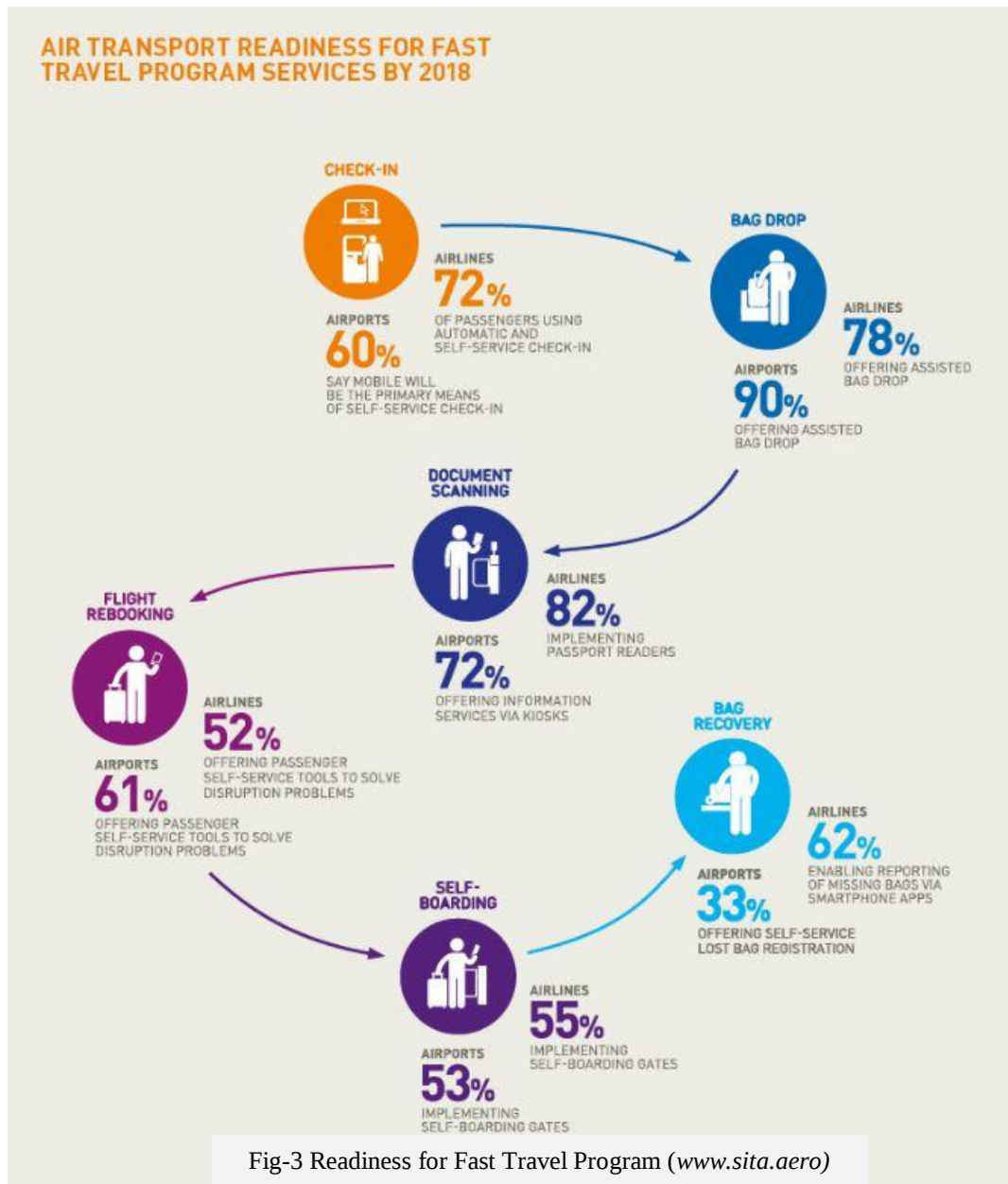
1. On the date of travel when the passenger approaches the entrance of the airport terminal the Pseudo Cell site in the Airport entrance will detect the Passenger Mobile Signals, checks the Passenger Operations Database and verify the itinerary and grant access to enter the Airport Terminal
2. When passenger pass the Entry Pseudo cell site and enter into the Check in concourse Pseudo Cell site the Passenger operational data base system will fetch the information from the Airport Ai Backend System on the Information regarding check-in counter number, aircraft departure gate information, and estimated time of departure.
3. The check in representative or A Digital Camera will verify the phone what your hold belongs to you, this is done by accessing the data stored in the Passenger operational data base. after verifying the passenger's credibility, the check baggage processes will be initiated
4. In the check in counter the check in system will access the Travel information from the passenger operational data base verify the baggage allowance and intimates your baggage tracking code and the boarding QR code will be sent to your smart phone if the passenger mobile has the smart phone. on the event of non-smart mobile phone your mobile phone number will be enabled for the boarding.
5. Once the Check-in is done and when passenger pass the Check in Pseudo Cell sites and enters in to the Immigration Pseudo cell site, the information of your travel will be given to the immigration Data base and when the passengers scans the passport his credibility is checked and verified based on visual conformation. and proceeds to the Security pseudo cell site area
6. A security scan will take pace based on the advanced Imaging technology and will be allowed to enter the Departure concourse area pseudo cell site
7. Once the passenger enters into Departure Concourse areas the Passenger operational data base will recheck with the Airport Backend system to confirm the departure gate and the estimated time of departure of the aircraft. If there is any change in these itineraries, then the Passenger operational data base will intimate the updated information to the passenger.
8. The passenger operational data base will update the particular passenger's data with their mobile numbers. upon the entry of the passenger in the departure pseudo cell site the sensor in the departure hall gate will verify the phone number and grant permission to enter the waiting area.
9. The passenger operations data base will verify the departure gate sensor and verify the arrival of all the passenger inside the waiting area before 30 mins of the boarding.

10. On the event of missing personal in the departure waiting area the passenger operational data base will scan the pseudo cell site and locate the person and remind him to proceed to the respected departure waiting area.
11. Passenger operational data base will also intimate the wandering passenger with the picture to the airport staff to locate and assist the passengers to the respected departure waiting hall
12. During the Boarding process the sensor will identify the mobile signal / or scan the QR code to access the boarding gate to enplane the aircraft.

Benefits of Digitally Unified Seamless Travel System (DUST)

This DUST system will help the passengers and the Airport operators to get travelers through the travel formalities as quickly and efficiently as possible. It removes the hassle, and therefore stress, for passengers. By cutting down the waiting time makes the passenger happier, so happy passengers are more likely to take advantage of the retail options at the airport, which is good for airport operators and their tenants. DUST System will enable the passenger's control over their airport journey and are shaping how airports will interact with them in the future, the 'connected passenger' has become a reality, with almost everyone carrying at least one personal electronic device (Mobile Phone) when flying. Passengers can receive real-time information and make it easier for passengers to move through the airport.

From an airport operation point of view this DUST system make way to receive real time information about the passenger's information from the Pseudo cell across the airport terminal and their respective operations, from baggage, passenger flow or aircraft departures helps provide a real-time overview of the airport. DUST system will improve security oversight and elevate the passenger's travel experience while speeding up passenger processing and reducing the resources needed to manage the travel journey.



Conclusion

Airports, governments and airlines are increasingly looking to create synergy between the airport stakeholders responsible for passenger facilitation through a seamless process. The number of passengers over the next 20 years is predicted to double and as such airports and airlines must prepare for this growth while attending to more demanding passengers in a competitive environment. A seamless flow, which connects the different checks a passenger takes at an airport, involves linking information via a shared or hosted platform, mobile solution or by using the information infrastructure of one of the stakeholders. The purpose is to transform the different steps into one uniform process, which makes it easy and quick to use for passengers, but with a secure identity check at the basis of it.

The use of a mobile service provider signal is possible the mobile technology revolution has made self-service options increasingly possible at every step of a passenger's journey but it's also important to remember the huge impact of existing technologies, and not to get caught up in the excitement of the new because this technologies has been a round in airports for several years but hasn't yet reached full maturity so with the present advancement and the

technical maturity we can use our technology to provide the seamless travel . In 2016 ADB SAFEGATE conducted the passenger survey and the survey showed that people prefer technology to people. Nearly everyone 91 per cent who use self-service check-in will use it again and again. The same applies across the entire journey through the airport: people will use self-service if it's available. Evidence from mature markets indicates that self-service is fast becoming the process of choice for passengers in many of the steps in the overall passenger process.

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