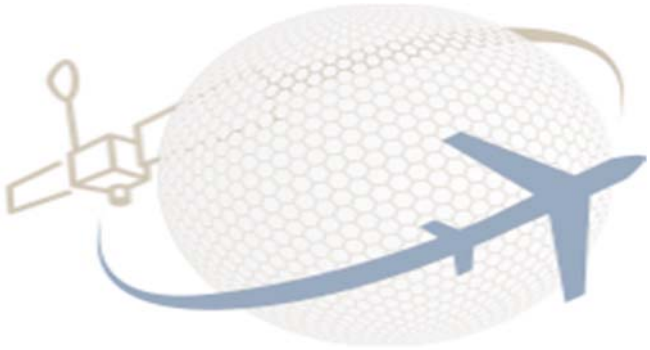
Air Transportation in 2030-50 and Data Analytics in Aviation

Asst. Prof. Nazim Kemal Ure*, Asst. Prof. Emre Koyuncu*

Prof. Gokhan Inalhan* and Cengiz Pasaoglu**

*Istanbul Technical University, Department of Aeronautical Engineering and Air Transportation Management

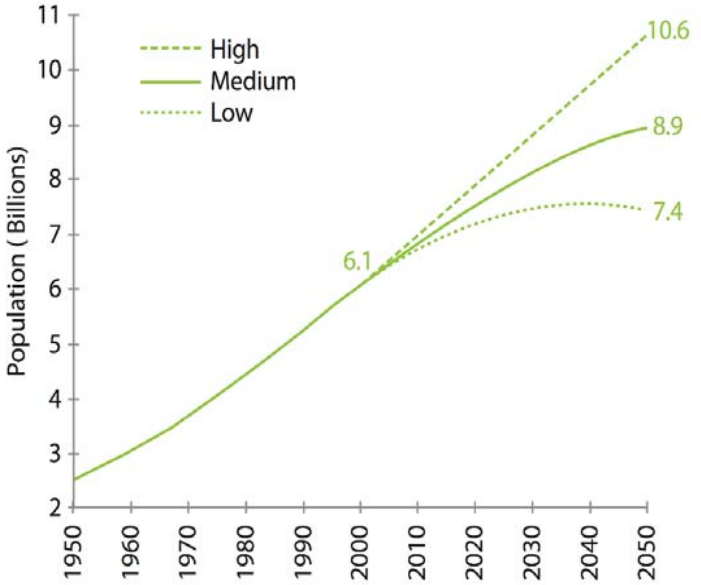
**DHMI, State Airports Authority and ANSP of Turkey



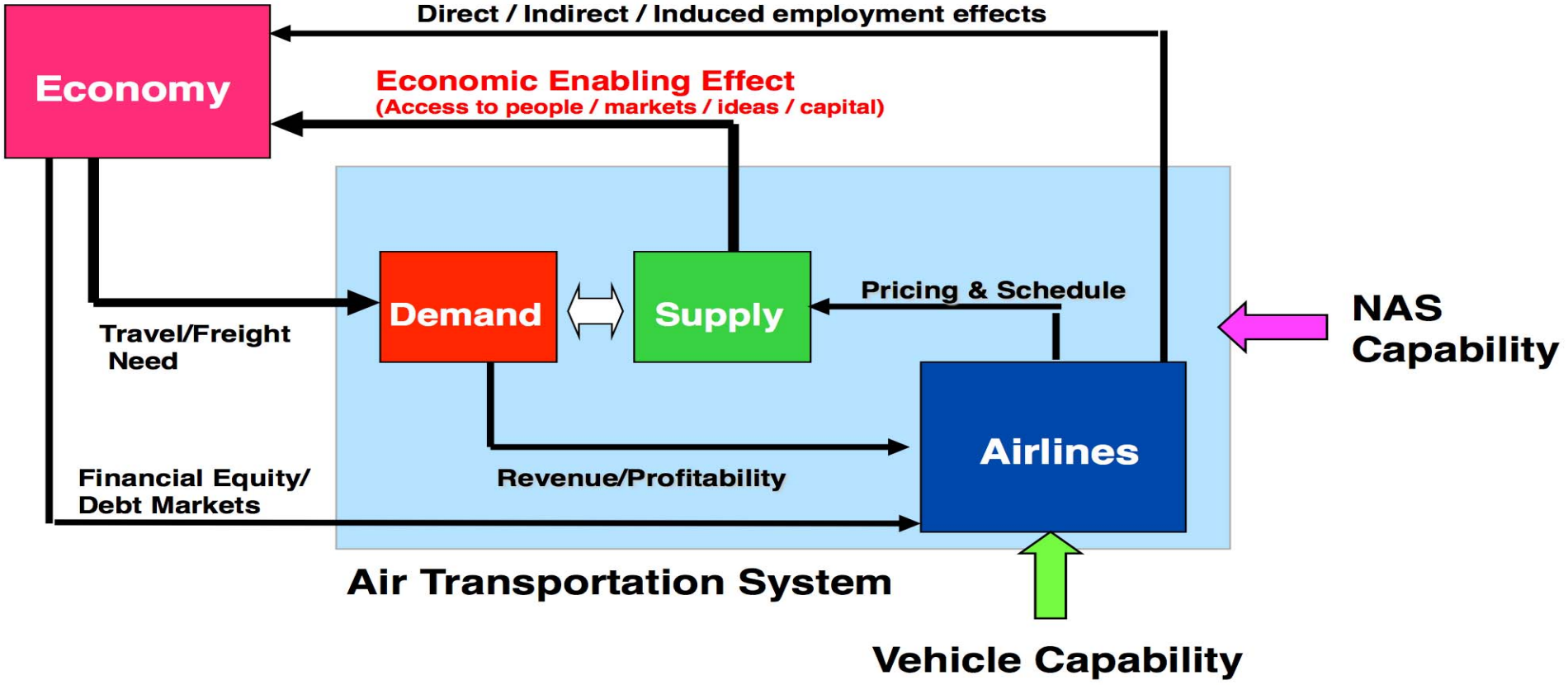
AIR TRANSPORTATION IN 2050

World in 2050 - Demography

Rank	*1950*		*2000*		*2050*	
1	China	554.8	China	1 275.2	India	1 531.4
2	India	357.6	India	1 016.9	China	1 395.2
3	U.S.A.	157.8	U.S.A.	285.0	U.S.A.	408.7
4	Russian Federation	102.7	Indonesia	211.6	Pakistan	348.7
5	Japan	83.6	Brazil	171.8	Indonesia	293.8
6	Indonesia	79.5	Russian Federation	145.6	Nigeria	258.5
7	Germany	68.4	Pakistan	142.7	Bangladesh	254.6
8	Brazil	54.0	Bangladesh	138.0	Brazil	233.1
9	United Kingdom	49.8	Japan	127.0	Ethiopia	171.0
10	Italy	47.1	Nigeria	114.7	Congo, DR	151.6

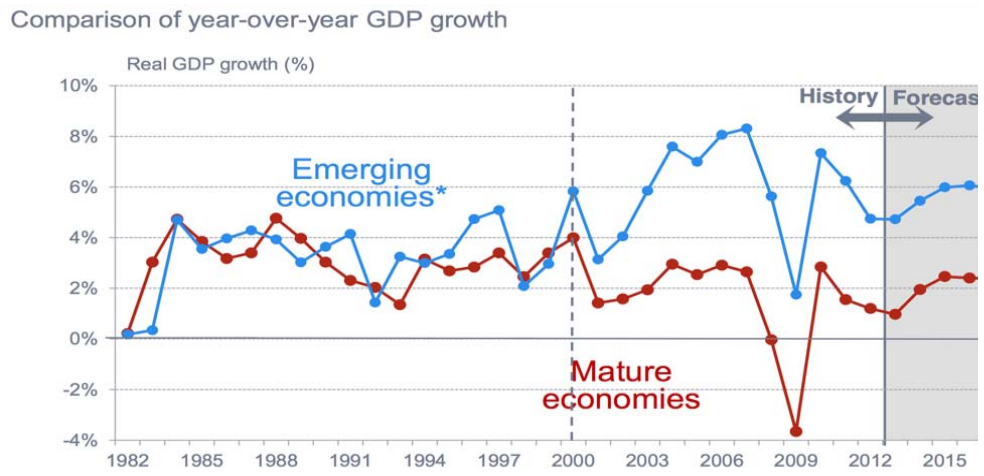


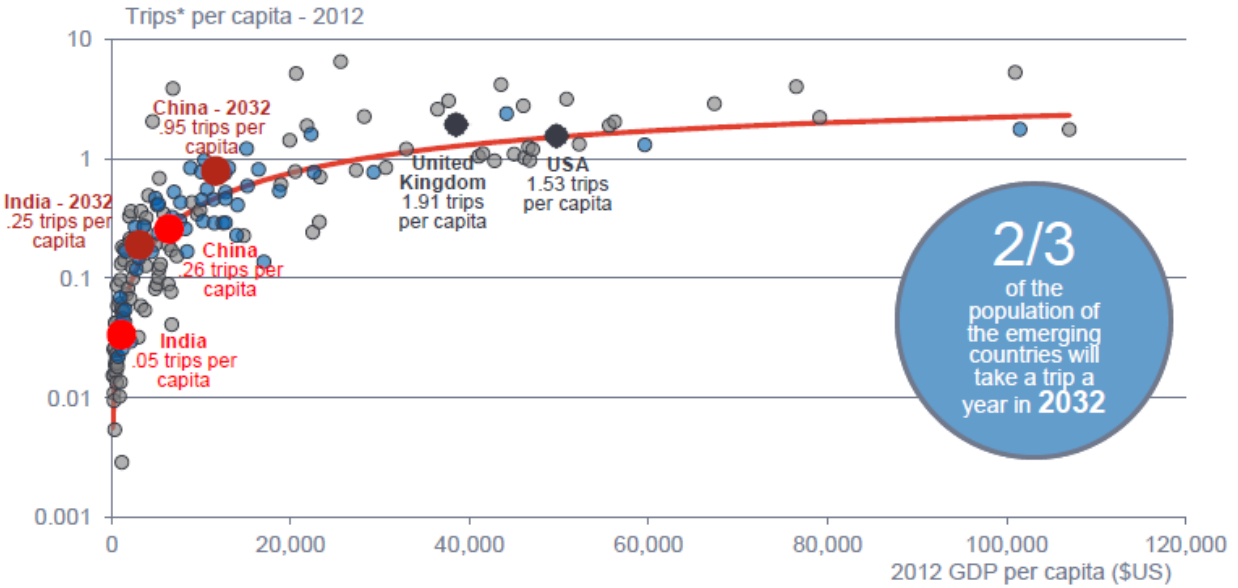
World population forecast [UNO4]



Relationship between the Economy and Air Transportation [Hansman14]

World in 2050 - Economy

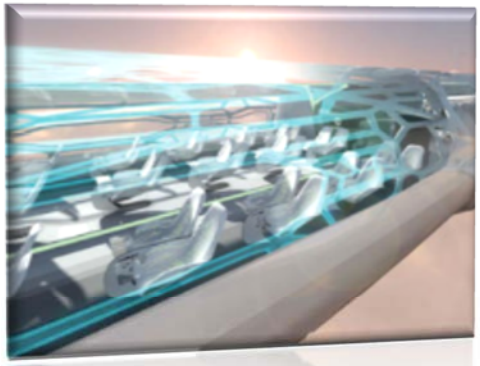




Comparison of year-over-year GDP growth (left), Trips over GDP per capita (right) [Airbus13]

World in 2050 – Enabling Technologies

- ATM/Aircraft Manufacturers
  - 3D/4D Printing
  - New materials
    - Ultra light metal alloys
    - Repairable composites
    - Hybrid & smart materials
  - New Engine Technologies
    - Quiet engines
    - Ultra high bypass ration turboprops
    - Open rotor engines, scramjets
  - New wing designs, longer and thinner structures
  - New inner designs
    - Bionic structures, self-cleaning spaces
    - Energy harvesting adaptable seats
  - Hybrid rocket technology
  - All electrical aircraft



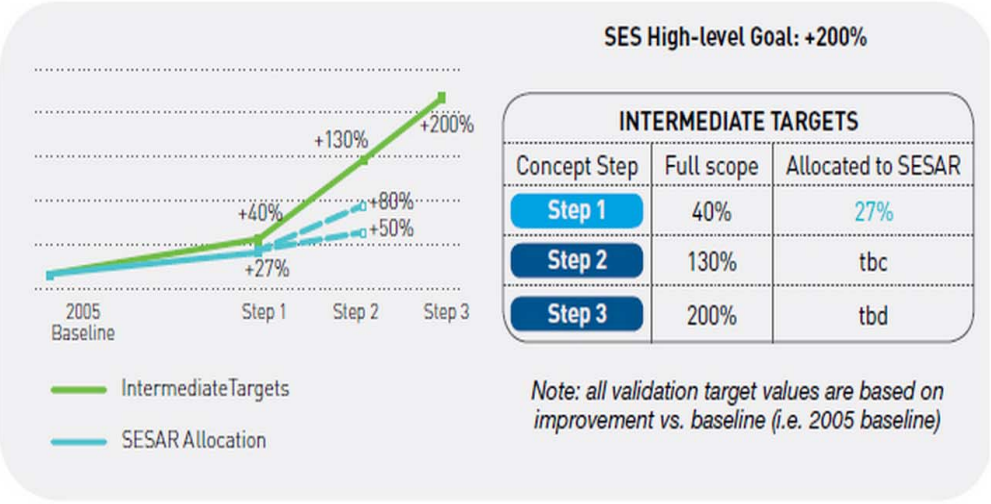
World in 2050 – Enabling Technologies

- Airlines / Aircrafts / Aircraft Manufacturers
  - Advanced guidance, navigation, control & communication
    - Air Traffic Service Unit (ATSU)
    - VHF data radio (VDR3)
    - Data link control and display units (DCDUs)
    - Controller – pilot data link communications (CPDLC)
  - Eco-climb
  - Express skyways
  - Free glide approaches and landing
  - Autonomous ground operations
  - **Data Analytics** for
    - Targeted Advertisement
    - Maintenance Optimization
    - Delay Estimation and Flight Planning

World in 2050 – Enabling Technologies

- Society
  - –Advanced virtual and augmented reality
    - •Real time sensitive feedback
  - –Internet of things
    - •Network of everyday smart devices
  - –Quantum computing
    - •Ultra efficient computing paradigm
  - –New energy sources

- Air Navigation Service Providers
  - –Favor functionality over supremacy by 2050, deal with political barriers
  - –Create new job areas
  - –EUROCONTROL vision:
    - Delays will be mitigated by highly efficient night operations
    - SESAR will be implemented by 2050
    - Airspace capacity will increase by 80% to 200% by 2050 [EU11]
  - –FAA vision [JPDO10] :
    - Collaborative capacity management
    - Collaborative flow contingency managemer
    - Efficient trajectory management
    - Flexible separation management



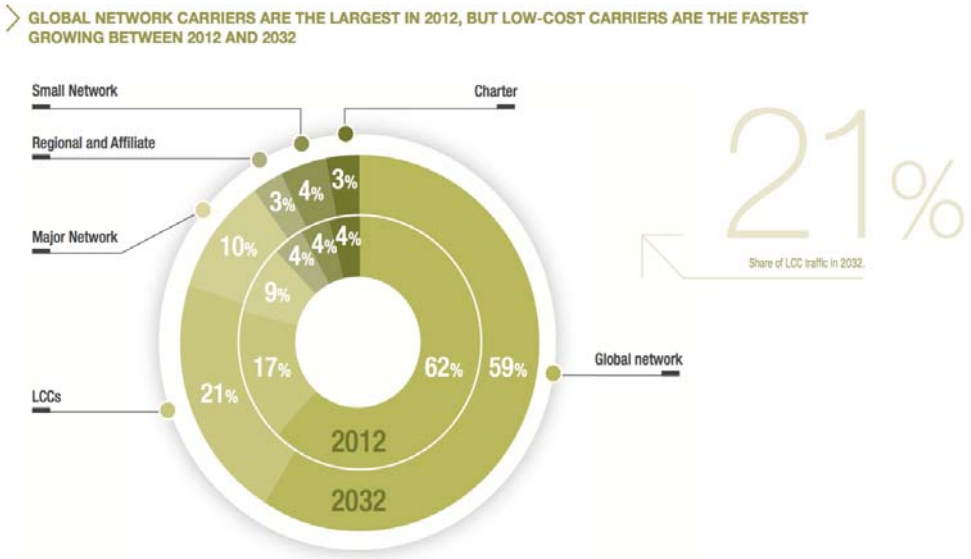
- Airlines
  - New airlines by 2050 with a higher percentage of them being low-cost carriers
  - Mitigating delays will help airlines to save billions of dollars

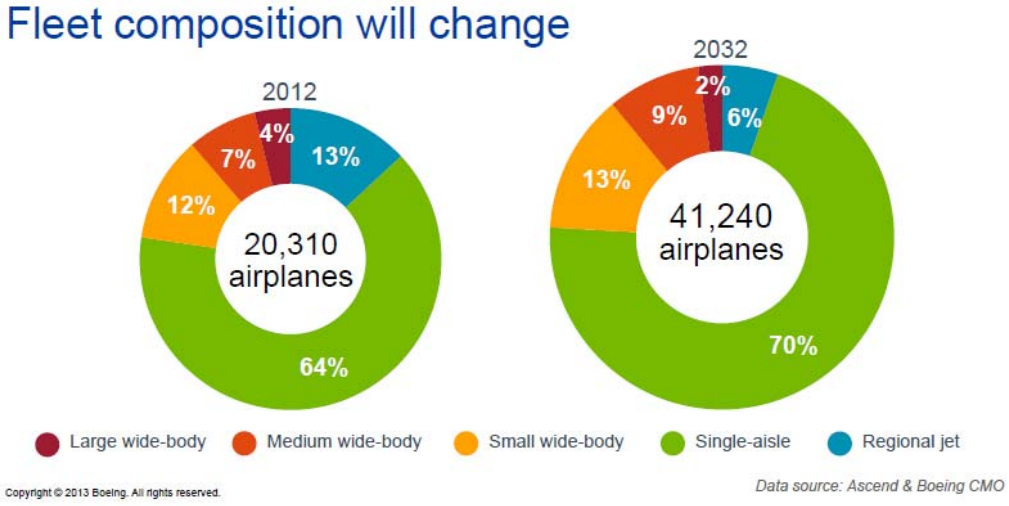
- Airports
  - In 2050, traditional hub airports expected to have high utilization rates
  - Airline owned hubs for creating a more integrated infrastructure
  - Airports can unbundle the prices for airlines for increasing the interoperability [IATA11]
  - Vertiports, helioports, high-speed trains, regional short-distance flights to interconnect with other means of transportation
  - More passenger oriented
  - Utilizing smart and renewable power
  - Increased security with enhanced equipment and infrastructure

- Aircraft and ATM Equipment Manufacturers / Suppliers
  - New engine Technologies
  - Advanced robotics, unmanned workspaces, flexible automation
  - Instantaneously switch between components, totally reconfigurable factory.
  - Advanced manufacturing equipment, smart materials

- Society
  - Equity of access, safe and seamless flights
  - Reduced environmental impact on society
  - Passengers will be able to pick the optimum way of transportation by easily providing their requirements and constraints

Air Transportation in 2030s

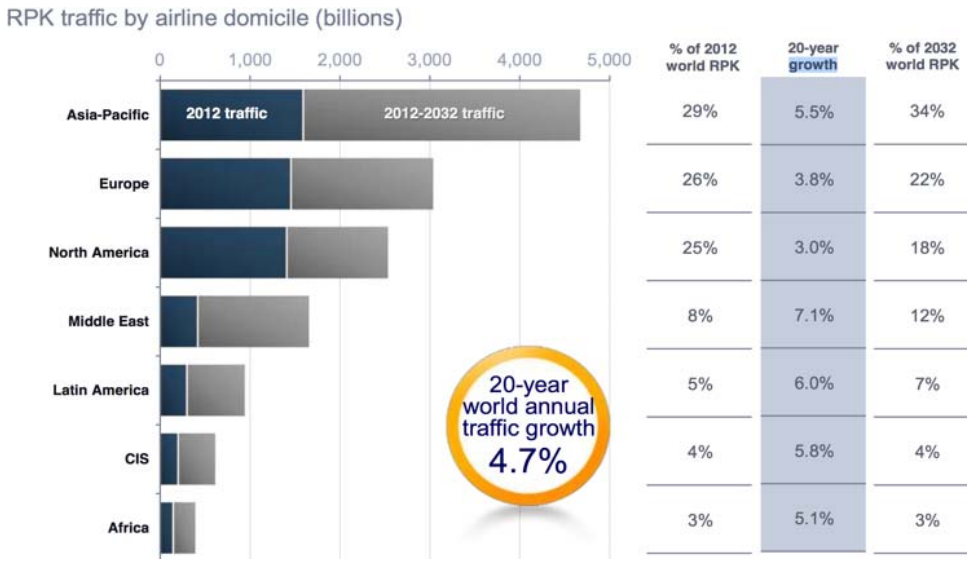


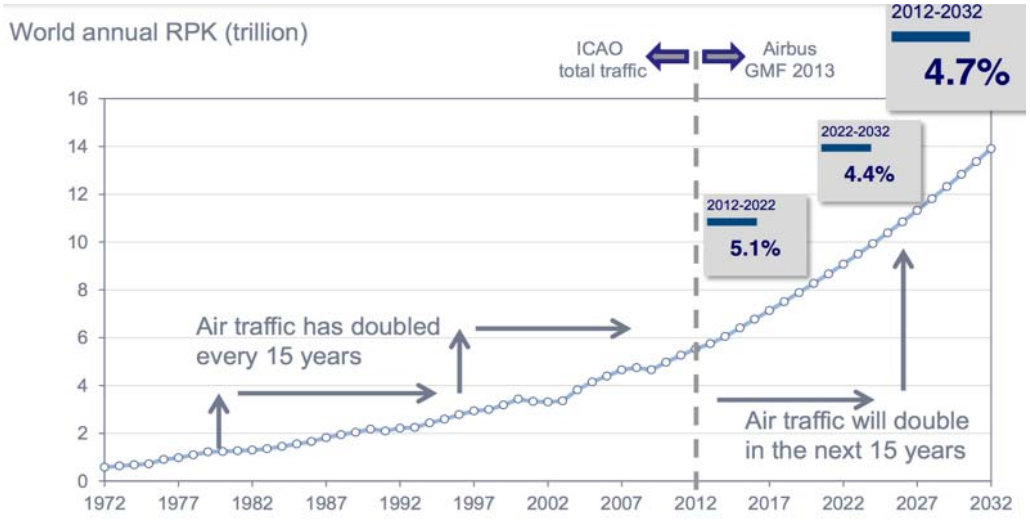


Market shares of carriers (left) [Airbus13], Fleet composition change (right) [Boeing13]

Air Transportation in 2030s

- Main drivers of traffic and fleet growth toward 2030



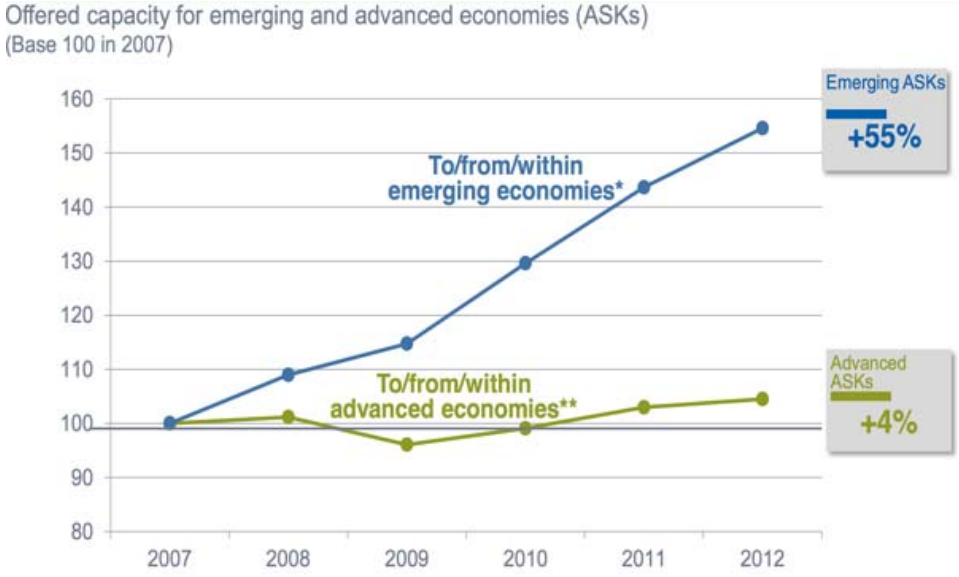


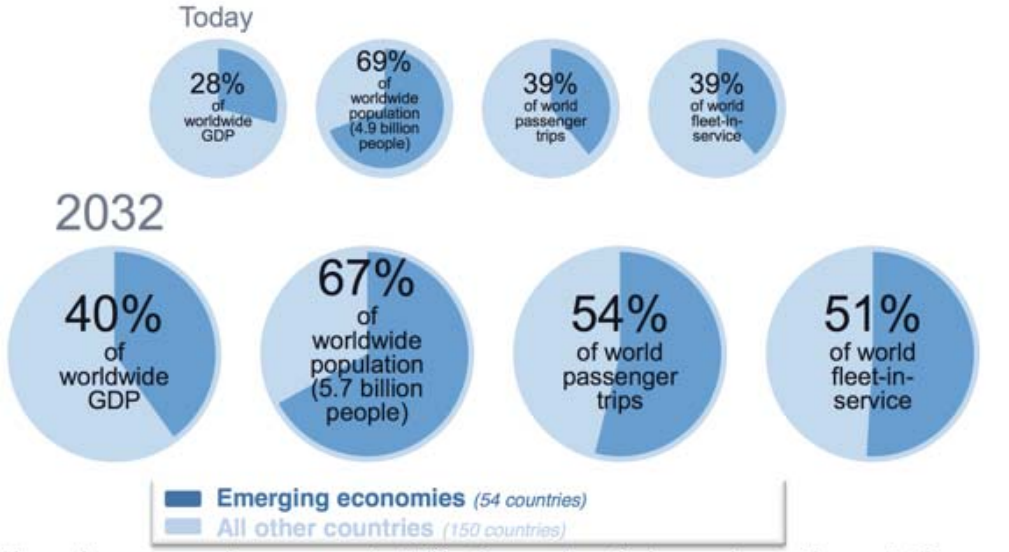
RPK traffic by airline domicile (left), World annual RPK in the next 15 years (right) [Airbus13]

Air Transportation in 2030s

- Emerging economies and the impact on air transportation growth up to the 2030s

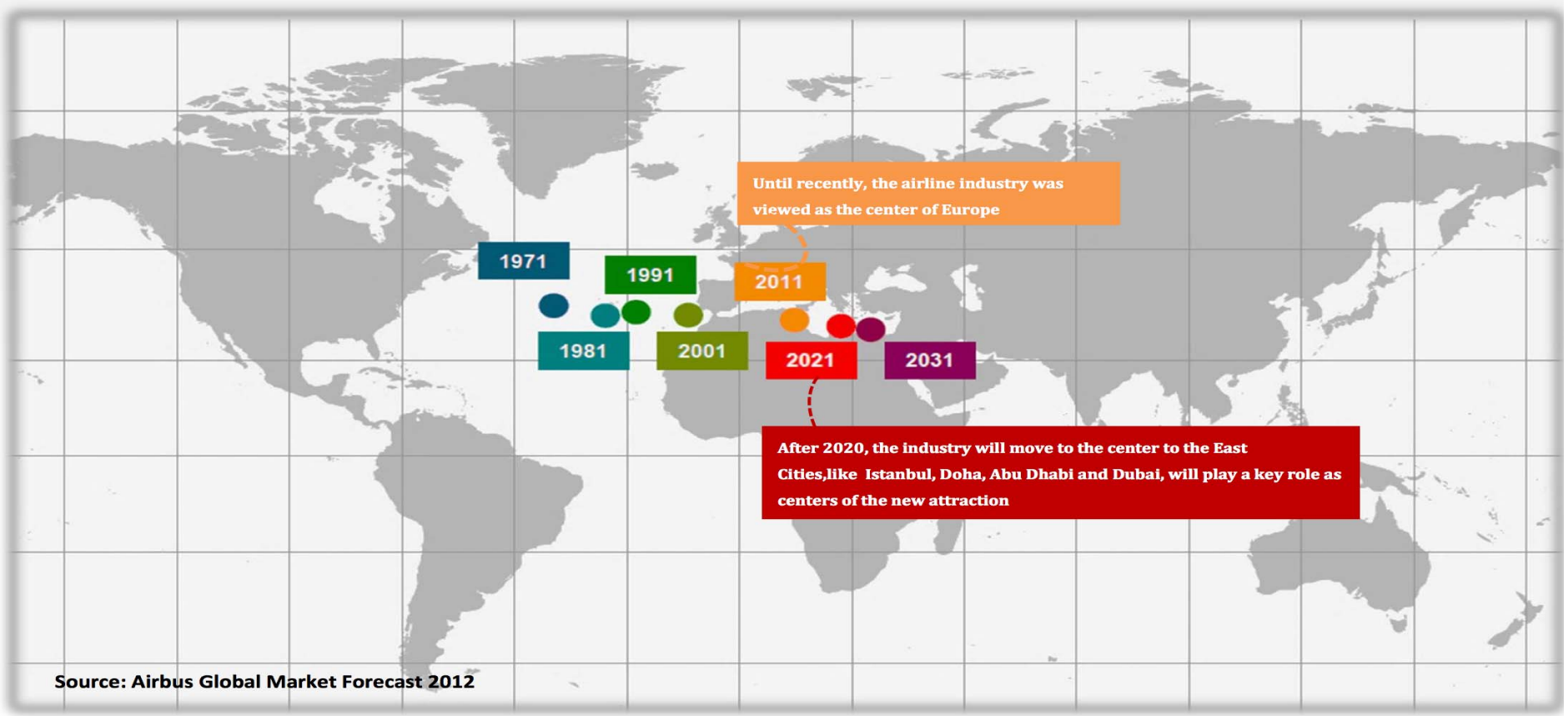
"..., we must embrace the reality of an industry whose center of gravity is shifting away from our traditional leaders in the US and Europe. Asia-Pacific is already our biggest market. The continued development of China and India will keep this region at the industry's forefront. We must engage the region to deliver leadership for change." [IATA11]





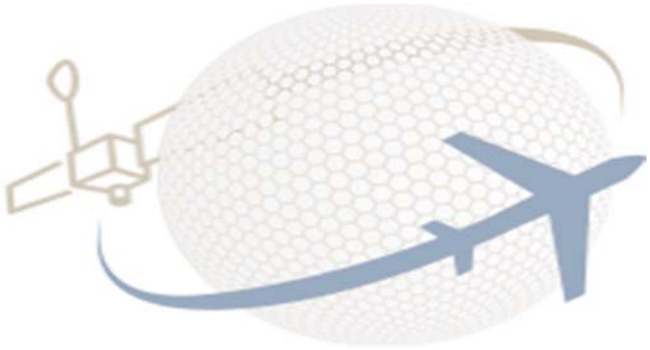
Emerging economies represents 50% of new aircraft demand over the next 20 years

Air Transportation in 2030s



Geographic centre of gravity of departing/arriving/connecting passengers per city

Traffic as month of September; estimates for historic passenger derived from offered seats; respective centres of gravity as median of city coordinates weighted by passenger traffic



DATA ANALYTICS IN AVIATION

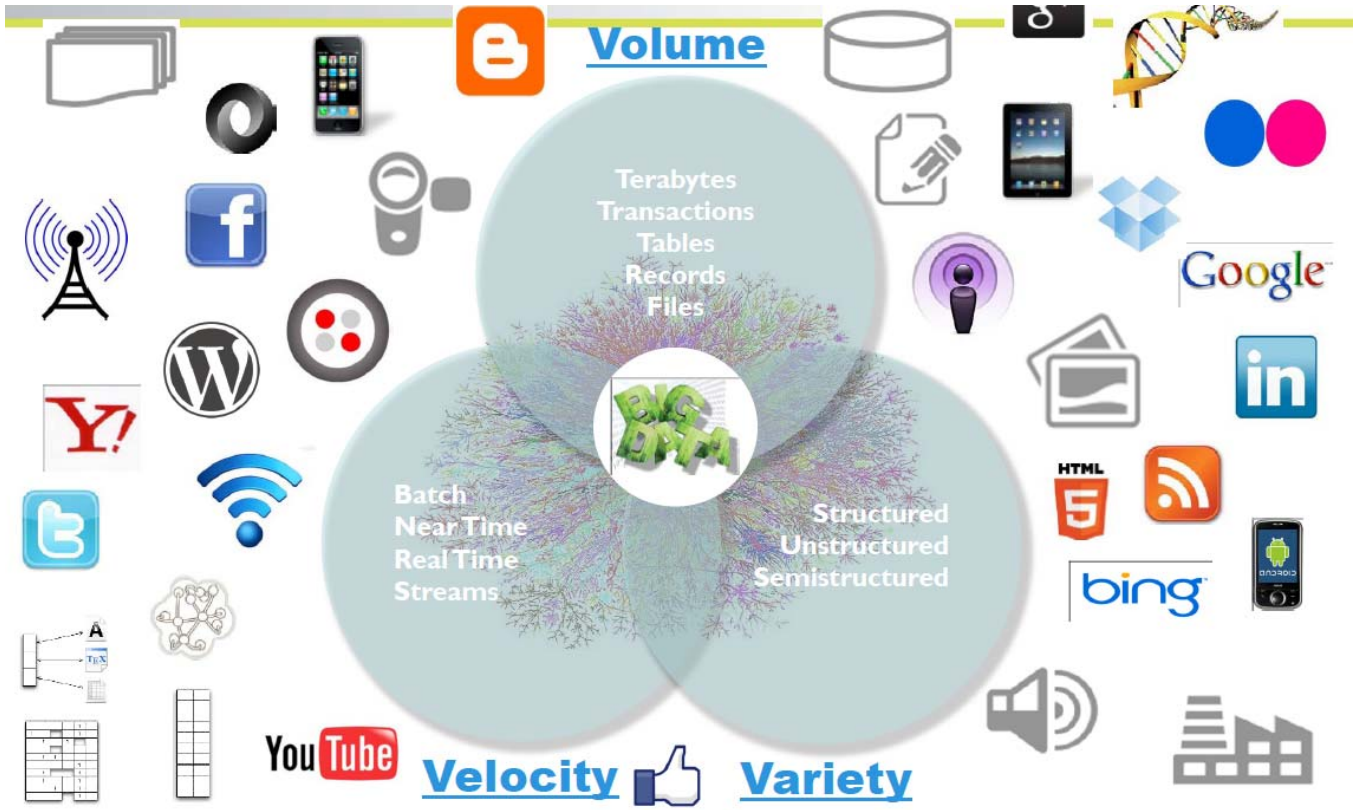
- Analytics improved massively in recent years
  - –Advances in operations research, computer science and statistics
  - –Sustained improvements in computation power
  - –Huge amounts of data
  - –Success stories

DATA

Data Scientist: The Sexiest Job of the 21st Century

by Thomas H. Davenport and D.J. Patil

Features of Big Data



Source: SNIA 2012

Big Data Applications

Retail

- CRM – Customer Scoring
- Store Siting and Layout
- Fraud Detection / Prevention
- Supply Chain Optimization

Advertising & Public Relations

- Demand Signaling
- Ad Targeting
- Sentiment Analysis
- Customer Acquisition

Financial Services

- Algorithmic Trading
- Risk Analysis
- Fraud Detection
- Portfolio Analysis

Media & Telecommunications

- Network Optimization
- Customer Scoring
- Churn Prevention
- Fraud Prevention

Manufacturing

- Product Research
- Engineering Analytics
- Process & Quality Analysis
- Distribution Optimization

Energy

- Smart Grid
- Exploration

Government

- Market Governance
- Counter-Terrorism
- Econometrics
- Health Informatics

Healthcare & Life Sciences

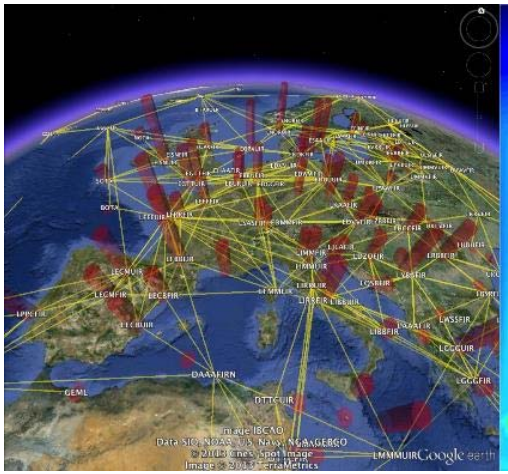
- Pharmaco-Genomics
- Bio-Informatics
- Pharmaceutical Research
- Clinical Outcomes Research

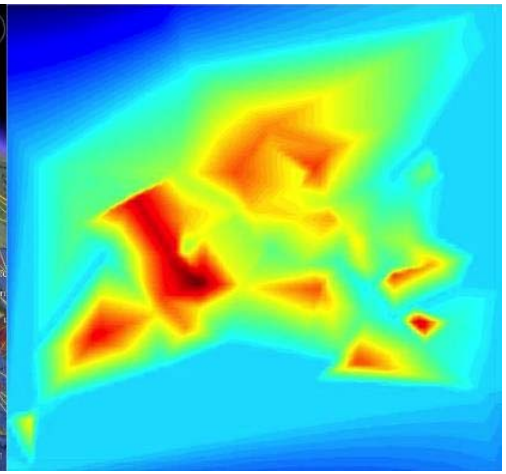
Data Resources in Aviation

- Flight Data
  - –Flight Plans
  - –Airport Capacity Declaration
  - –Radar Data
- Aircraft Data
  - –QAR Data
  - –Aircraft Health Data
  - –Maintenance Reports
- Customer Data
  - –Surveys
  - –Transactions
  - –Ticket Prices
  - –Social Media

Data Driven Applications in Aviation

- Trajectory Optimization
- Predictive Maintenance
- Delay Estimation
- Targeted Advertising
- Crew Performance Assessment
- Sentiment Analysis
- Prediction of Customer Behavior
- …. And many more!





Richard Quest @richardquest · 10h

So @SouthwestAir charges $8 for Internet in the air @HiltonHotels charges $14.95 on ground. I realise they don't care I am complaining

46 60


THANK YOU!

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