Towards Airport 4.0: Airport Digital Maturity and Transformation

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Research project funded by the Research Council of Norway Transport 2025 Programme

A partnership between Kristiania University College, Cranfield University, Molde University College and Avinor

Introduction

Digital capabilities and passenger benefits of a seamless and resilient Norwegian airport system

Aim

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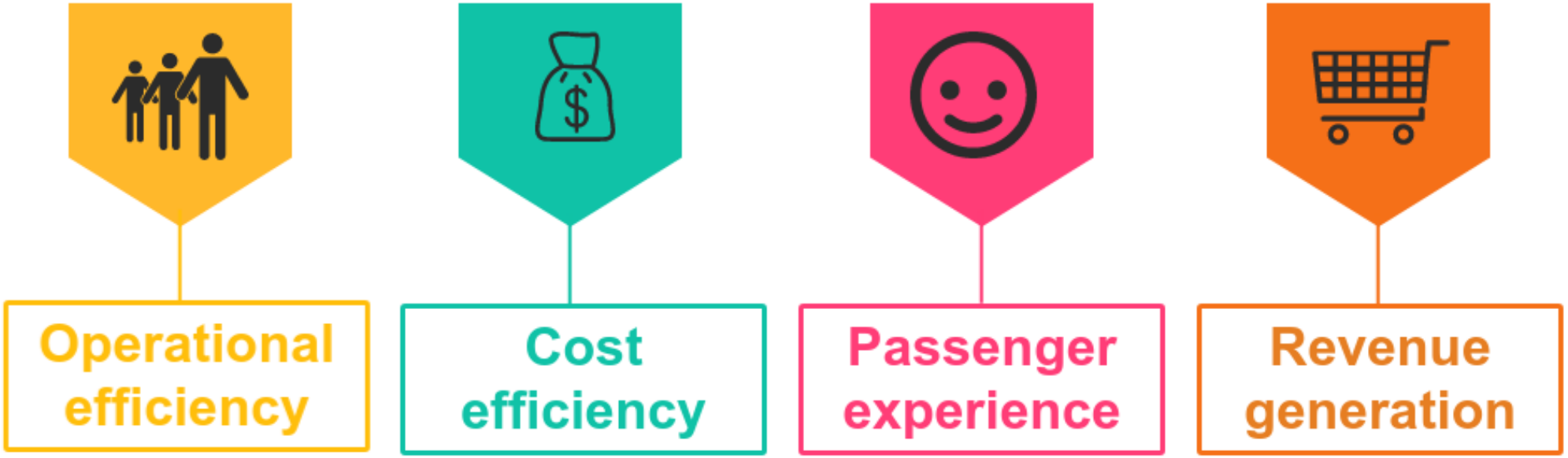
"To develop a conceptual framework for research on airport digital maturity and transformation"

Main benefits of investing in technology at airports



Main challenges of investing in technology at airports

Cost

- Initial & running costs
- New versions & updates
- Quantifying benefits & ROI

Capabilities

- Technical support & staff training
- Fit existing infrastructure & services

Uncertainty

- Tech lifespan
- Potential tech or supplier lock-in
- Buy-in from management, partners and stakeholders

Vulnerability

- Cybersecurity
- Privacy and other social and ethical considerations

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Expenditure on technology at airports in 2017

US$8.6 billion

(up from US$7.0 billion in 2016)

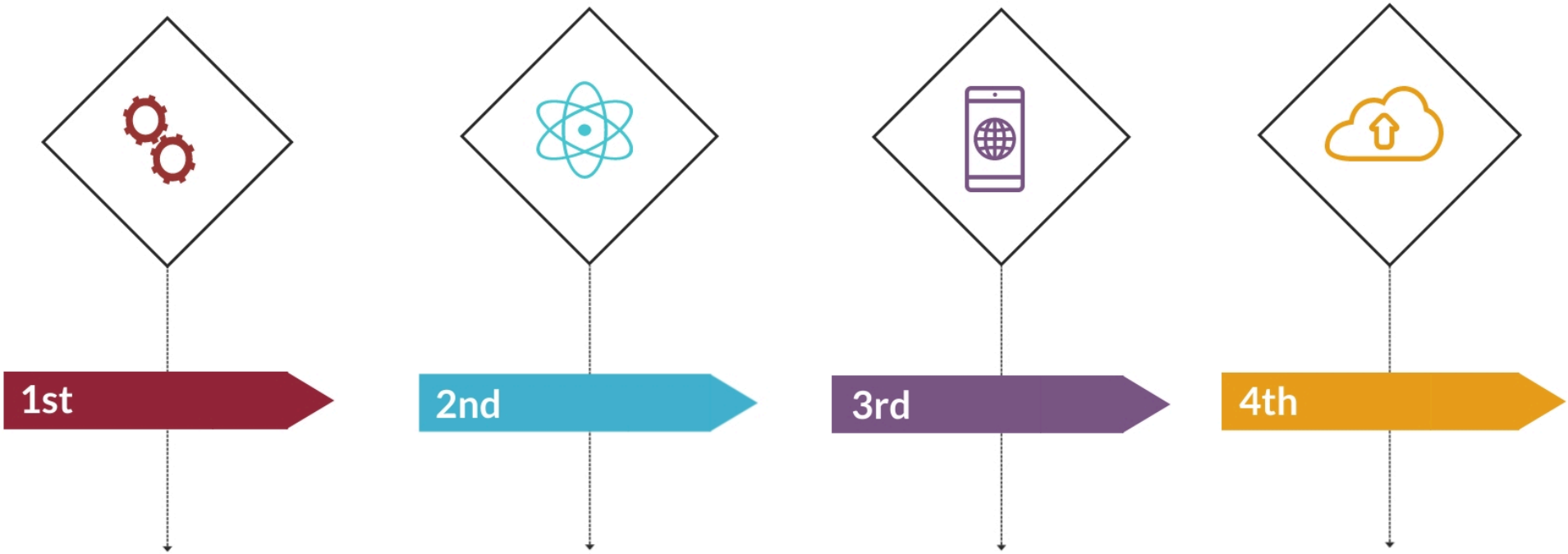
As a proportion of total revenue

5.7%

(up from 2.7% in 2016)

SITA (2010). *The Airport IT Trends Survey*, FlightGlobal, Sutton.
SITA (2018). *2018 Air Transport IT Insights*, SITA, Geneva.

The Industrial Revolutions



Age of mechanical production

1780s

Advancements in the use of water and steam power and mechanical production equipment

Age of science and mass production

1870s

Advancements with electricity and mass production

Digital revolution

1970s

Advancements with electronics, information technology and automation

Age of cyber physical systems

2000s

Advancements with autonomous decision making of cyber physical systems using machine learning through cloud technology

The Four Stages of Airport Digital Maturity

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Analogue processes

Traditional approaches for virtually all key processes, with the vast majority of tasks undertaken manually by staff with or without the help of computers. There are long lag times between the capture and use of any electronic data

Digitisation

While some processes are conducted manually by staff, there is also some use of automated and/or digital technologies within the airport

Digitalisation

Automated and/or digital technologies are used extensively for the majority of airport processes, and to add value to airport functions over and above basic operational requirements

Digital Transformation

Value is created from data that is captured and shared with a range of stakeholders, and used in real-time via smart data capabilities. Airport systems and processes are integrated within the wider digital ecosystem that connects all stakeholders

Technology architecture

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- Technology alone cannot create significant value; this happens when there is an overall cohesive architecture
- The Internet of Things (IoT) is regarded as the technology architecture for a digital future across different industries
- IoT: «The interconnection via the Internet of computing devices embedded in everyday objects, enabling them to send and receive data.»
- Synonymous with the ‘Smart Airport’ concept

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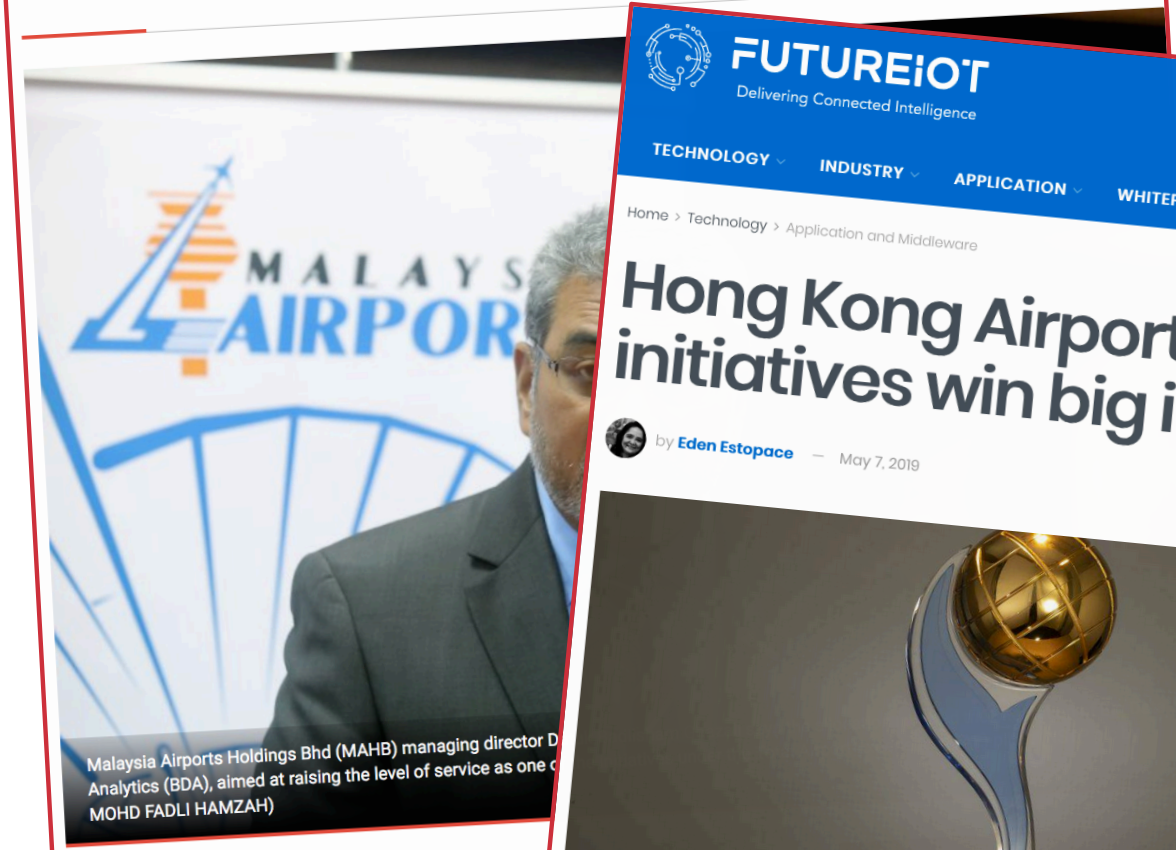
MAHB allocates RM30m for Airports 4.0 initiative



Malaysia Airports Holdings Bhd (MAHB) managing director D
Analytics (BDA), aimed at raising the level of service as one
MOHD FADLI HAMZAH)

By Nasuha Badrul Huzaini - June 4, 2018 @ 8:25pm

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Hong Kong Airport's IoT, smart airport initiatives win big in ICT Awards 2019

by Eden Estopace — May 7, 2019

HKIA's IoT-Augmented Airfield Service System received The Smart Mobility Grand Award. PHOTO from HKIA

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How IT helps Changi Airport to be smart, sweet and swift

Technology is a key enabler for many of the productivity improvements that the airport has undertaken to stay efficient.

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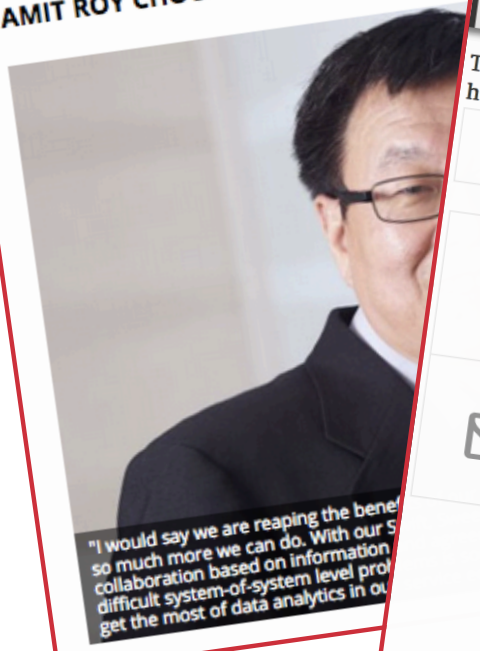

"I would say we are reaping the bene
so much more we can do. With our S
collaboration based on information
difficult system-of-system level pro
get the most of data analytics in ou

Ahval

Tiny Url
http://tinyurl.com/y6xktobf

May 13 2019

English Türkçe العربية

Istanbul Airport adopts technology to try to dominate industry - Forbes

Turkey's new Istanbul Airport, one of the first truly smart airports in the world, is preparing to dominate the $35 billion industry by using the most cutting-edge technology available, Forbes magazine said.

Turkey is betting on return to its total projected cost of $12 billion dollars investment by handling 200 million passengers a year at the airport once fully completed, the article said.

The first phase of the 29.5 square-mile airport, the flagship project of Turkey's ruling Justice and Development Party (AKP), opened following numerous delays in October of last year. The project will be completed in four phases by 2027.

"Smart technology will dramatically change the way we run airports and fly. Istanbul Airport is equipped with cutting-edge technology that accelerates all processes at the airport and facilities travelling for its passengers," Turkish Airlines New York General Manager Cenk Öcal told the U.S. magazine.

‘Smart Airport’

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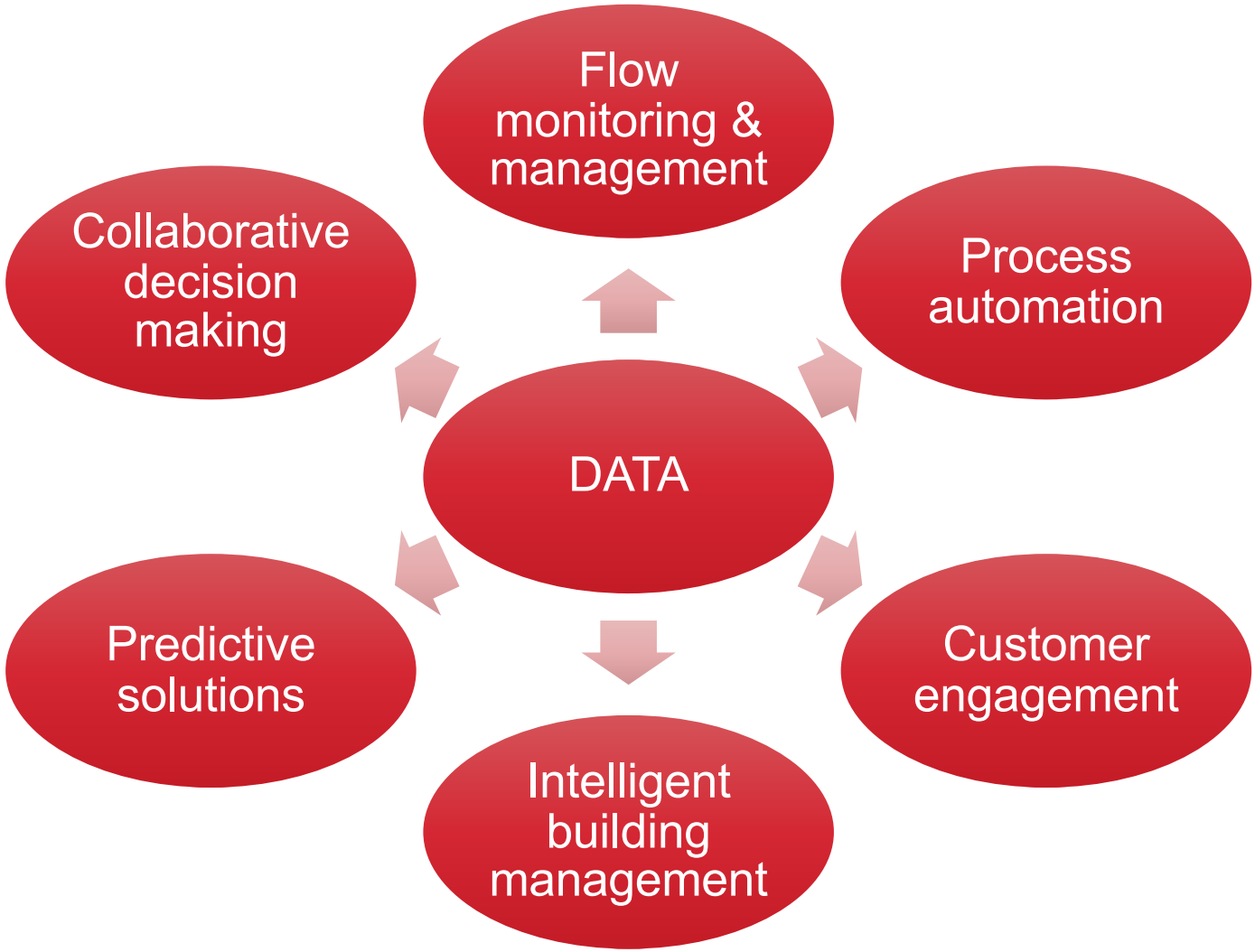
- Physical objects - digitally enabled
  - Passengers, baggage, cargo, aircraft, staff, equipment, etc
- Touch points or moments - digitally enabled
  - e.g. digital channels, access, check-in, security, commercial, information & wayfinding, passport control, departure, arrival
- Instrumentation - sensors or ‘smart’ components

e.g. sensors that gather data and allow for connectivity and interaction (via a network)

Category	Examples
Proximity	Parking space sensors, radio-frequency identification (RFID) smart baggage tracking, asset or workforce tracking, passenger tracking via beacons, Bluetooth, near field communications (NFC) or wifi
Pressure	Sensors for smart energy monitoring, building maintenance, waste management
Optical	Cameras or other sensors for biometrics, security screening, flow or throughput management, or monitoring equipment such as kiosks and bag drop stations
Motion	Access control sensors for intrusion detection, video surveillance, automatic doors or barriers

Data can be communicated across the network to aid decision making for a range of solution clusters



Data is at the heart of digital transformation
Also the greatest challenge given the siloed nature of airport processes!

Stakeholder data exchange matrix

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Stakeholder	Challenges	Required data	Shared data
Airport	• Keep SLAs • Increase non-aeronautical revenue • Improve operational workflow	• Passenger information	• Location of passenger in the terminal • Terminal situation and environment • Retail offers
Airline	• Meet target off-block time	• Location of passenger in the terminal	• Passenger information
Passenger	• Improve travel experience • Find best deals in retail	• Travel updates • Live information at the airport • Guidance • Retail vouchers	• Passenger information • Current status and location of passenger
Border control	• Keep SLAs • Reduce operational costs	• Current and expected passenger flow information	• Resource allocation
Security	• Keep SLAs • Reduce operational costs	• Current and expected passenger flow information	• Resource allocation
Ground handling	• Keep SLAs • Reduce operational costs	• Baggage information	• Current status and location of baggage

Adapted from ACI Europe (2018). Guidelines for Passenger Services at European Airports: The Passenger at the Heart of the Airport Business, ACI Europe, Brussels.

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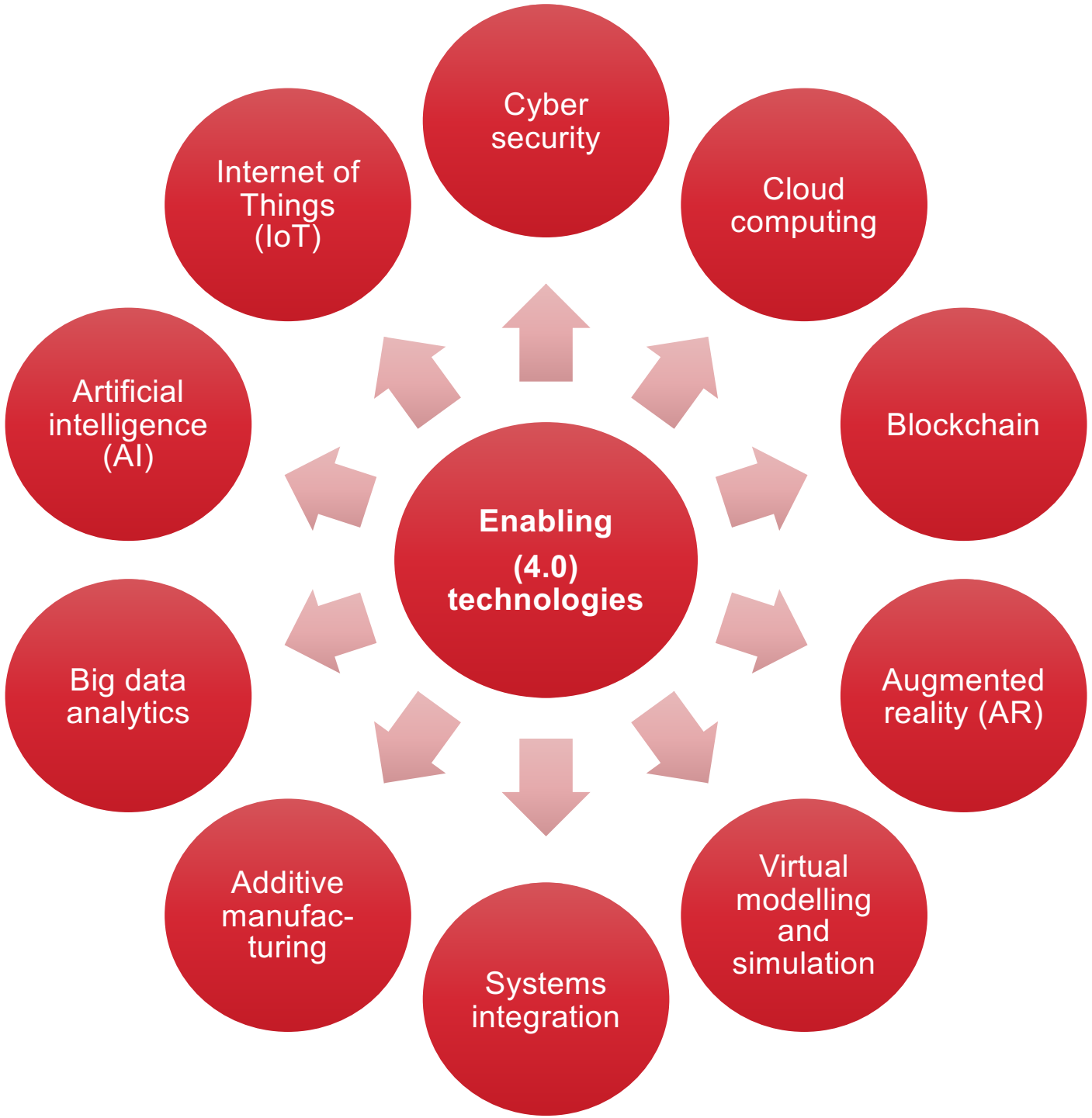

Seamless, customised and personalised

Passenger Journey

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Surface access

Intermodal eTicket for public transport. Autopay car parking (and guided to the nearest available space)

Check-in

Pre-register biometric and travel details for a walk through experience. Digitally tag and track any baggage from your mobile

Security

Biometric recognition and the use of infra-red cameras and other technologies for a walk-though experience (without removing items)

Info. & wayfinding

Artificial intelligence, augmented and virtual reality experiences, and personalised notifications (e.g. on flight status)

Commercial

Mobile or biometric payment options, personalised and context aware offers to your mobile (e.g. based on location or preferences), 3D printed food and goods

Departure gate

Biometric walk through experience

Passport control

Biometric walk through experience

Arrival

Personalised notifications for transfer or arrivals (e.g. directions, gate, public transport information, baggage status and reclaim, context aware retail offerings)

Destination

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“Digital transformation is not just about implementing more and better technologies. It involves aligning culture, people, structure and tasks”

Kane, G. C., Palmer, D., Phillips, A. N., Kiron, D. and Buckley, N. (2016). Aligning the organisation for its digital future. MIT Sloan Management Review, 26 July.

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“

Digital Transformation is an important trend influencing the airport business. It is not just about the deployment of new technologies, instead, it is about transforming the business of airports, adapting to customers, staff, community and cultures and leveraging existing and new technologies to meet objectives and goals. Digital transformation is becoming a core capability and a necessity to meet the capacity demands of the future.

ACI (2017). *Airport Digital Transformation – Best Practice*. ACI, Montreal.

Digital strategy
Leadership support and engagement
Support from stakeholders
Business cases

Build support
Form relationships
Learn through collaboration
Channel ideas or requests

Knowledge
Skills and resources
Talent
Solutions that build trust

Digital mindset
Dynamic decision-making
Holistic approach
Innovation governance

Attitude to adoption

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Strategy	Description
Laggards	We are normally amongst the last few airports to use new digital technologies
Late majority	We tend to use new digital technologies when they are used by most airports
Early majority	We tend to use new digital technologies when they are used by some airports
Early adopters	We embrace new digital technologies, and are usually amongst the first few airports to use them
Innovators	We actively seek out new digital technologies and are happy to experiment with them, even when they have not been trialed much in an airport setting before

Based on Diffussion of Innovations theory by Rogers (2003 - 1st edition in 1962)

Rogers, E. M. (2003). Diffusion of Innovations, 5th ed., Free Press, New York


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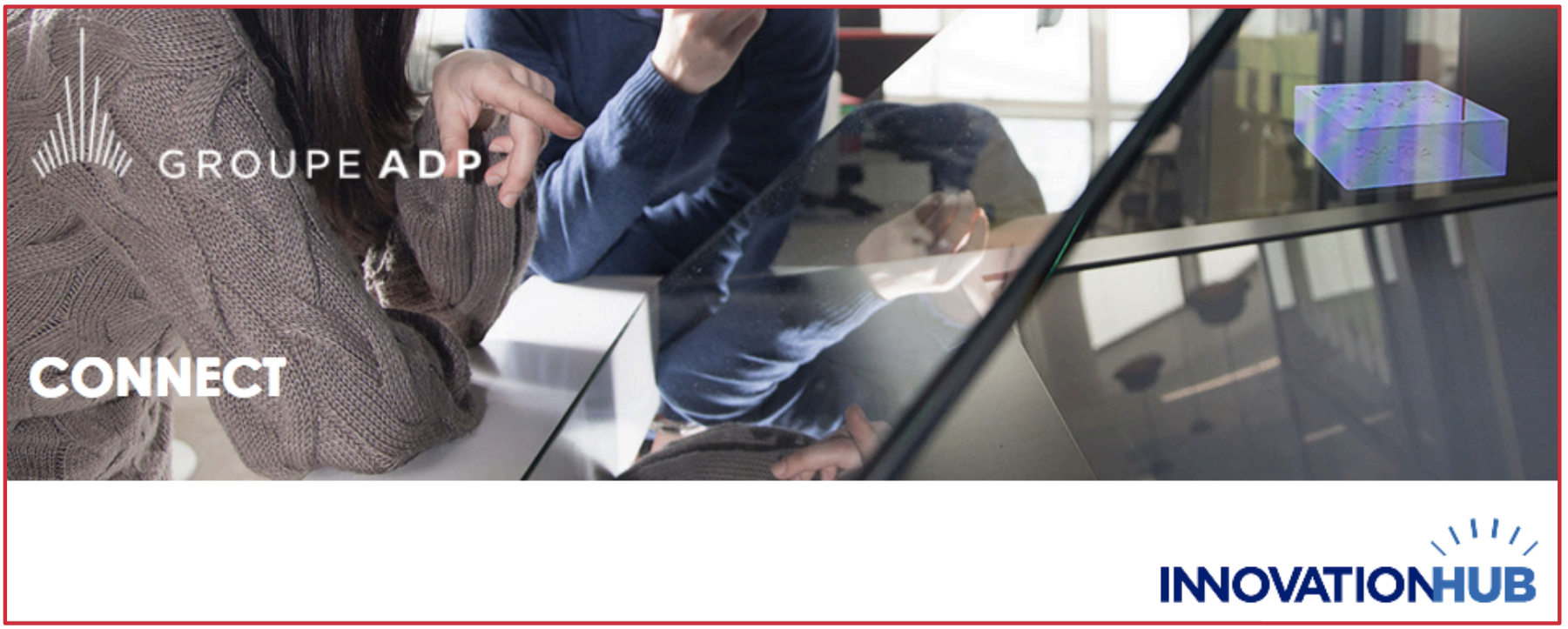
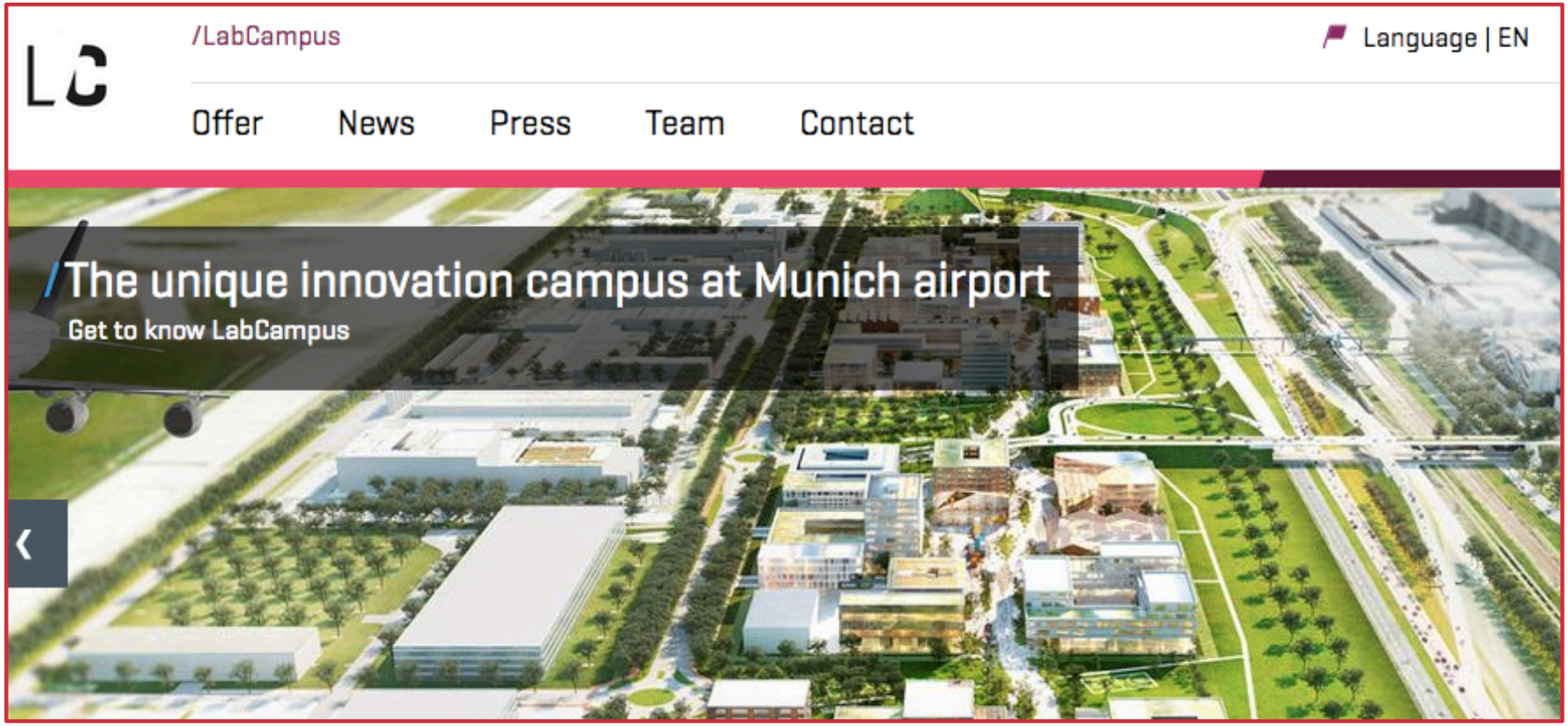

GROUPE ADP
CONNECT
INNOVATIONHUB

WHAT IS THE LIVING LAB PROGRAMME?

The Living Lab Programme is a platform for Changi Airport Group to collaborate with innovation-driven companies and start-ups, to develop and demonstrate new technology solutions in a live airport environment.



Airport Digital Transformation Model
ADTM

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Value is created from data that is captured and shared with a range of stakeholders, and used in real-time via smart data capabilities. Airport systems and processes are integrated within the wider digital ecosystem that connects all stakeholders

Organisational readiness
Clarity | Collaboration | Capability | Culture

Benefits

Physical objects digitally enabled
e.g. passengers, baggage, cargo, aircraft, staff, equipment

Touch points and moments digitally enabled
e.g. pre-trip, access, check-in, security, dwell, passport control, boarding

Instruments (sensors and other "smart components")
e.g. sensors (proximity, pressure, optical, motion) and networks

Enabling (4.0) technologies
e.g. systems integration, cloud computing, cybersecurity, augmented reality, modelling/simulation, blockchain, AI, big data analytics

Challenges

Solution clusters
Flow monitoring & management | Process automation | Customer engagement | Intelligent building management | Predictive solutions | Collaborative decision making

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