Building an AI Capability at Air Canada

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Building an AI Capability at Air Canada

- Establishing a Foundation

- What we have built & what we are working on
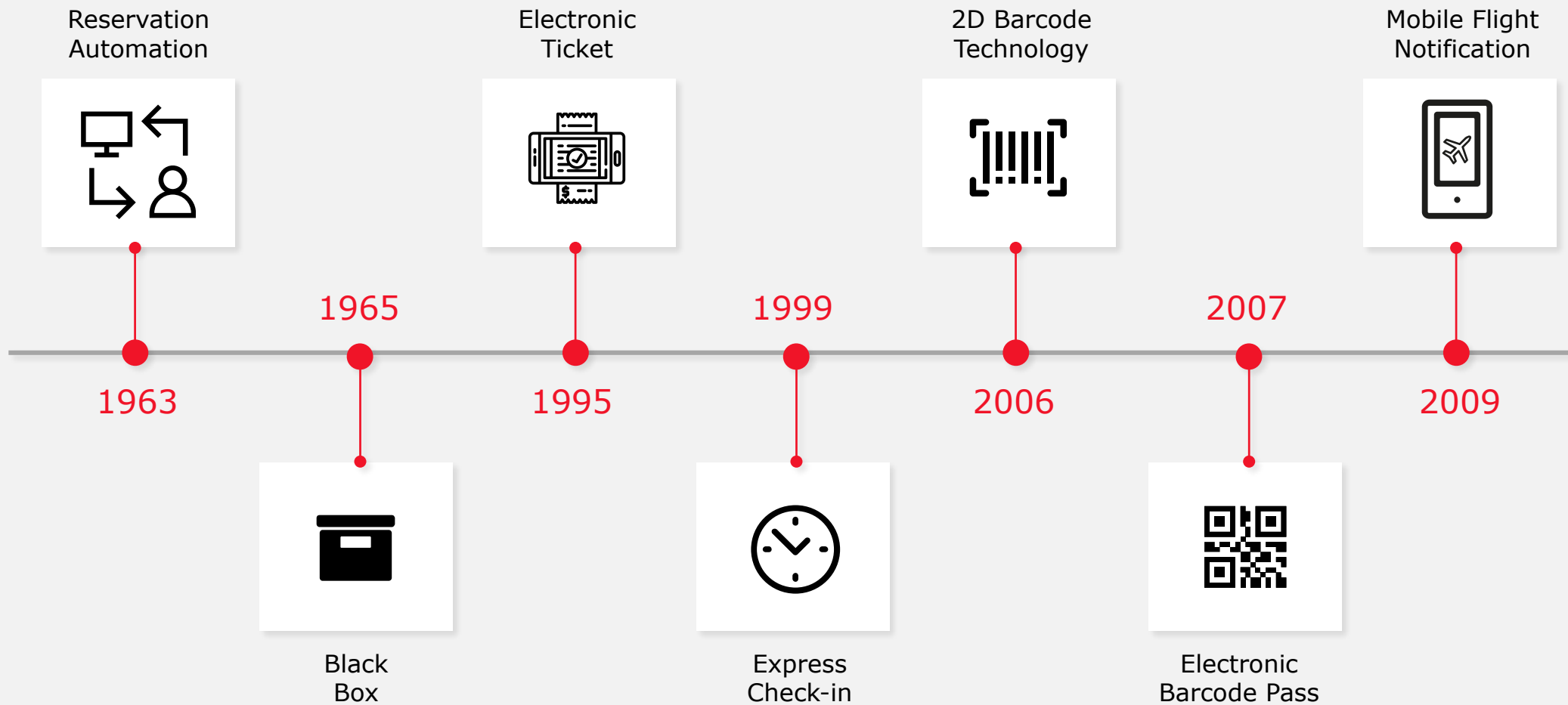
- Lessons Learned

- Future Opportunities

Drivers for building an AI Competency at Air Canada

- Revenue Generation & Cost Transformation
  - Predicted **10-15% EBITDA** improvement from fully embracing data/analytics across all functions

- Competitive advantage
  - Delta, United and JetBlue among the many airlines that are leveraging AI for decision making

- Leverage of existing Analytics Capability
  - A natural next step in some of the Analytics work that had already been done by AC's Revenue Management & Customer Analytics teams
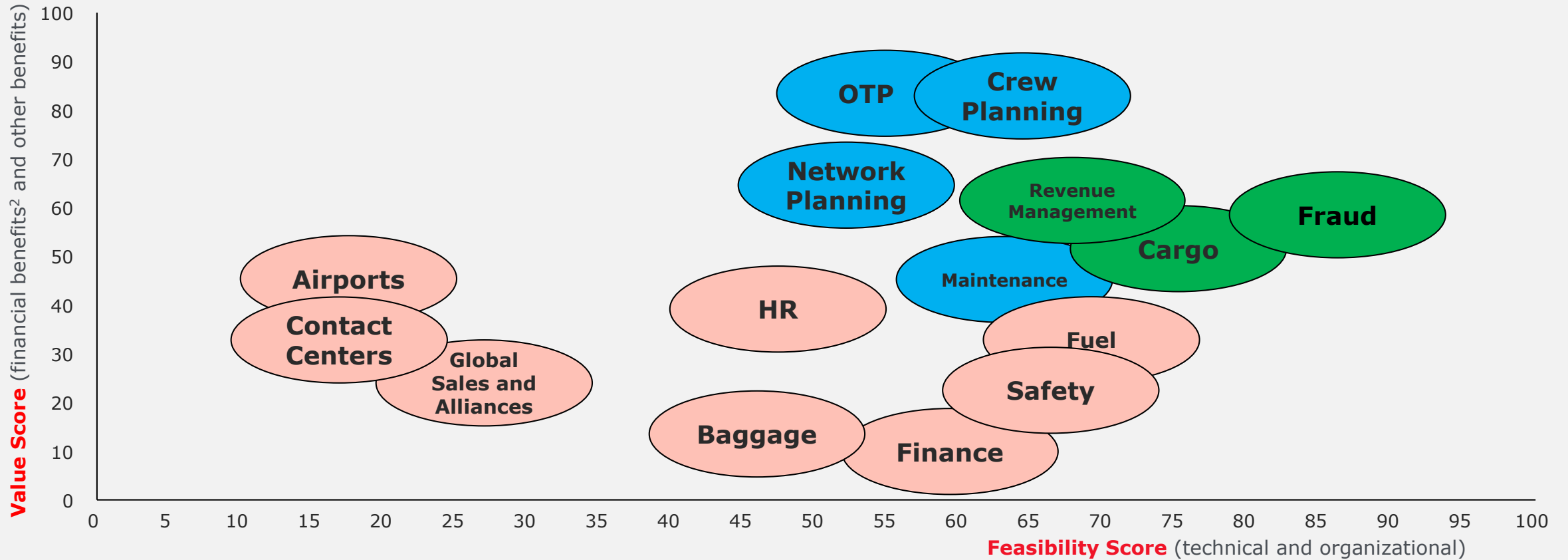
Air Canada consistently at the forefront of innovation

Reservation Automation

Electronic Ticket

2D Barcode Technology

Mobile Flight Notification

1965

1999

2007

1963

1995

2006

2009

Black Box

Express Check-in

Electronic Barcode Pass

In 2019, potential AI projects were evaluated

Prioritization matrix, Index

As of May 2022: ☐ Future Roadmap   ☐ In-Progress or Starting Soon   ☐ In Production

Value Score (financial benefits[2] and other benefits) vs. Feasibility Score (technical and organizational)

- OTP
- Crew Planning
- Network Planning
- Revenue Management
- Fraud
- Cargo
- Airports
- HR
- Maintenance
- Contact Centers
- Global Sales and Alliances
- Fuel
- Safety
- Baggage
- Finance

AI Transformation Pillars

People

- **Hiring of technical talent** ongoing; including Data Scientists, Operations Research Scientists, Data Engineers, and AI Developers

- **Retention of hired talent**; with ambitious projects and fostering of team spirit and competitive compensation programmes.

- Delivery of continuous **training and development**

Technology

- **Investment in key systems** and technologies, including Azure and Databricks as our AI and Data platforms and the FICO Xpress Solver for Optimization

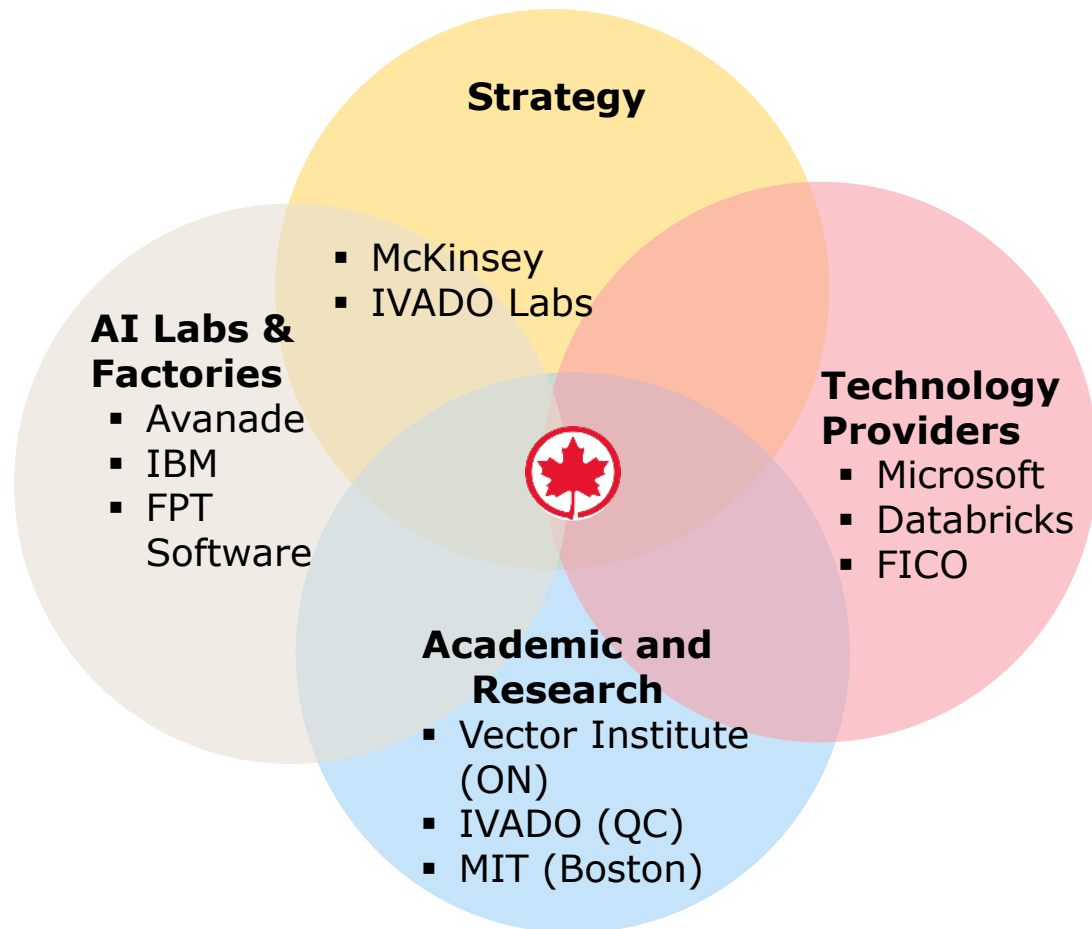- Continuous **focus on new/emerging AI tech** that may aid us now or in future

Processes

- Development of **AI Playbook** to cover everything we do:
  - Processes
  - Standards
  - Best Practices

Working with our partners to build AI capabilities

Partner Ecosystem

Strategy
- McKinsey
- IVADO Labs

AI Labs & Factories
- Avanade
- IBM
- FPT Software

Technology Providers
- Microsoft
- Databricks
- FICO

Academic and Research
- Vector Institute (ON)
- IVADO (QC)
- MIT (Boston)

Funding sources:

- Internal – business case driven

- SR&ED – Government of Canada Tax Credits

- Scale.AI

Scale.AI

The Canadian government launched the Innovation Supercluster Program in 2018 with funding provided for 5 areas.

Scale AI's mission is to boost productivity across industries in Canada by integrating AI with supply chains and by building a knowledge-sharing framework to advance technological research.

AI Delivery Model

Pre-Lab	Lab	Factory	ML/OPS
• Refine the opportunity through the assessment of data and validation of the value at stake	• Translate raw data into business value through feature engineering and modeling	• Industrialize the solution by stabilizing the model data pipeline & implement automation	• Maintain accuracy of the models and data quality

- -

Pre-Lab	Lab	Factory	ML/OPS
• Data exploration to identify sources, catalog, schema • Research different modeling approaches • Define Business Requirements • Define KPIs	• Data ingestion, validation and transformation • Feature engineering • Prototype ML/Optimization models • Build the Minimum Viable Product (MVP) and confirm value /impact.	• Build production version of the solution & incorporate User feedback in models • Ensure scalability & maintainability • Change management & User Training	• Monitor Model performance • ML/OPS • Update models to support new Business requirements

AI Delivery Model

Product owner

Guides the agile team and ensures link to business

**Enterprise/solution architect**

Designs software and data architecture and selects product/solution components

Business/Analytics translator

Contributes specific expertise to inform product/solution development and implementation

Change manager

Design a solution adoption program that is tailored to end-users (e.g., factors in ways of working, existing use of technologies, etc.)
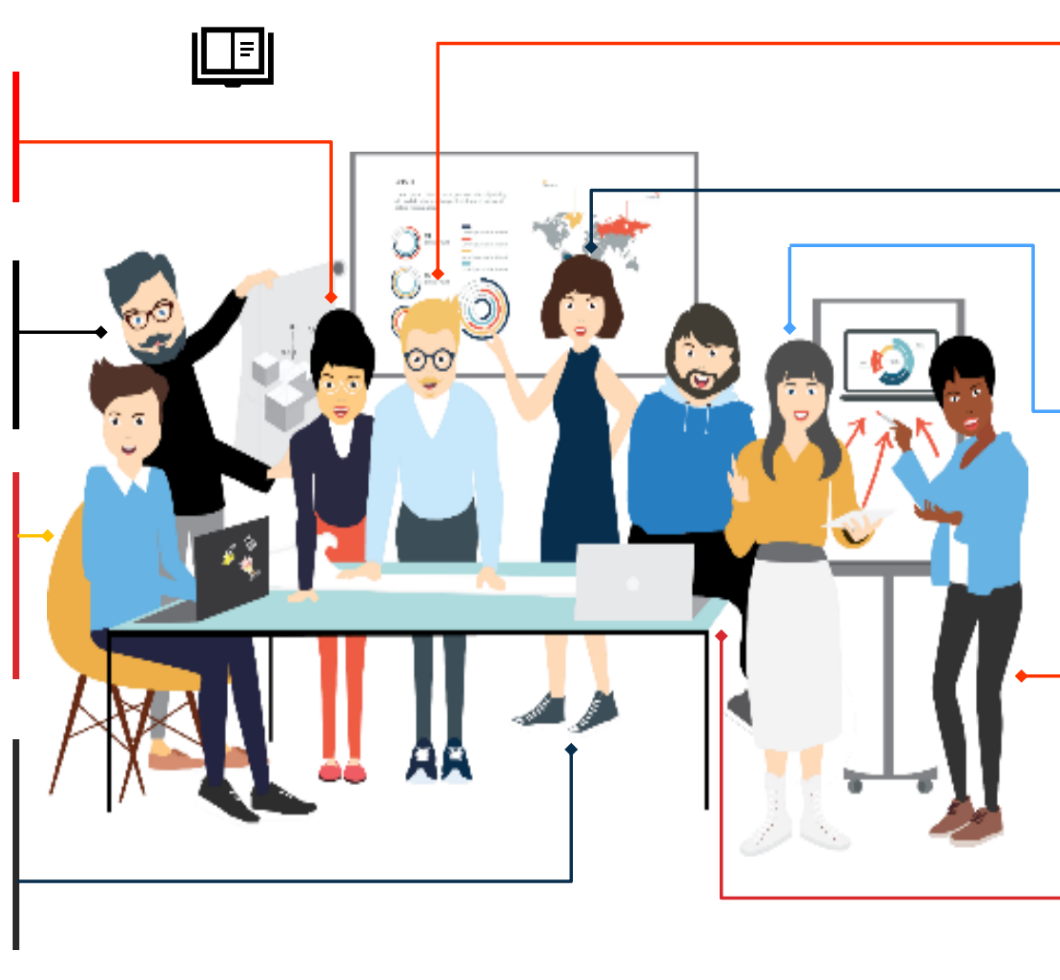
Scrum Master

Coordinates the agile team on a day-to-day basis

Technical Delivery Lead

Leads the project from conception to launch, ensuring alignment with business.

Data scientist

Designs and develops analytical models (statistical models, machine learning etc.)

Designer

Leads customer/user research and design thinking process

Data engineer

Manages data pipelines and associated transformations

Examples of AI systems in production

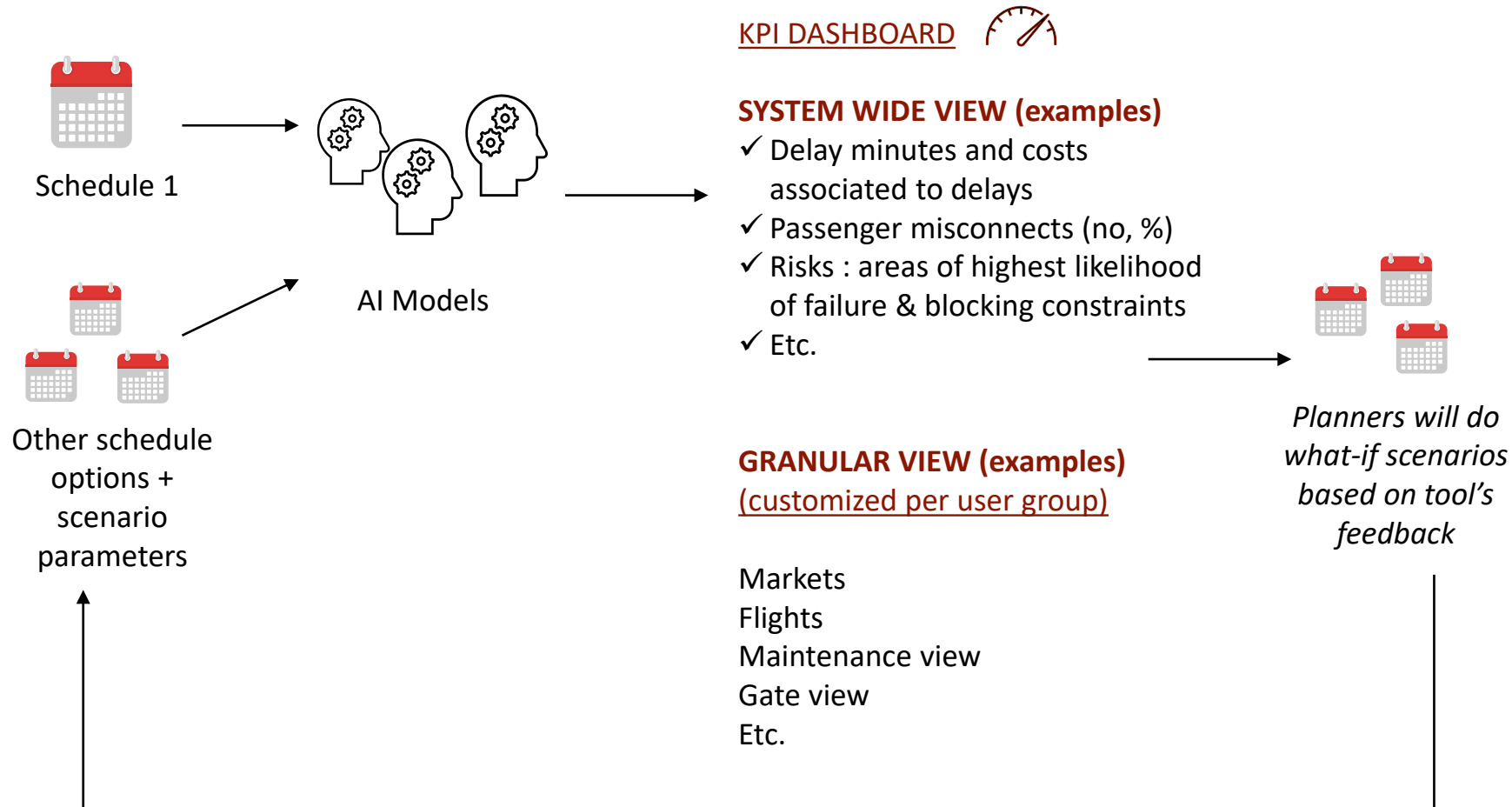| Demand Forecasting	Cargo Capacity Prediction
• AI Models predicting passenger demand across the Air Canada Flight Network. • Both a supervised learning model and an optimization model are used to group multiple forecasts to a single view for a Revenue Management Demand Manager • Consolidates many reports into an intuitive UI.	• AI Models predicting available cargo capacity and suggested oversell for all the flights. • Forecast capacity (Weight & Volume) available for cargo on each Passenger flight. • Make an oversell recommendation based on late bookings, historical cancellations and available capacity. • Model is re-trained daily.
15% increase in forecast accuracy → +1% in Revenue	**Contributing more than $1M/month of additional revenue**

AI for Maintenance

- **Aircraft Maintenance represents close to $1B in annual costs at AC.**

- 5 AI projects which are part of a long-term investment

  - Maintenance Cost Optimizer

  - Maintenance Scheduling Assistant

  - Predictive Maintenance

  - Inventory Optimization

  - Smart Diagnostics

- Each project aims to either reduce costs and/or drive efficiency.

On Time Performance (OTP) Schedule Optimizer

Schedule 1

Other schedule options + scenario parameters

AI Models

KPI DASHBOARD

SYSTEM WIDE VIEW (examples)
- ✓ Delay minutes and costs associated to delays
- ✓ Passenger misconnects (no, %)
- ✓ Risks : areas of highest likelihood of failure & blocking constraints
- ✓ Etc.

**GRANULAR VIEW (examples)
(customized per user group)**

Markets
Flights
Maintenance view
Gate view
Etc.

Planners will do what-if scenarios based on tool's feedback

Lessons Learned

- **Make sure Domain Experts & Technical Experts work side-by-side:**

  - Helps ensure requirements are understood

  - Regular feedback on AI models

  - Helps ensure usage once in Production

  - We have decided to either not start or pause if AC Domain experts are not available.

- **Availability & Quality of Data**

  - GIGO

  - If there are issues with the data, machine learning scientists will end up spending their time doing collecting, annotating and cleaning data.

  - AI Product Teams are expensive, so work-arounds/waiting time needs to be minimized.

  - We have implemented the *Pre-Lab* phase to assess the readiness of Data as the pre-requisite for a *Lab* start.

Lessons Learned

- **Effective & efficient ML/OPS**

  - Don't underestimate the work required to set-up data pipelines, build CI/CD tooling and effective monitoring of models once deployed.

  - Poorly done, it's expensive or worse, it can delay projects.

- **Be realistic about what you can do in-house vs getting help**

  - It's an <u>extremely</u> competitive market for IT talent, especially for Data Scientists & Data Engineers

  - Recruiting is hard/costly.

  - We have built a happy balance of in-house & vendor team delivery capability to quickly meet project requirement needs.

Merci
Thank You