

ICAS EMERGING TECHNOLOGY FORUM 2019

Digital Factory: Being Digital from Design to Manufacturing



João Zerbini
Sr Manager - Digital Engineering
& Manufacturing Technologies





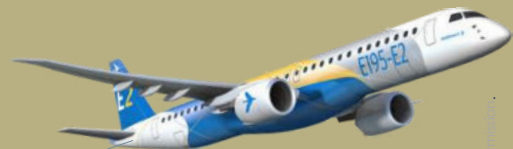
1946

National Strategic Project to foster the aeronautics in Brazil - CTA (Aerospace Center of Technology) and ITA (Aeronautics Institute of Technology) were created



1994

The company is privatized, combining technological and industrial knowledge with an entrepreneurial culture



2019

One of the world's leading manufacturers of commercial and executive aircraft, with Strong and growing performance in defense and security

1969

EMBRAER was founded controlled by the Federal Government as a step to develop the aeronautic industry



WHERE WE OPERATE



JOINT VENTURES & AFFILIATES



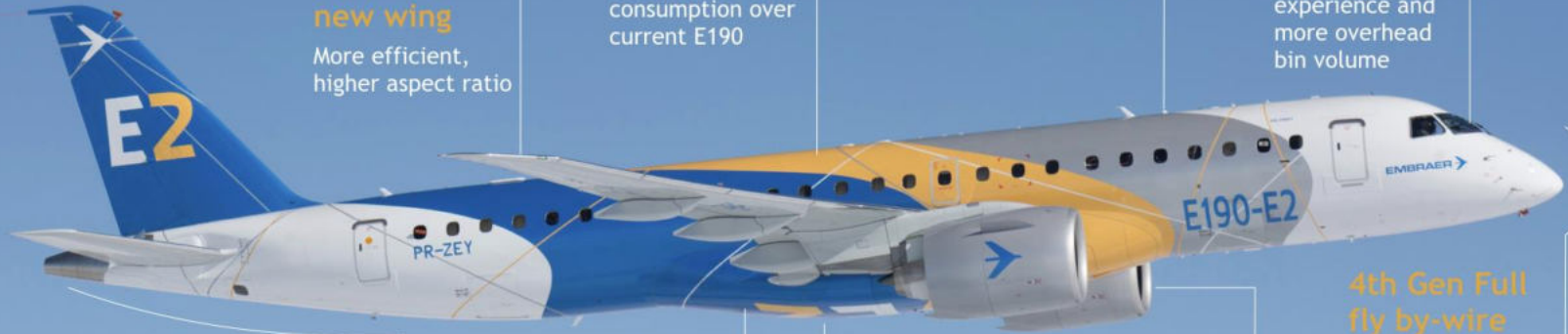


OUR CHALLENGE



A NEW DESIGN ON A PROVEN PLATFORM

E-JETS
E2
THE SECOND
GENERATION



new wing

More efficient,
higher aspect ratio

fuel

17,3% lower fuel
consumption over
current E190

improved avionics

45% more display

new interior

Enhanced PAX
experience and
more overhead
bin volume

fuselage

Extensive
aerodynamic
optimization to
improve fuel
efficiency

aircraft system

Re-designed to boost
performance and
reliability and to improve
maintenance costs

landing gear door

Up to 1% fuel
burn reduction

new engine

High By-Pass
Ratio, Geared
Fan Engines

4th Gen Full fly by-wire

Digital closed-
loop control to
improve flying
qualities and
fuel efficiency



INNOVATION VERTICALS

ELECTRIFICATION

AUTONOMY

ADVANCED DESIGN AND MANUFACTURING

URBAN MOBILITY

AI & DATA SCIENCE

CYBERSECURITY

PASSENGER EXPERIENCE

AIRCRAFT EFFICIENCY

PLATFORM-BASED SERVICES

THE DIGITAL VALUE CHAIN

DESIGN



MANUFACTURE



SERVICE



CONCEPT

DESIGN

PROTOTYPE

CERTIFY

SUPPLY

SERIE

TEST

QUALITY

SUPPORT

SERVICES



THE DIGITAL VALUE CHAIN



DESIGN



MANUFACTURE



SERVICE



This information is property of Embraer and cannot be used or reproduced without written permission.



THE DIGITAL VALUE CHAIN



DESIGN



MANUFACTURE



SERVICE



Smart
Generative
Design



AR/VR Mixed
Reality



Additive
Manufacturing



Robotics



(I)IoT



Artificial
Intelligence



Distributed Ledgers
Blockchain



HPC
Edge Computing
QC



KBE/RPA



Simulation &
Optimization



Digital Twin



AGV
AMR



Analytics



Cloud
Computing



Design Thinking,
Agile, Lean,
Data Science



Advanced Design and Manufacturing (ADAM)



STRATEGIC PLAN FOR ADVANCED DESIGN AND MANUFACTURING



- ➔ Guarantee the alignment of resources
- ➔ Avoid effort duplication and rework
- ➔ Prioritize the initiatives - corporate strategy
- ➔ Optimize the investments - leverage the competitiveness



ADAM STRATEGIC DIMENSIONS



➤ PROCESS

Tools: SWOT, Benchmarking, Assessment (BPM), Workshops

Deliverables: The Factory of the Future

Sub products: VSM, Competitiveness Strategy Analysis, Make x Buy



➤ TECHNOLOGY

Tools: Roadmaps

Deliverables: TRMs (Technology Roadmaps) for I4.0 Technologies

Sub products: Technologies Funnel, Maturity (TRL/MRL), Integrated Portfolio



➤ PEOPLE

Tools: PEE, EMPower, School of Manufacturing Engineer, Community of Practice

Deliverables: I4.0-Ready Skilled Engineers

Sub products: Digital Culture, Training Plan



ADAM TECHNOLOGY DIMENSION

➤ DIGITAL ENGINEERING

Anticipate the maturity of the products and processes
Increase efficiency in the development phase

➤ SHOP FLOOR

Increase efficiency, flexibility, throughput and quality of the productive process

➤ MANUFACTURING INTELLIGENCE

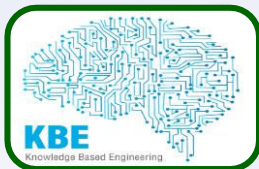
Information to supports the decision making intelligence



INITIATIVES



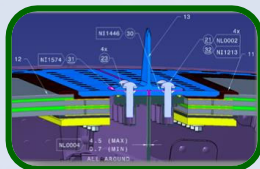
SE
MBSE



ENGINEERING
AUTOMATION

Digital Engineering
Product Design

Anticipating the product
maturity & efficiency



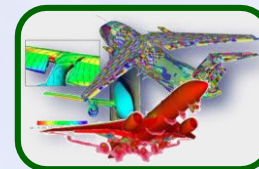
MBD



COLLABORATION



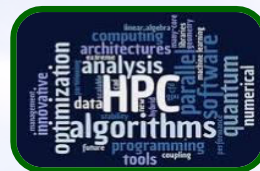
DATA REUSE



INTENSIVE
SIMULATIONS



GENERATIVE
MODELING



HPC



INITIATIVES



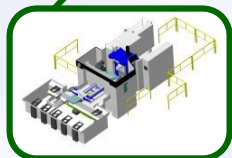
Discrete Event Simulation



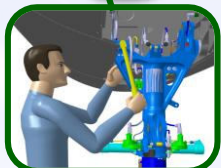
Paperless Online Information



Machining & Robotics Simulation



Virtual Commissioning



Assembly Simulation

**Digital Engineering
Manufacturing Design
Factory Deployments
done First-Time-Right**



INITIATIVES



**Hybrid
Manufacturing**



**Incremental
Sheet Forming**

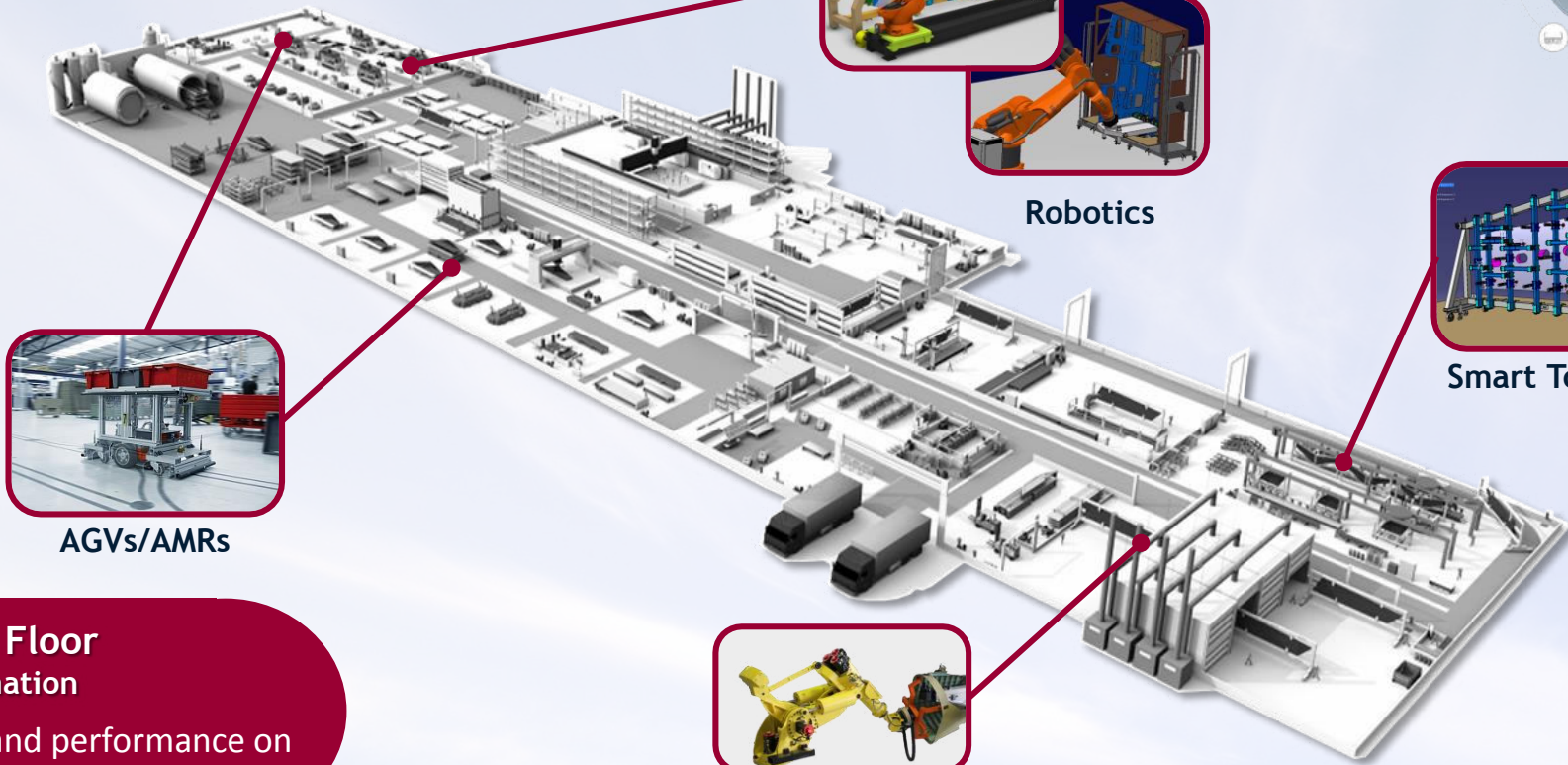


**Additive
Manufacturing**

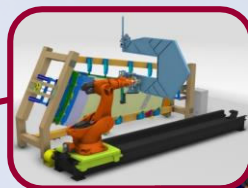
**Shop Floor
fabrication**

**New fabrication processes
to increase flexibility**

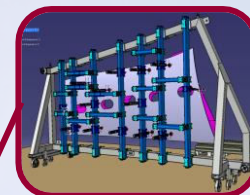
INITIATIVES



AGVs/AMRs



Robotics



Smart Tooling



Cooperative Systems

Shop Floor Automation

Flow and performance on Discrete Manufacturing



INITIATIVES



Exoskeleton



Augmented Reality

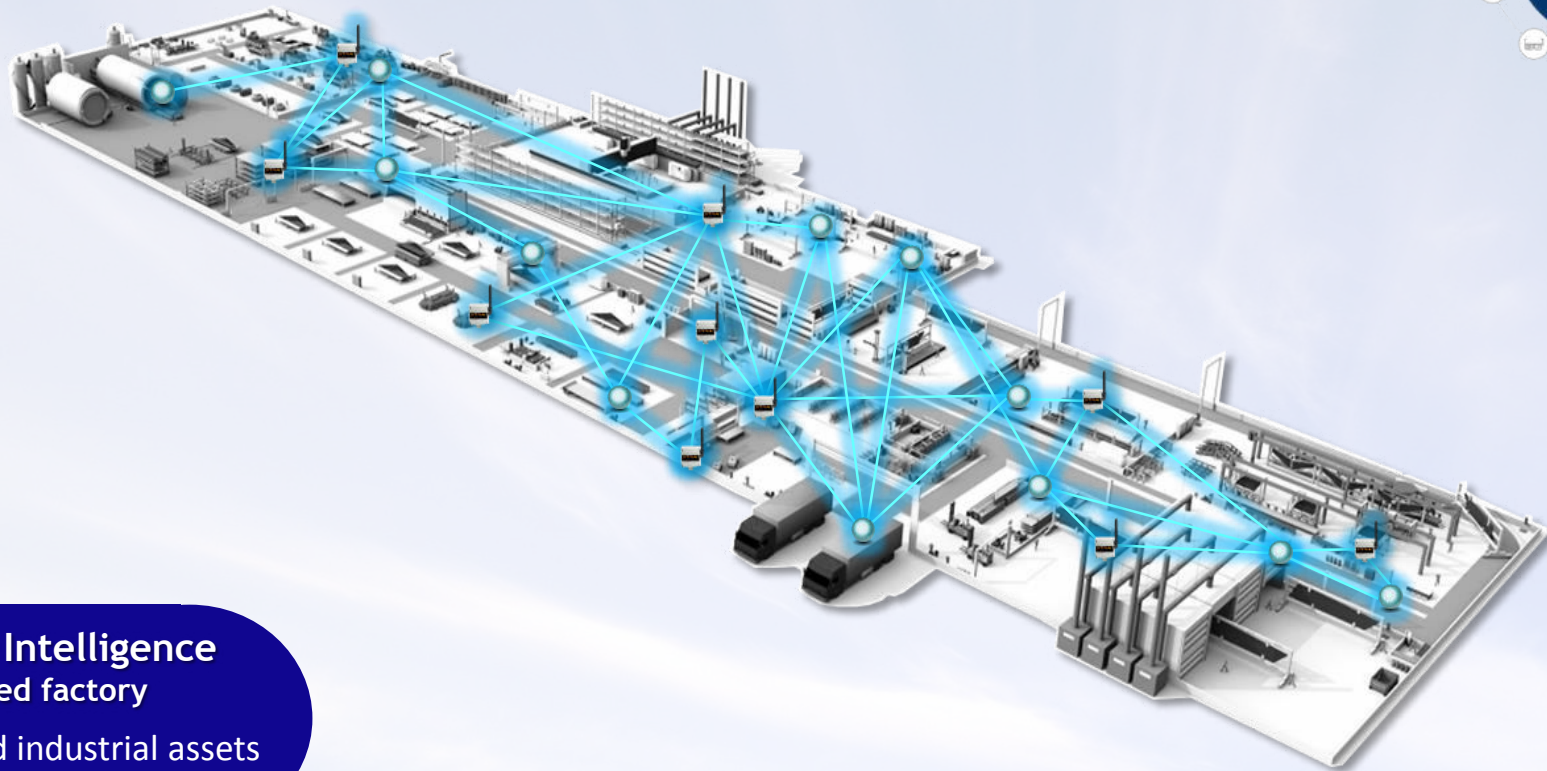


Cobots

**Shop Floor
Augmented Environment**
Technology to augment operators capabilities



INITIATIVES

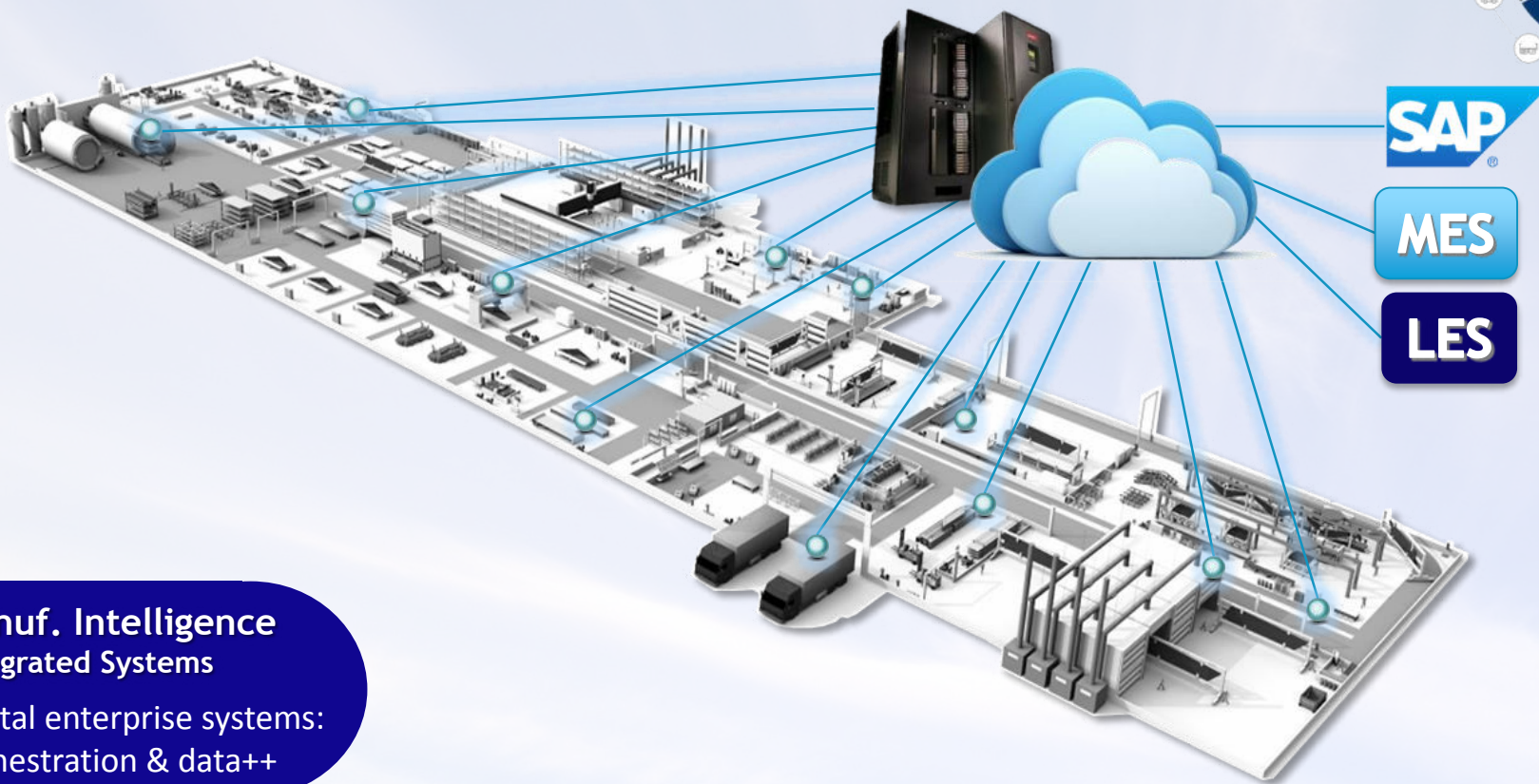


Manuf. Intelligence
Networked factory

Sensored industrial assets
to enable Automation



INITIATIVES



**Manuf. Intelligence
Integrated Systems**

Digital enterprise systems:
orchestration & data++

INITIATIVES



Select



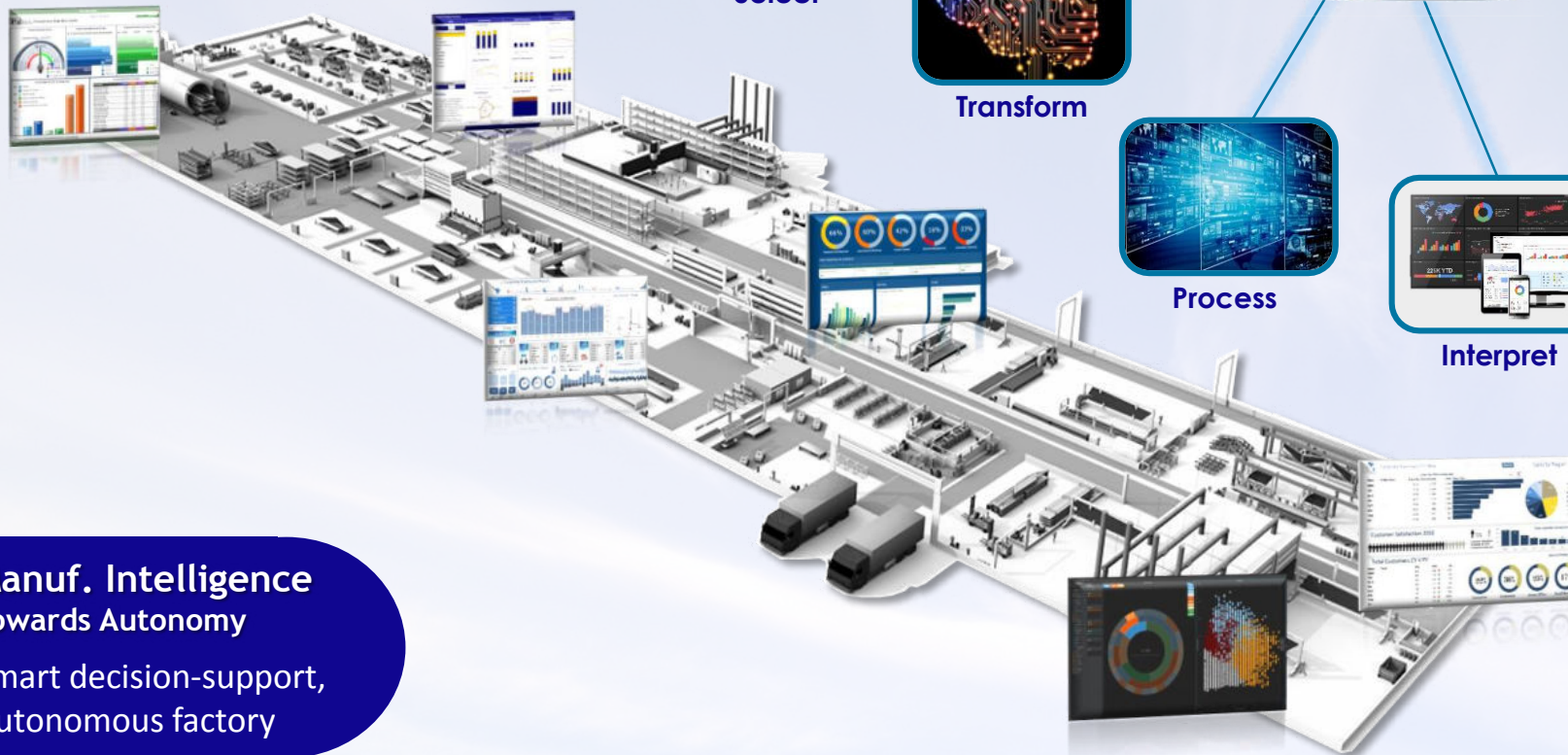
Transform



Process



Interpret



Manuf. Intelligence
Towards Autonomy

Smart decision-support,
Autonomous factory



FACTORY OF THE FUTURE

From Design, through Manufacturing, to Operations



TAKEAWAYS

- Anticipate maturity with digitalization to ensure first-time right
- Start small, Think Big, Move Fast: Incremental, achieve feasibility with early wins, choose wisely the demo/pilot case
- A bad process cannot be fixed with digitization (GIGO)
- Lean Engineering, Lean Manufacturing and Lean Services can help a lot simplifying and focusing on the value added tasks
- Have an implementation Roadmap carefully considering your legacy systems
- Being Digital is not only about technology: the 3 dimensions (Process, Technology & People) are equally important





embraer.com.br

jzerbini@embraer.com.br



João Zerbini

Sr. Manager Digital Engineering &
Manufacturing Technologies

