



DIGITAL TWINS AND THE FUTURE OF MANUFACTURING

HARMAN DIGITAL TRANSFORMATION SOLUTIONS(DTS)



**SIMPLE WAY TO
UNDERSTAND
DIGITAL TWIN**

WHAT IS A TWIN?



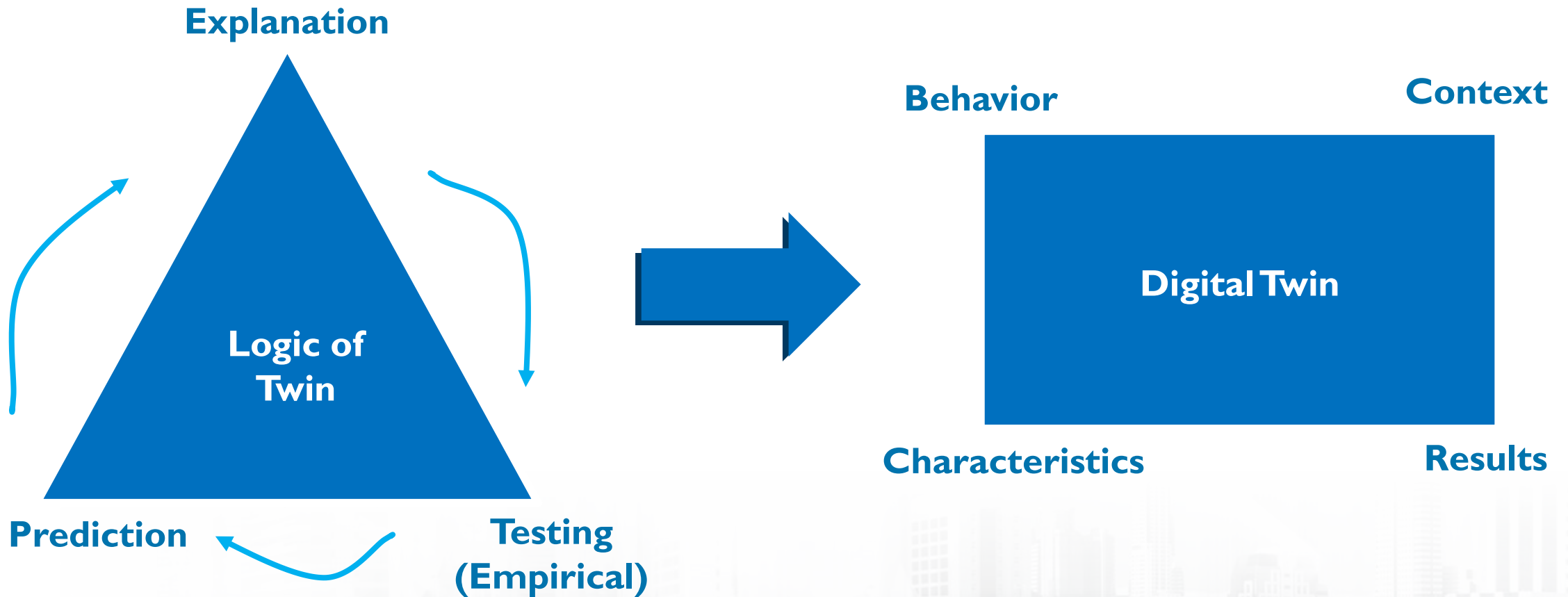
Digital Twin

Virtual Reality?

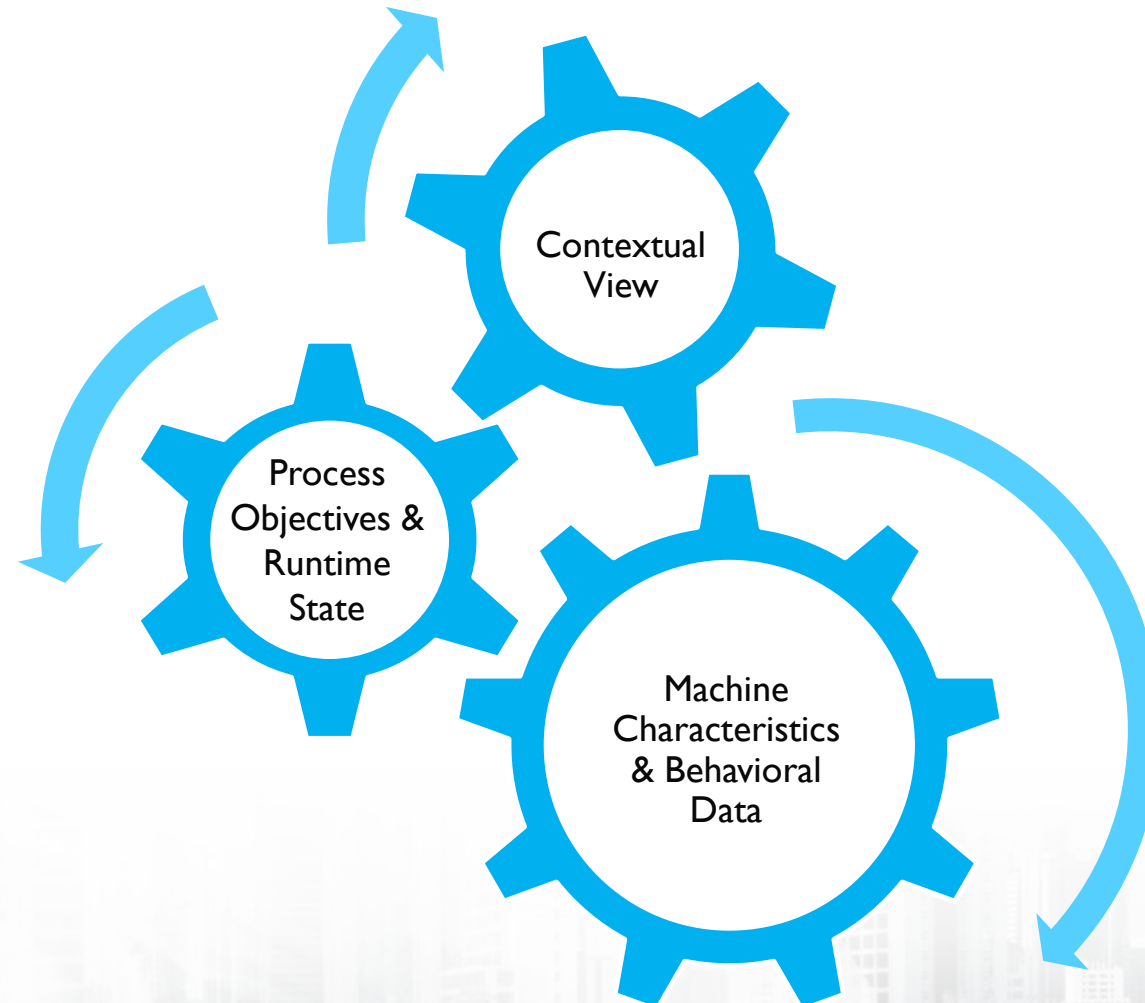
Digital Modelling?

Simulated Environment?

BASICS OF TWIN



HARMAN DIGITAL TRANSFORMATION SOLUTIONS(DTS) KEY ASPECTS



—
IT'S A JOURNEY



CROSS INDUSTRY USE CASES AND HARMAN OFFERING



Product Twins

Product design

Sandbox testing

Model outcomes

Virtual prototyping

Intelligent design

Predictive modelling

Customer-driven design

Production Twins

Streamline ops

Optimisation

Efficiency models

Smart connected products

Smart asset mgmt.

Supply chain mgmt.

Warranty mgmt.

Performance Twins

Reduce downtime

Preventive monitoring

Real-time insights

Virtual reality

Predictive maintain

Continuous adaptation

Simulation models

HIGH LEVEL DIGITAL TWIN PLATFORM COMPONENTS



SAP/ERP



BIG DATA



ANALYTICS



CLOUD




EDGE



SIMULATION



IOT



ROBOTICS



AI/ML



BLOCKCHAIN



ASSET #1



ASSET #2



ASSET #3

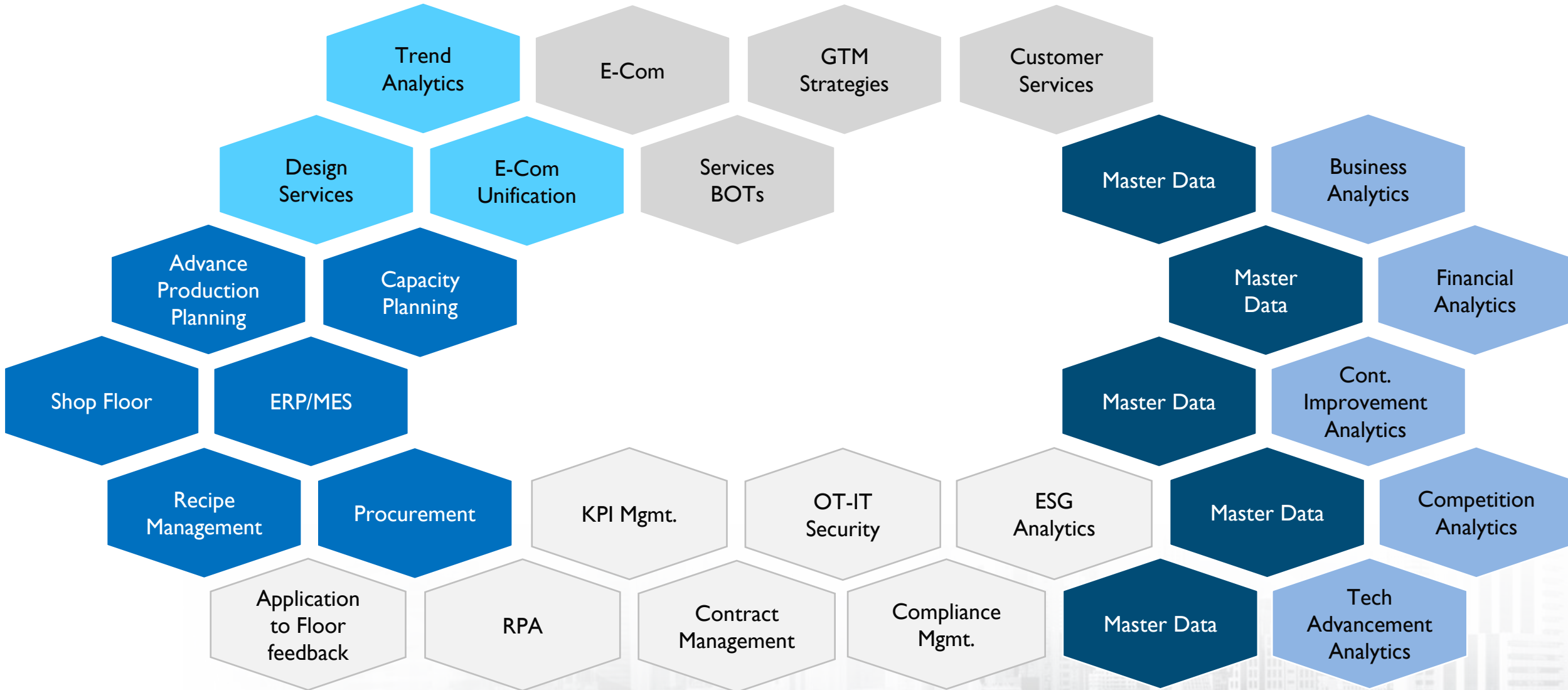


ASSET #4

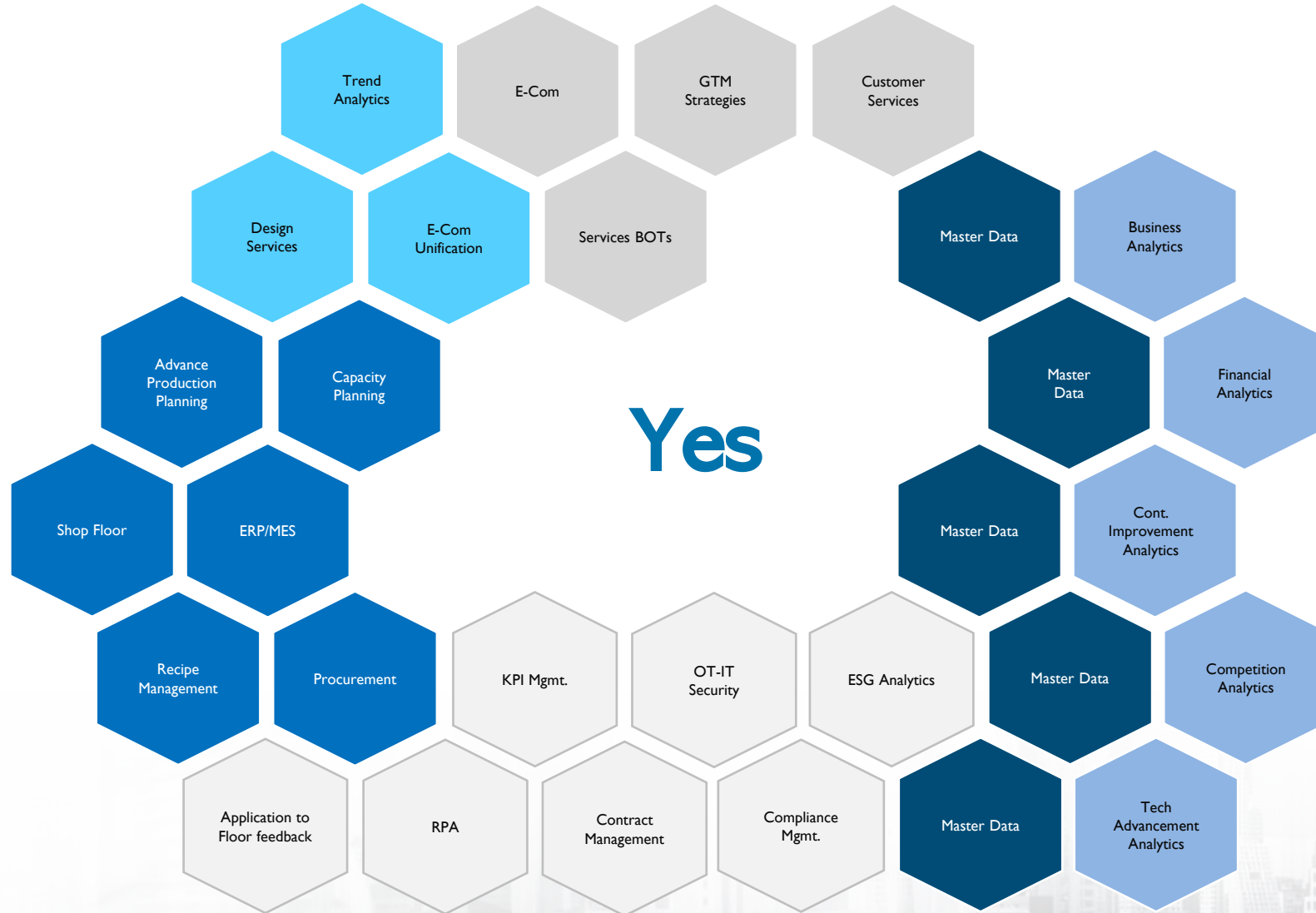


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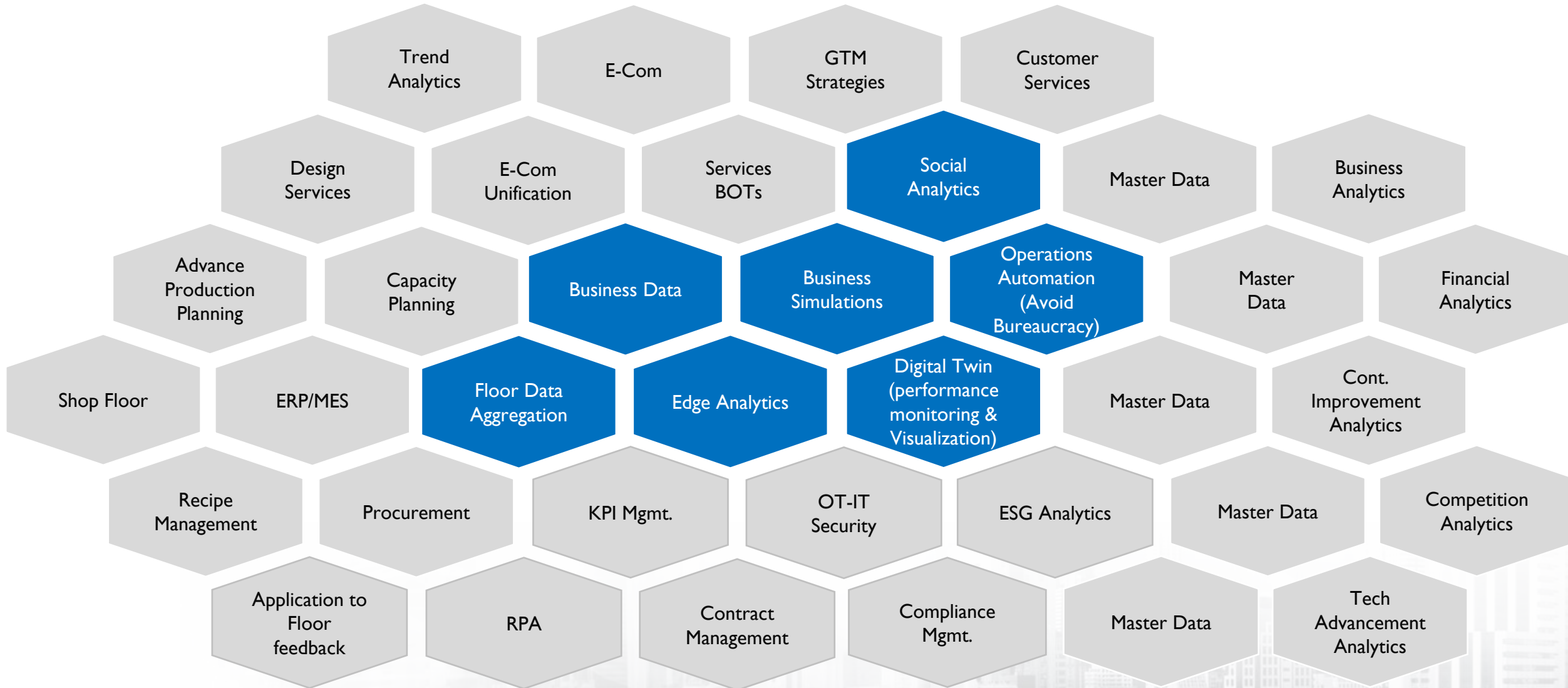
HARMAN DIGITAL TRANSFORMATION SOLUTIONS(DTS) SOMETHING MISSING?



HARMAN DIGITAL TRANSFORMATION SOLUTIONS(DTS) SOMETHING MISSING?



HARMAN DIGITAL TRANSFORMATION SOLUTIONS(DTS) DIGITAL TWIN BLOCKS

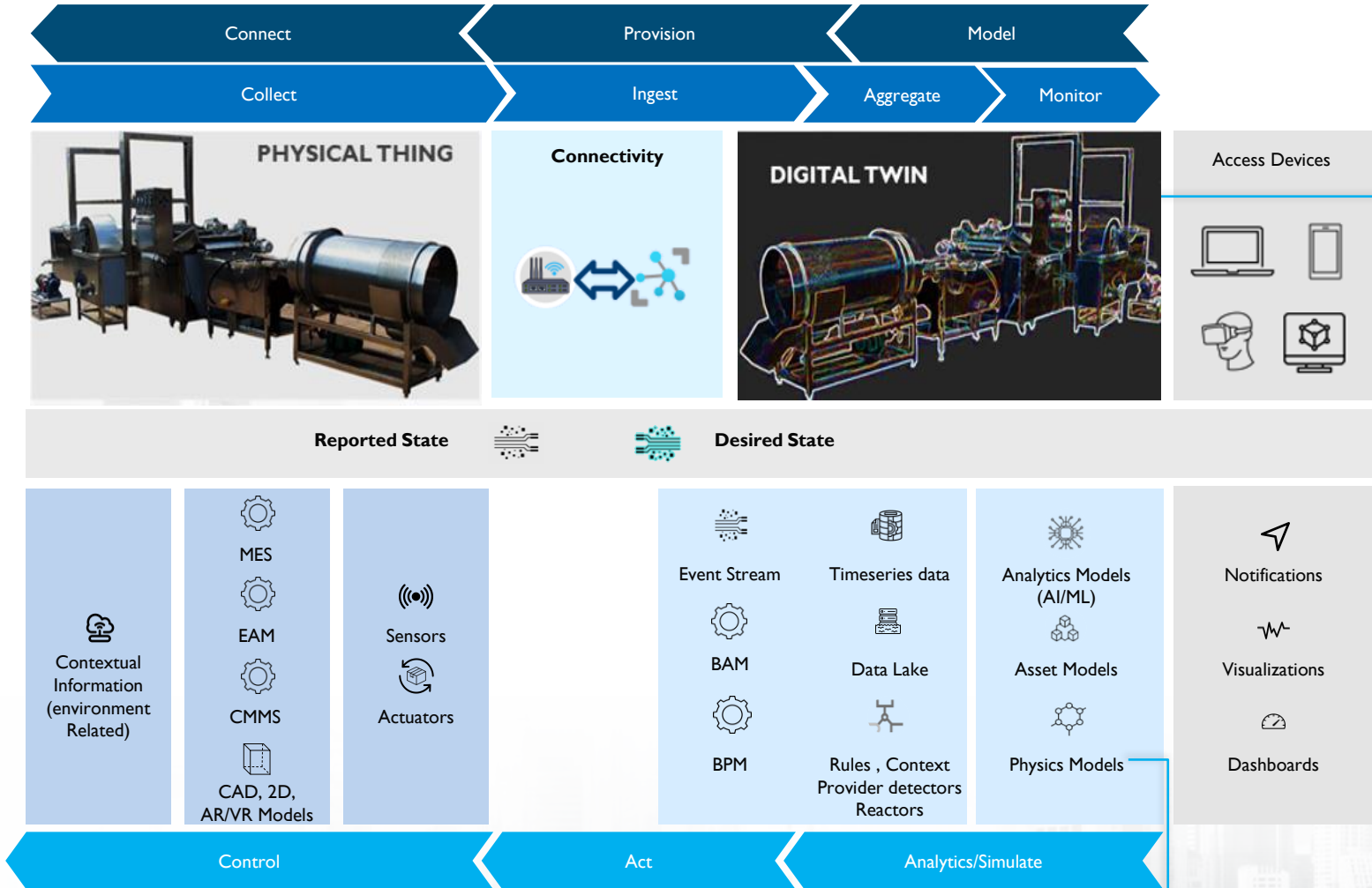


ENTERPRISE LANDSCAPE OF DIGITAL TWIN



Key Criteria

- Improved asset life
- Process efficiency
- Operational optimization
- New digital revenue
- Improved customer satisfaction
- Improved safety
- Competitive advantage



Digital Twin Types

- Discrete Twin (Dewatering Control Twin)
- Asset Twin (Potato Peeler)
- System Twin (Lay's Potato Chips Processing Line)
- Process Twin (Lay's Potato manufacturing process)

Ontology based resource definition

- Interface: Describe properties, telemetries, commands, relationship, or components)
- Telemetry: Describe data emitted by a digital twin
- Property: Characteristics of the component represented by a digital twin
- Command: Operations that can be performed on a digital twin
- Relationship: Describes a link to another digital twin
- Component: Enable interfaces to be composed of other interfaces

KEY BENEFITS



Real-time
monitoring

Optimize
performance

Better financial
decision

Predictive
maintenance

Accelerate risk
assessment

Accelerate
production time

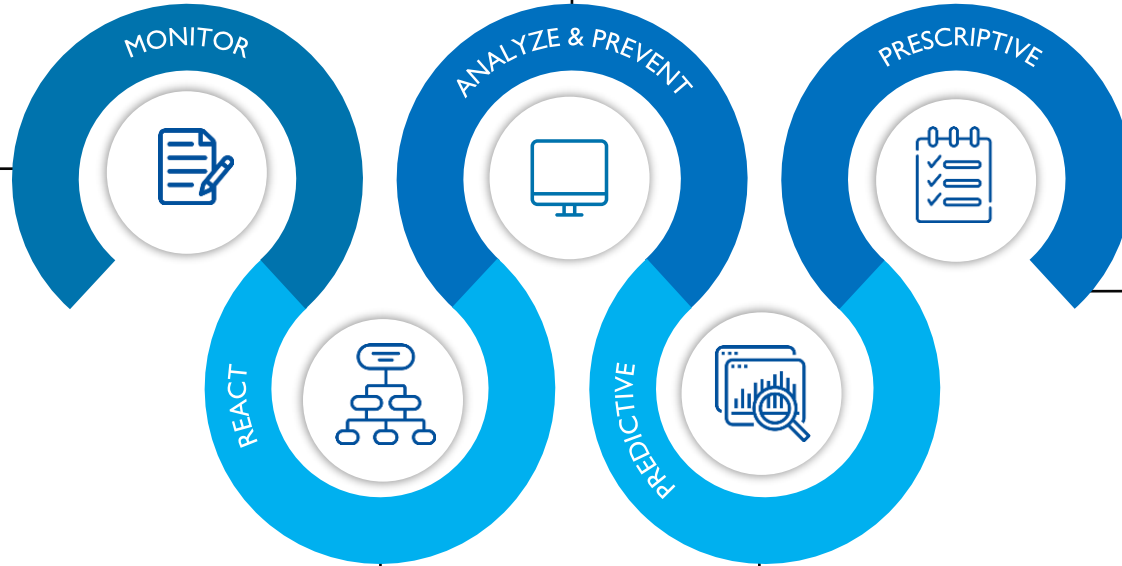
DON'T MAKE THINGS COMPLEX



GO AGILE



OT HANDSHAKES IT
Monitor machines & processes
Heart beats



VISIBLE INVISIBLE
Domain experts to play a role

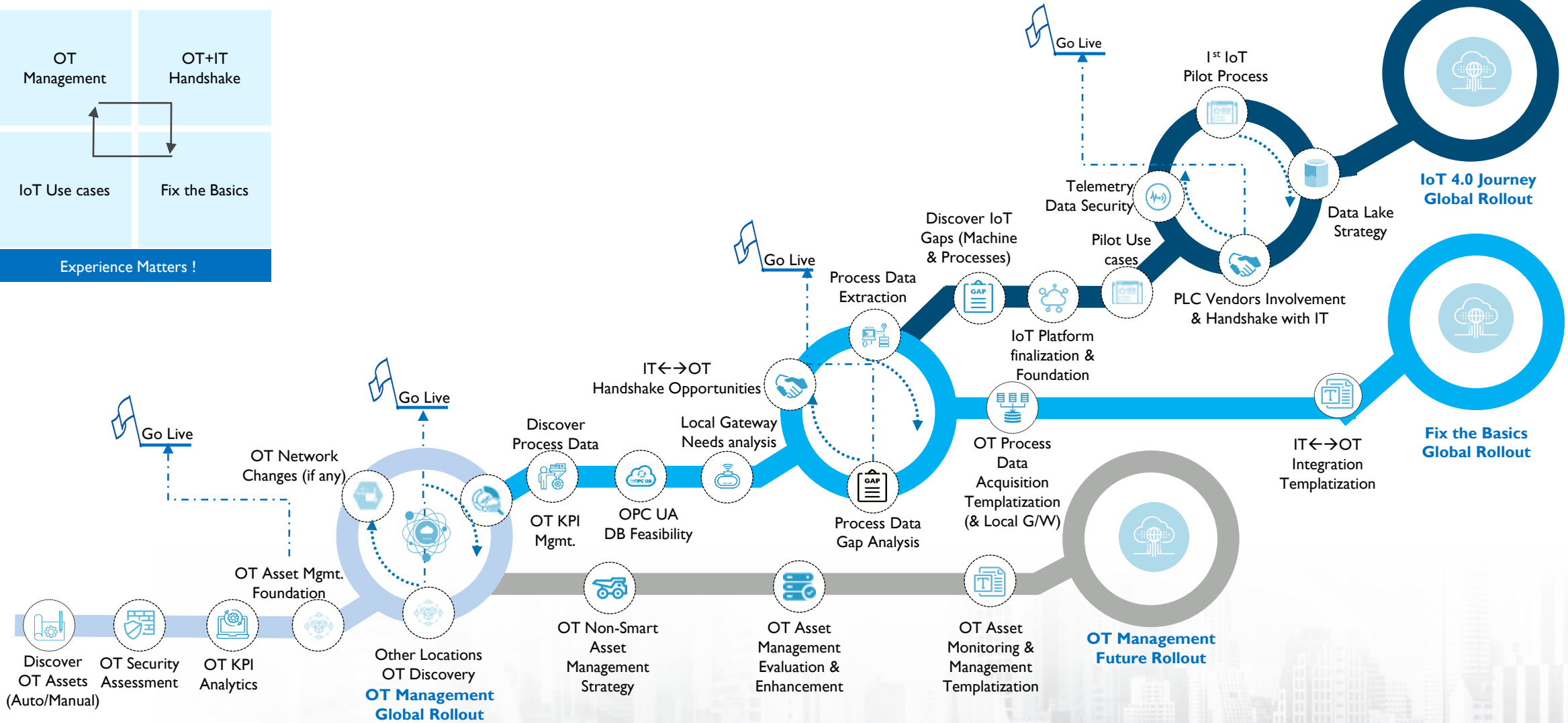
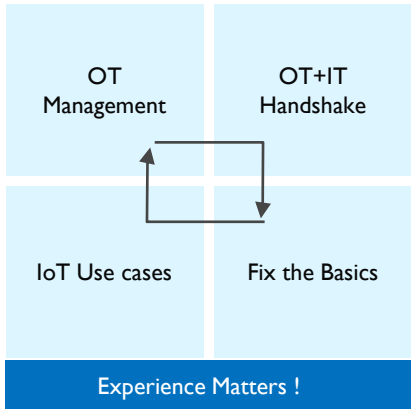
TWIN MODELING
Business works like human body

MAKE DECISIONS
Go agile, make small decisions to
improve OEE

SPOT OPPORTUNITIES
Continuous assessment to
spot improvement areas



IOT IMPLEMENTATION & DIGI TWIN MATURITY PATH



LET'S SEE IT LIVE

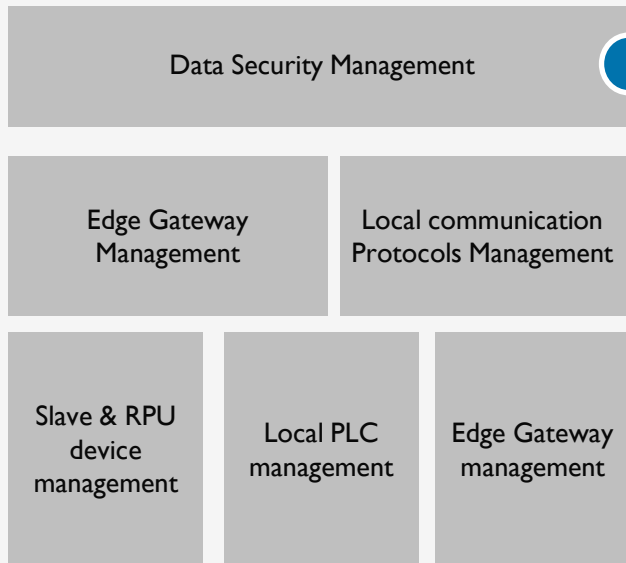


IOT IN A BOX - PLATFORM FOR ONBOARDING IOT ASSETS IN SIMPLE WAY



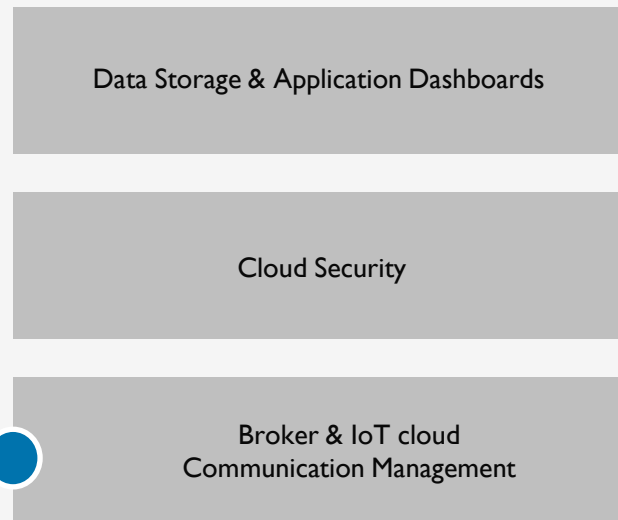
(Connected machines/assets, plc connectivity, industry std protocol support, gateway integration [live demo](#))

Setup at Local Smart Transit Stations



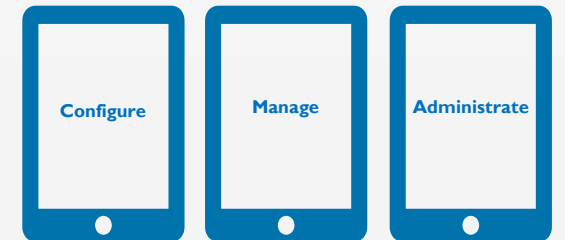
DIY Model (Do it yourself)

IoT Cloud



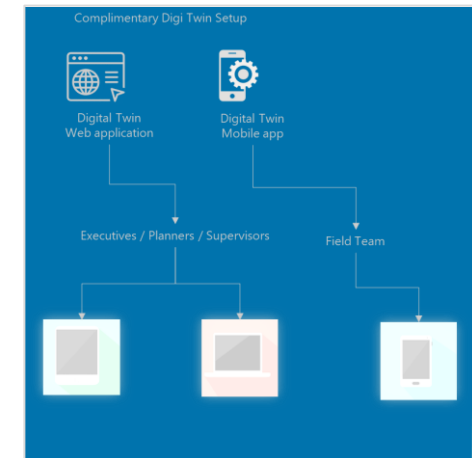
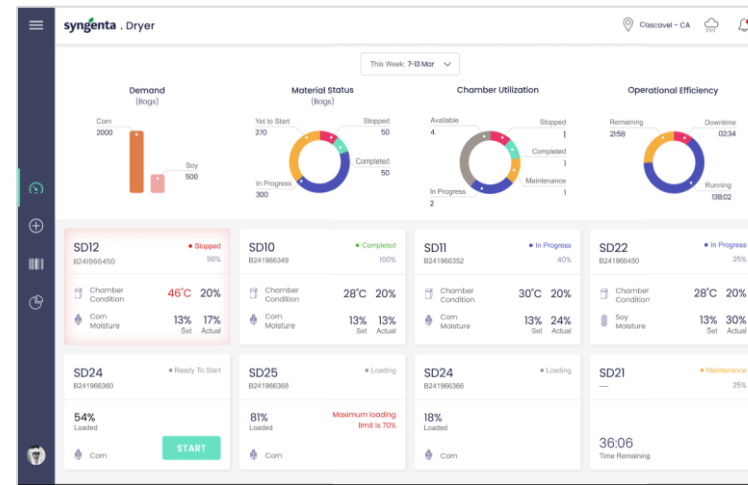
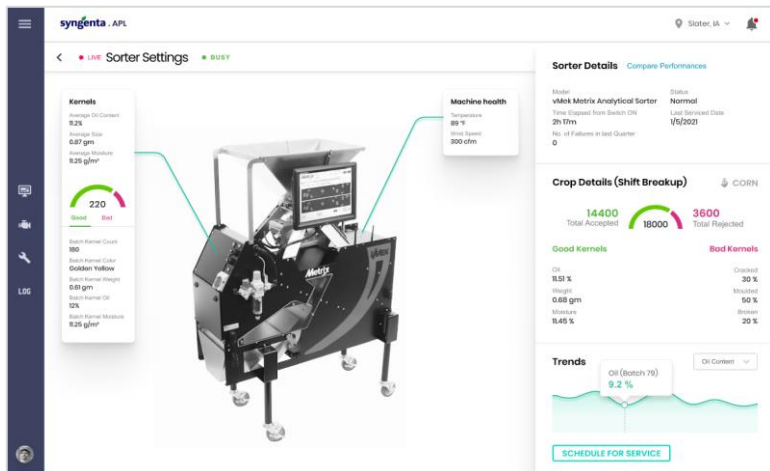
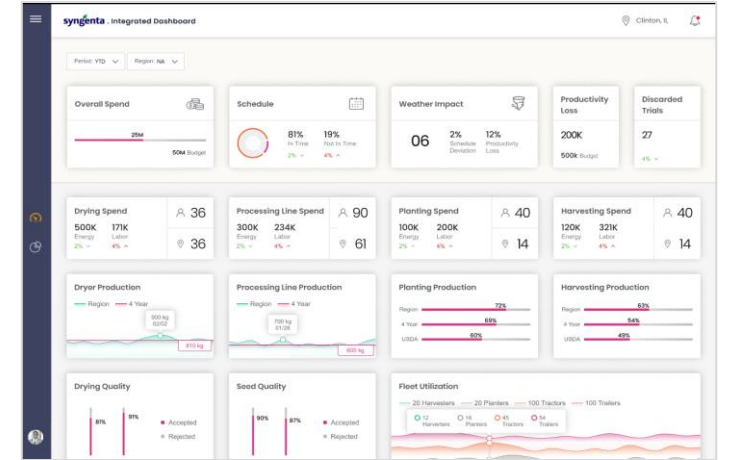
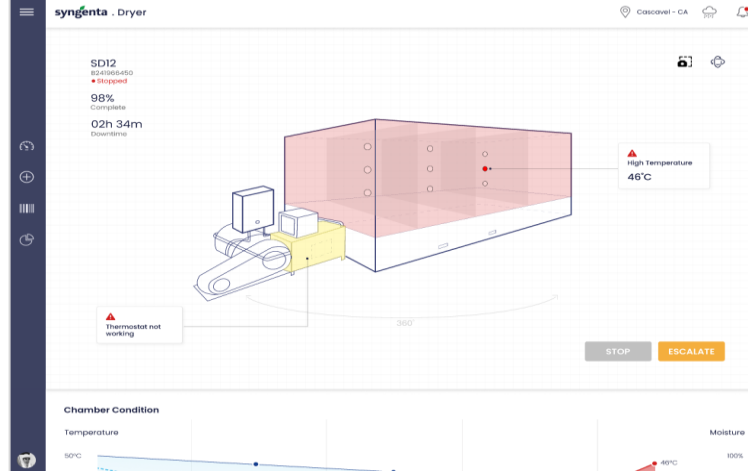
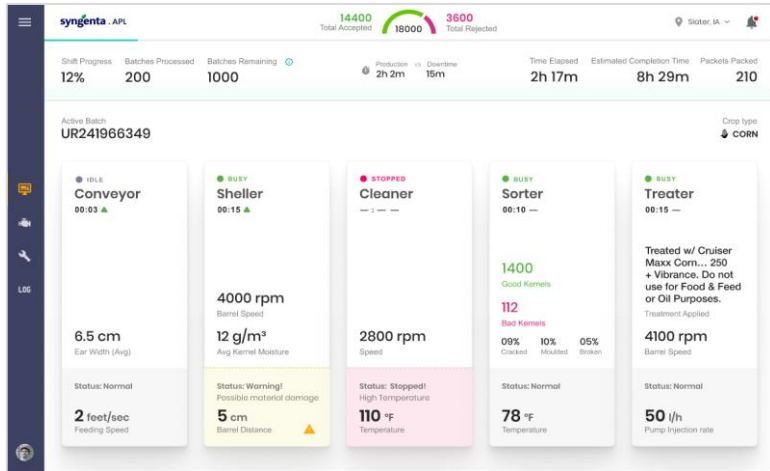
DIY Model (Do It Yourself)

Asset Connectivity Editor & Live landscape

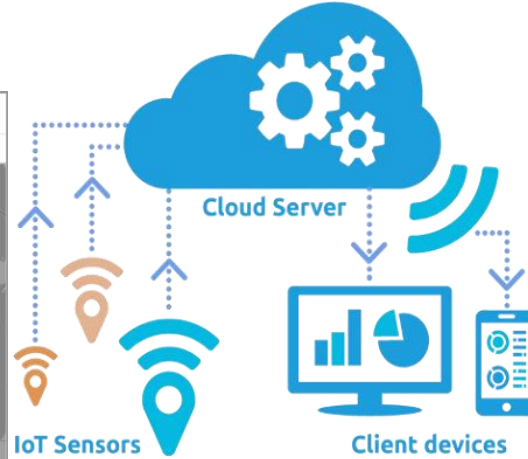
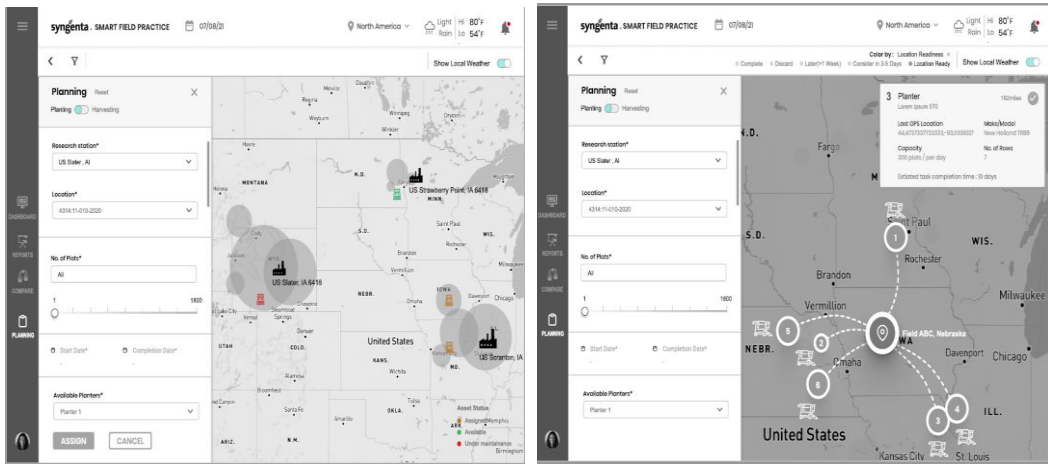


Smart Asset Management

AGRITECH GIANT - AUTOMATIC PROCESSING PLANT: DIGITAL TWIN

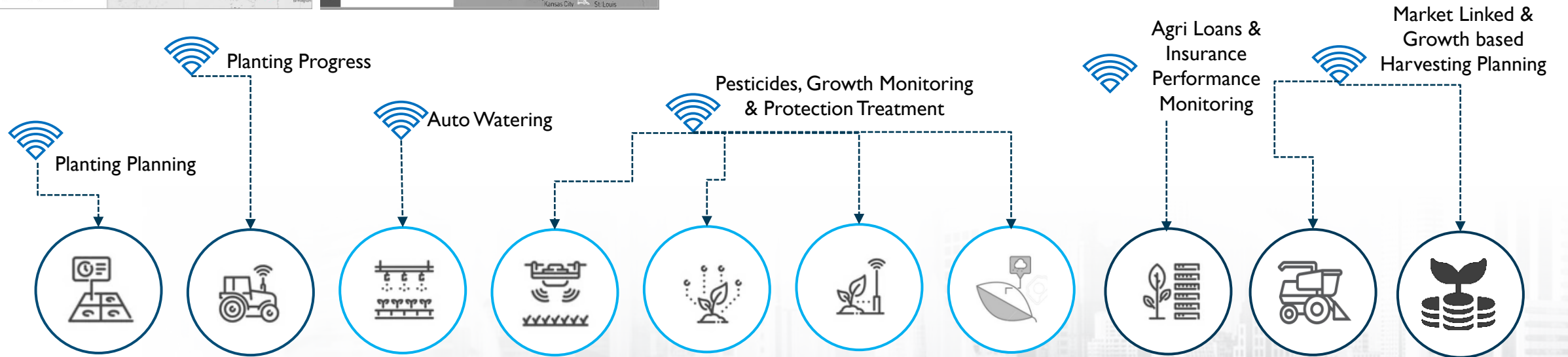


SMART FIELD PRACTICE : CONNECTED SEED TRIALING & MARKET LINKED ECOMMERCE



Sensing & Linked Enablers

- Geospatial
- GIS
- Genome Analytics
- Phenotyping
- Image Processing
- Weather
- Water
- Soil
- Market





THANK YOU