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AI Solutions

Solving challenges in the Real World

Demystifying

Artificial Intelligence

“44% of executives believe that failure to implement AI will adversely affect their bottom line in the years to come.”

NTTDATA, AI Accelerated Jan 2021

“….and yet, Enterprise AI Adoption Rate remains below 10%”

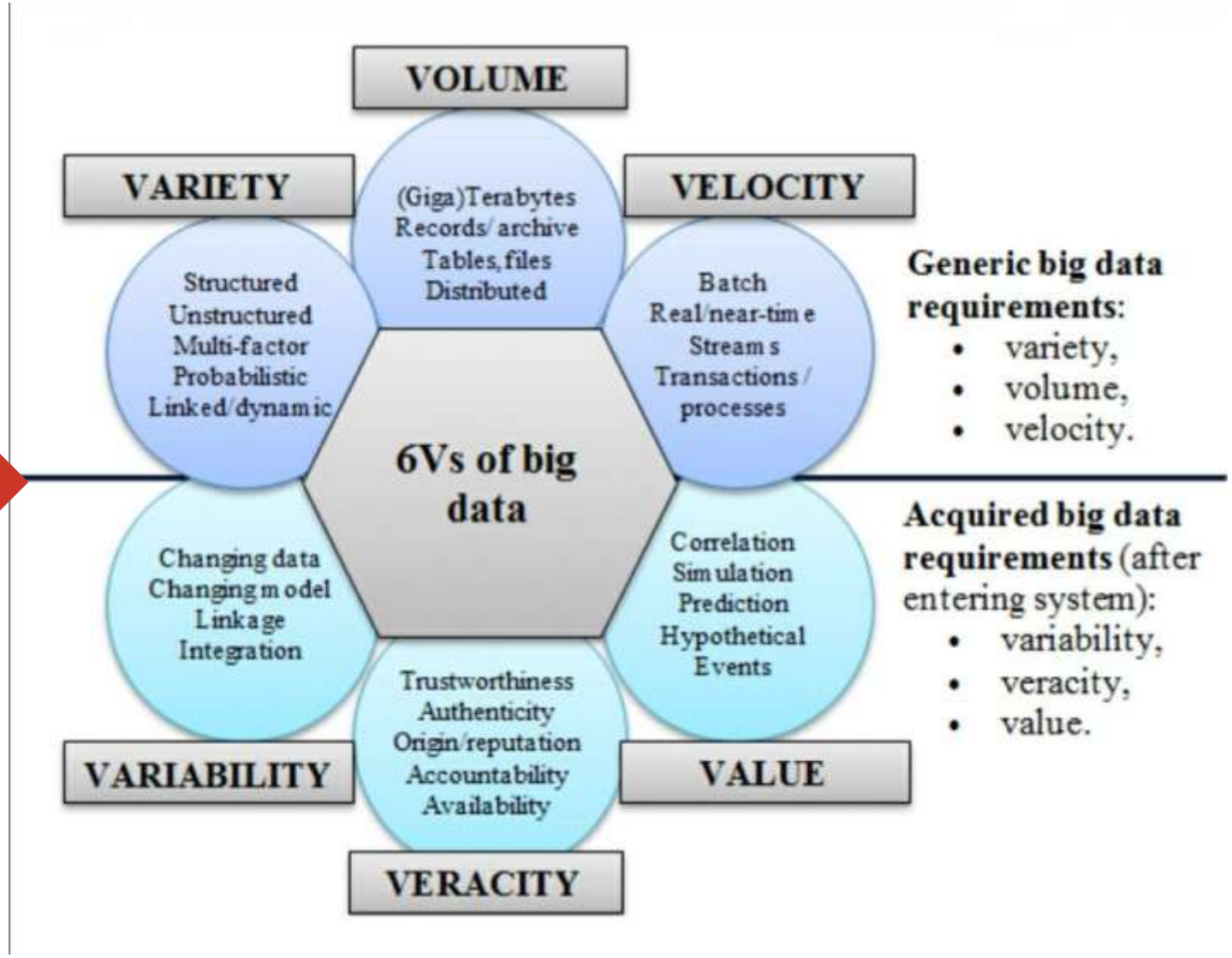
US Census, Dec 2020:
https://www.itprotoday.com/artificial-intelligence/census-data-finds-low-ai-adoption-rate-enterprise

Top 11 Myths about AI…

MYTH	FACT
Automation	Autonomous
Project	Process
Single Business Function	Enterprise-wide Initiative
People Replacement Tool	Augmented Decision Support systems
Self Starting	80% Learning, 20% Human Direction
Single Server Program	Comprehensive IT System
New Data	Existing Data
Not New	Statisticians have been doing it
Machine Learning	Pre-enablement process
Optimization	Post-enablement process
Hype	Reality

“Artificial intelligence is the capacity of a computational system to transcend manually created, hardwired logic.”

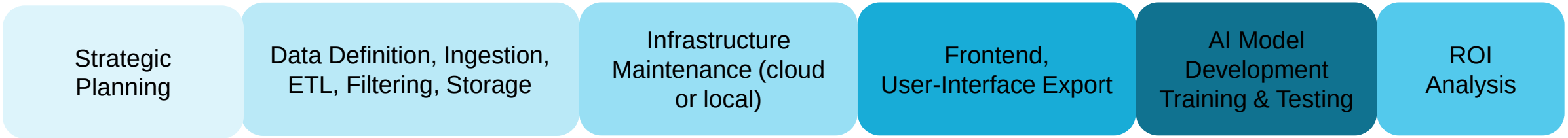
What is Big Data?



Common AI Mistake by most enterprises…

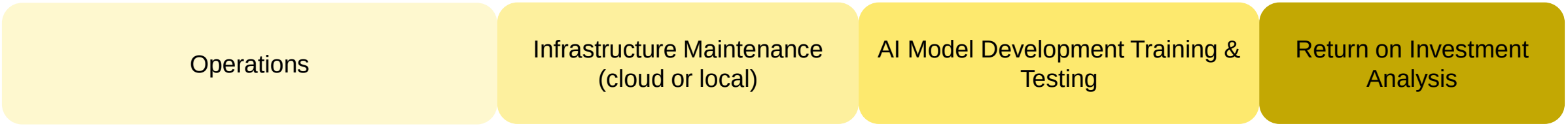
Where are the resources (time, cost) spent in developing an AI product?

Initial Launch



10-15%

Subsequent Iterations



20-25%

There is a clear case to be made for companies interested in availing AI to partner with firms that specialize in AI methodology, while they maintain focus on core business competency.

Risks associated with AI Solutions…

- ***Data dependency:*** AI systems are inextricably linked to the training data and rules that have been supplied. Biases, size, coverage, and missing values each have a deep effect on the performance.

- ***Cost function:*** For classifier systems, there is always a tradeoff between false positives and false negatives. Depending on the domain, it is critical to quantify this tradeoff. For example, in quantitative trading, false positives are very costly $; whereas in medical diagnosis false negatives are *potentially* a death sentence.

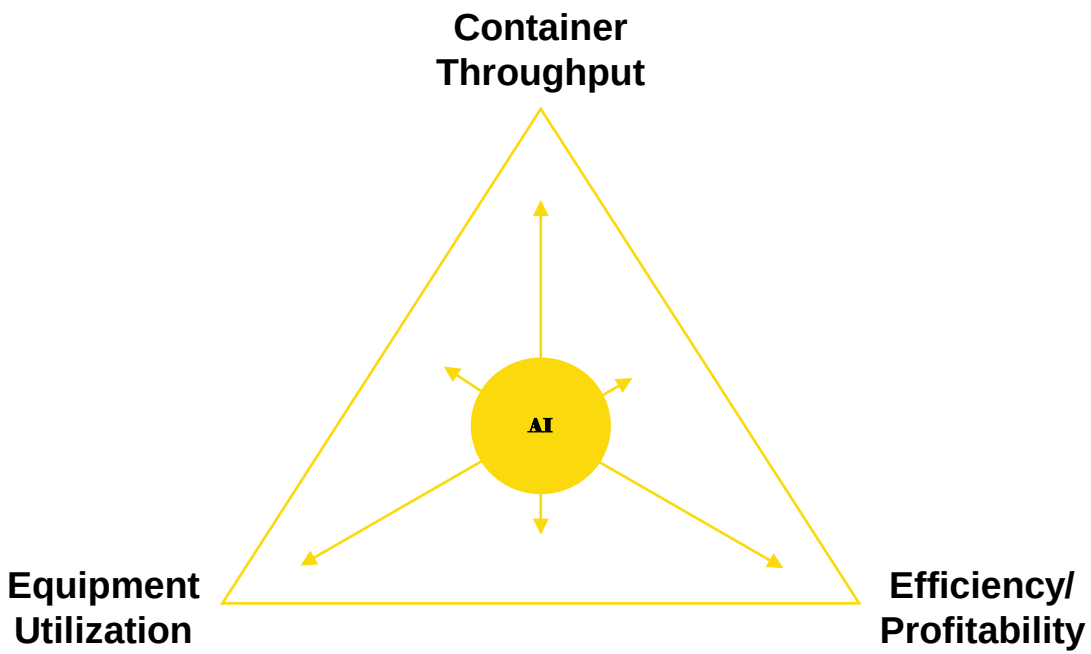
- ***Interpretability:*** For many types of AI such as deep learning models, Bayesian networks – the induced model is difficult – if not impossible – for humans to interpret. This also imposes a difficulty for human *feedback* in which business concerns require modifications to the behavior.

- ***Domain knowledge:*** Every business domain has its own set of intricate, non-obvious rules, constraints, and heuristics. Incorporating these into a production AI is always a challenge.

- ***Time:*** Production AI algorithms often require substantial amounts of time to train, and depending on the algorithm, once trained, may consume significant resources for processing queries (*response time*).

Practical Implementation of AI in Container Terminals

AI based Paradigm Shift



Customer Behavior

Before

Software and automation logic drives business KPIs

Now

Business KPIs drives autonomous logic

Customer Behavior

Before

Business KPIs were taken as static

Now

Business KPIs are dynamic and can be varied

AI Solution Suite for Terminal Operators

An easy to use
Innovative solution

Intelligent

Adaptive

Experience-Driven

AI solution have to work as a
Plug & Play solution within the existing eco-system**.**

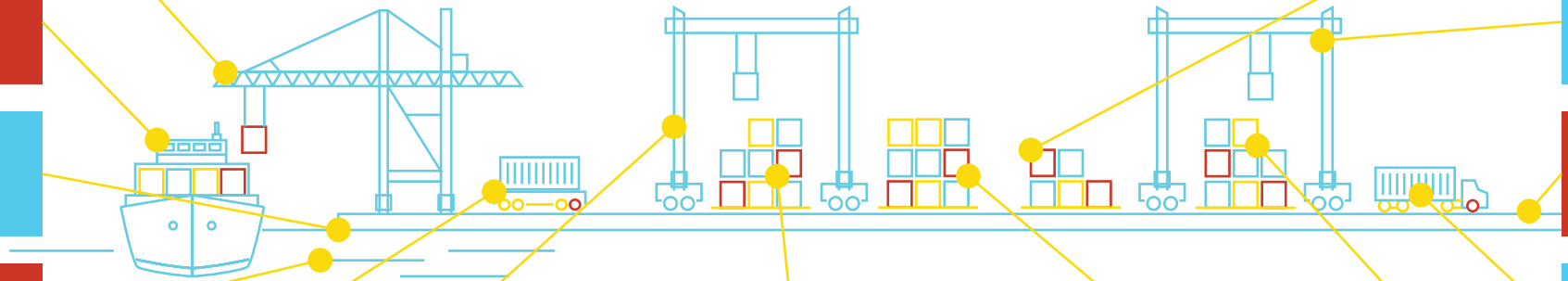
AI modules, assimilate data from TOS,
Management and Operational subsystems & external sources to **generate transparency** across the Terminal.

Breaking the “rules” of TOS, AI machine & deep learning algorithms quickly and continuously **adapt to changes in operations**.

AI has to be developed in **cooperation with Industry-leading Experts**, solving real pain points & delivering answers unavailable in the market.

Uncertainties and optimizations

Despite these challenges, ports are tasked with optimizing service to the lines and truckers consistently all while considering their impact on the environment and delivering profitability.



What is the minimal # of Cranes required to (un)load a vessel?

Will the Vessel arrive on posted time?

How to maximize berth allocation for (delayed) vessels

What happens if a channel closure impacts vessel departure?

How many internal trucks should support a Crane?

What happens if an equipment breaks down?

What is the most optimal path for an internal truck?

How to stack the containers to minimize unproductive moves?

How to find an incorrectly positioned or lost container?

Which operator can drive higher productivity for a given equipment?

How does external factors (weather, traffic etc.) disrupt operations?

How to predict external trucks or freight arrival?

What happens when a container is not picked on time?

UNCERTAINTIES

OPTIMIZATIONS

Implementing the 3-Step Autonomous Industrialization in Container Terminals

AI Solution Suite

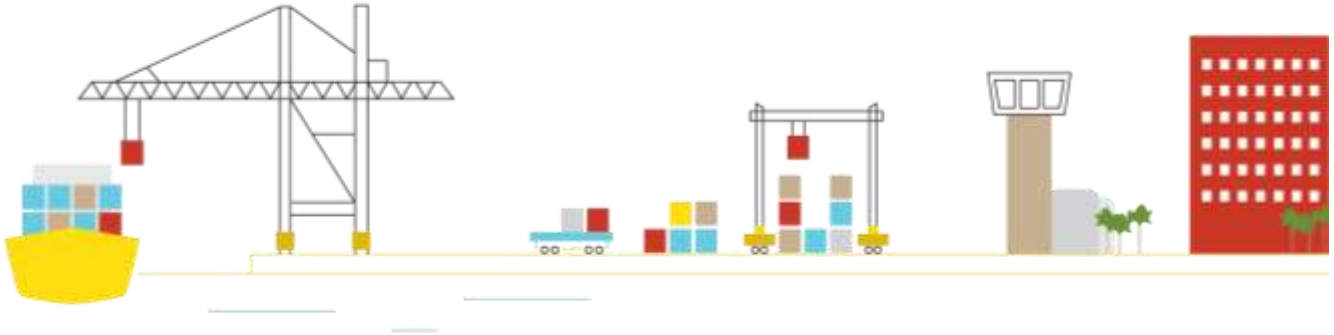
1 Data Assimilation

2 Process Digitalization

3 Operational Digital Twin

- ✓ Operational Data
- ✓ Weather Data
- ✓ Equipment Data
- ✓ Ext Truck Data
- ✓ Consigner Data
- ✓ Consignee Data
- ✓ Customs Data

Autonomous Operations



- ▶ Vessel Berthing
- ▶ Crane Allocation
- ▶ Container Stacking
- ▶ Routing & Scheduling
- ▶ Failure Prediction
- ▶ Operator Allocation
- ▶ Gate Planning

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The AiCON Solution Suite: Holistic Approach

VesselSight

Keep berthing opportunities in check

EquipmentSight

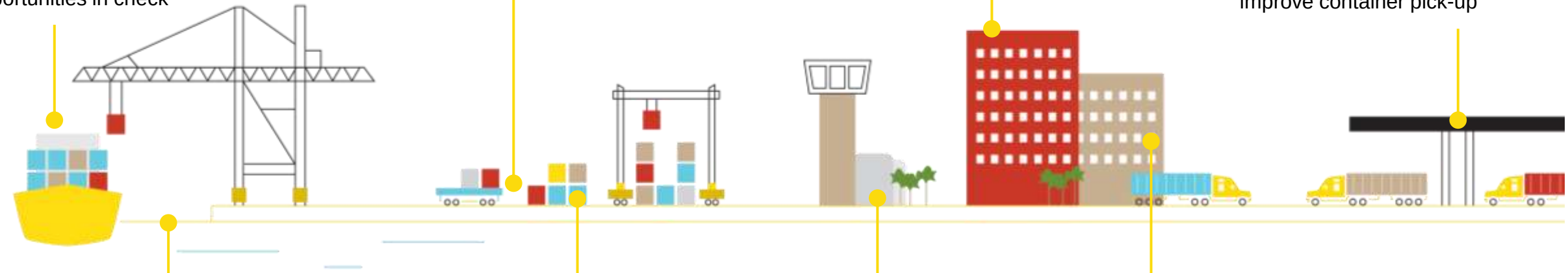
Predicting equipment failures to increase availability

PortSight

Exploring port analytics for informed decision-making

GateSight*

Coordinating operations to improve container pick-up



BerthSight

Real-time berth planning to maximize occupancy

YardSight

Optimizing container stacking to reduce unproductive moves

DispatchSight*

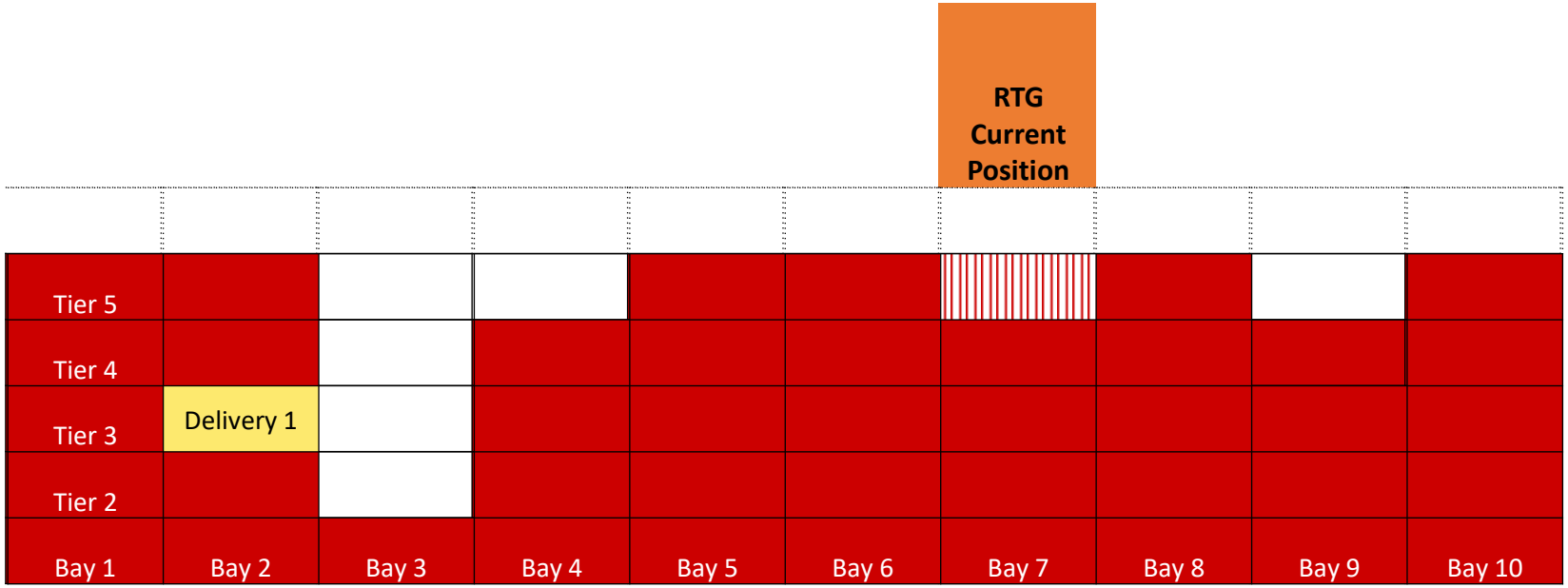
Synchronizing and scheduling equipment for efficient use

AlertSight

Monitoring log events to predict application status

** Beta Development*

Programmed Software vs. AI



TOS Optimizer will likely place container at Bay 7 Tier 5, as it's the shortest RTG travel distance

AI preplans for the future and will compute the total optimal position and will place the container at Bay 4

Horizontal

1. TOS will make a decision for decking position in yard based on distance that is good, but far from optimized solution:
    a. Due to congestion, roadway conditions and changes significantly – e.g., more than 2X to 3X that is
    b. AI optimize with in multi-dimension

AI versus TOS Optimization Modules

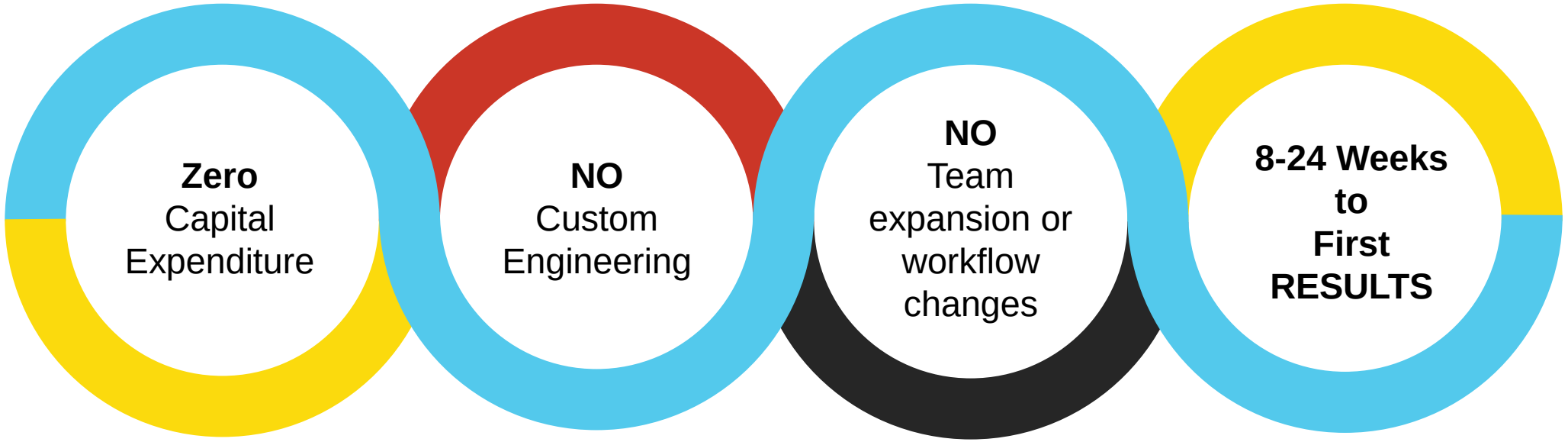
Programmed Software Systems and Optimization modules

- No real-time (dynamic) logic reconfiguration
- Manually Configured Engineering Rules
- Human Heuristics
- Assigns penalties for certain events
- Difficult to modify and adjust parameters for optimality
- Configuration parameters less effective or contradictory over time
- Manual update is limited to preprogrammed set of parameters
- Not adaptable

AI Yard Optimization

- Takes current state of Yard, Berth, and Gate into consideration for logic optimizaiton
- Set Business Rules , Engineering rules are derived
- Learns Terminal characteristics (eliminating penalties)
- Self optimizing and auto updated penalties based on terminal modifications
- Learn from all contributing factors - weather, traffic, operator performance
- Need minimal set of operational rules
- Adapts in Realtime

Preferred Deployment Mode



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