

Decision Making in Winery and Packaging Operations

Improving Production Performance using IIoT, Automation and AI

James Balzary



The image shows three large, vertical stainless steel fermentation tanks in a winery. Each tank has a large rectangular access door near the top and a circular hatch near the bottom. The tanks are connected by a network of pipes and valves. The scene is dimly lit with a blue tint, and the ceiling features a grid of recessed lighting.

We manufacture wine in a world that is rapidly automating and optimising....

Why is it important?

For Large and **Small businesses**



2019
>20%

Automated
Technologies

IDC FutureScope: Worldwide Digital
Transformation 2018. IDC

www.ailytic.com

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800,000

Automatable
Tasks

PwC The Future of Work: 2017



9%

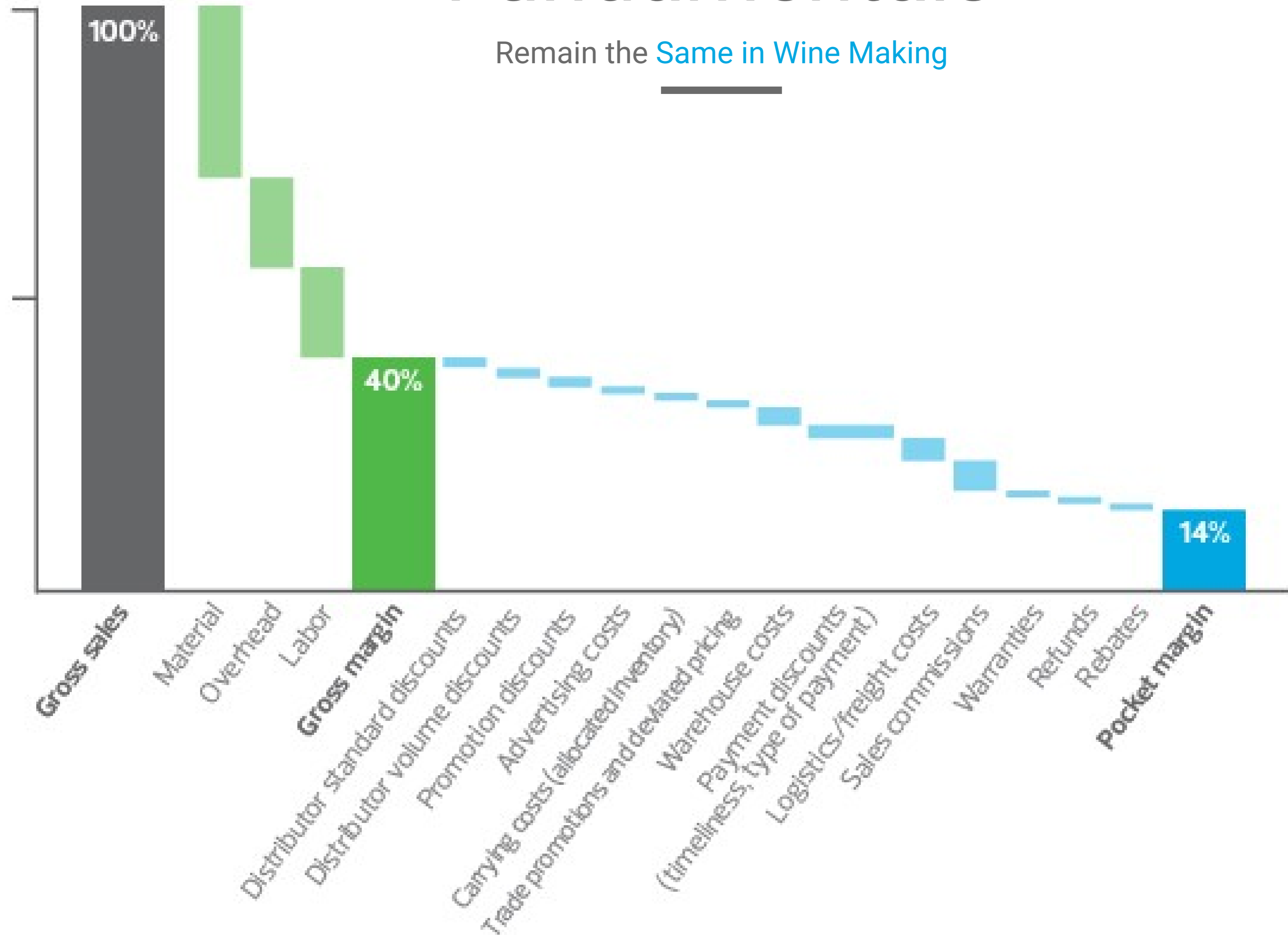
Investing in
Automation and AI

Alpha Beta Strategy and Economics
Report: The Age of Automation 2017



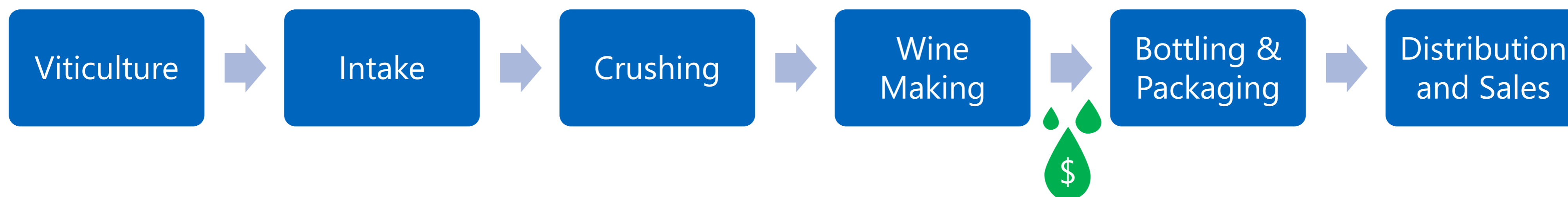
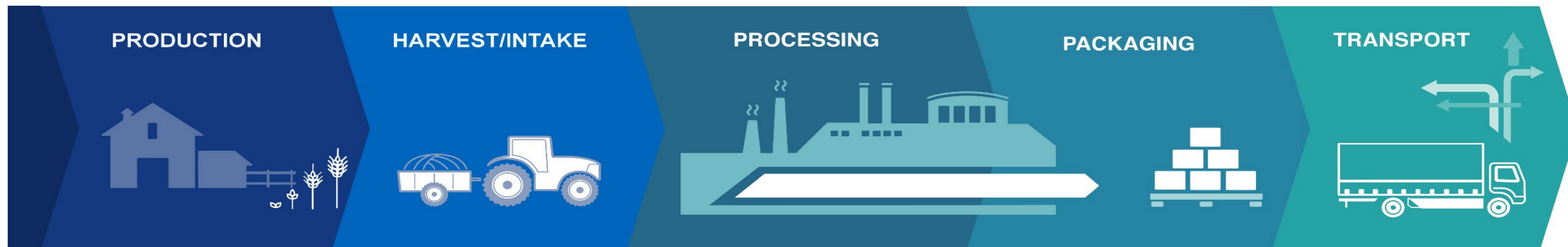
Fundamentals

Remain the **Same in Wine Making**



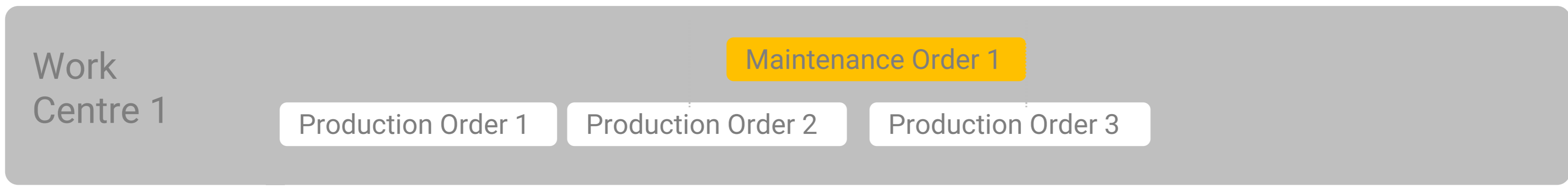
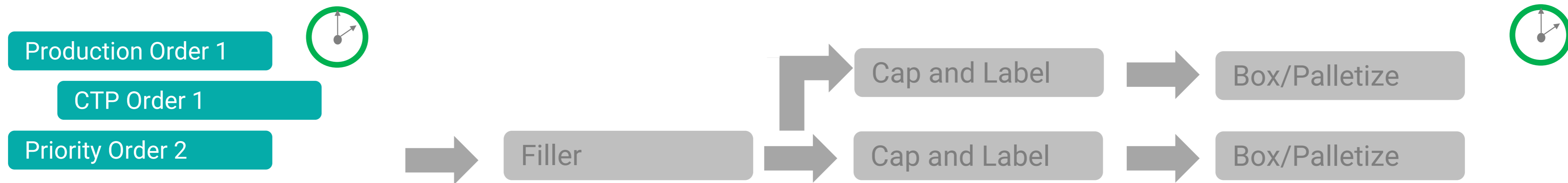
Value Leaks

Typical Supply Chain and Production Environments



Value Leaks

Operational and Organisational



Value Leaks

Resource Management

Strategic:

- Network Capacity
- Capital works
- Intake Optionality

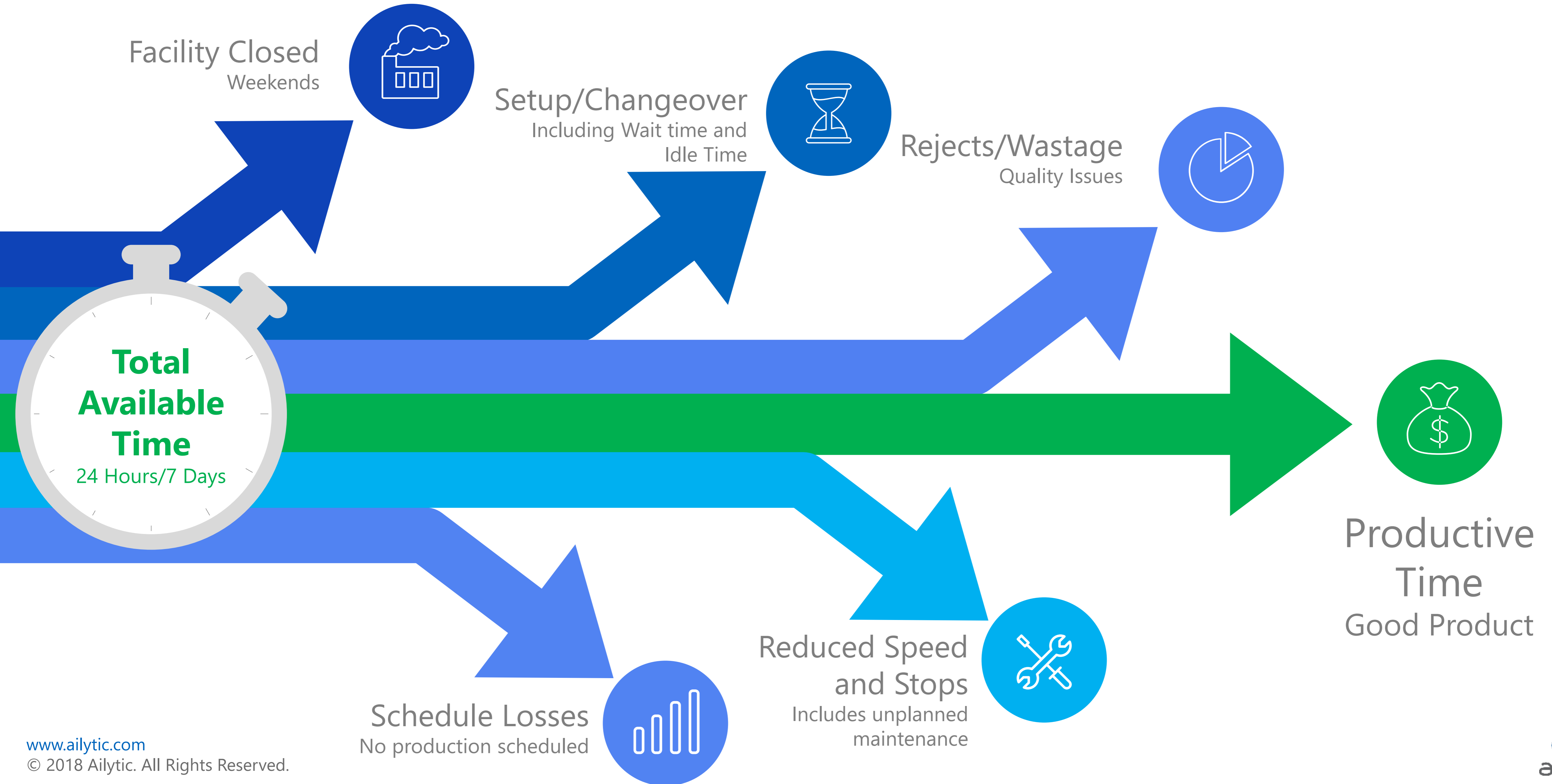
Tactical:

- Winery Workload
- Labour
- Equipment

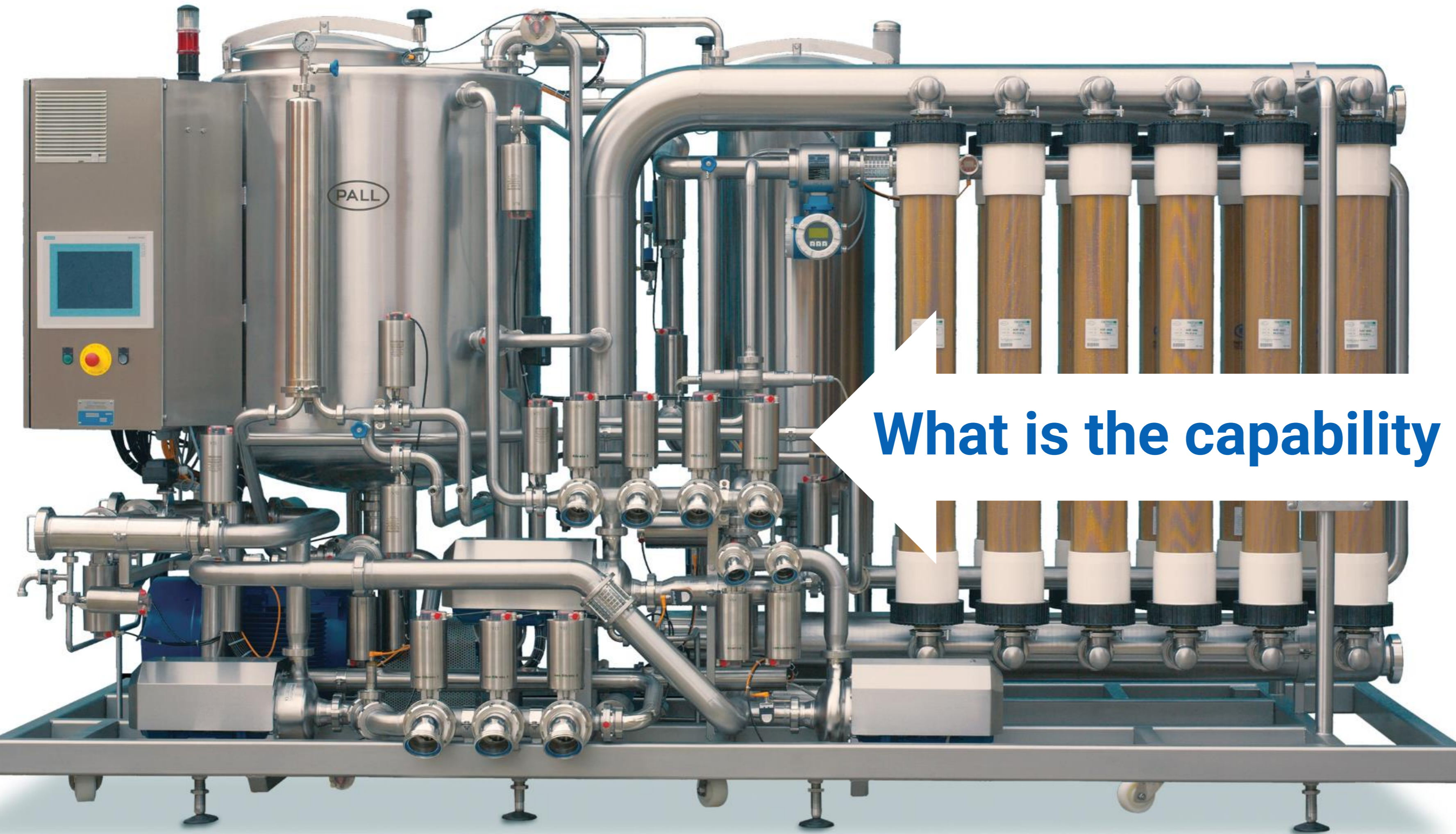


TEEP/OEE Drivers

Increasing Productive Time



Common Knowledge Gaps



What is the capability of this machine???

Decision Making Puzzle

Can Intuition destroy value??



Four travellers approach a bridge...

Each travels at a different speed:

A – 1 minute

C – 5 minutes

B – 2 minutes

D – 10 minutes

Challenge: schedule the travellers to minimise the total time to cross the bridge

Notes:

- Travel at night
- Only one torch
- Maximum 2 travellers on the bridge at a time and they have to walk together with the torch
- Can only cross at the speed of the slowest person in a pair
- No tricks

Decision Making

Intuition

A possible solution:

A & B	↑	2
A	↓	1
A & C	↑	5
A	↓	1
A & D	↑	10

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where: $A = 1, B = 2, C = 5, D = 10$

Heuristic: use the fastest traveller as much as possible

Decision Making

Intuition often destroys value

An optimal solution:

A & B	↑	2
A	↓	1
C & D	↑	10
B	↓	2
A & B	↑	2

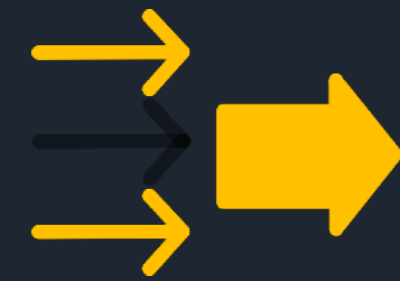
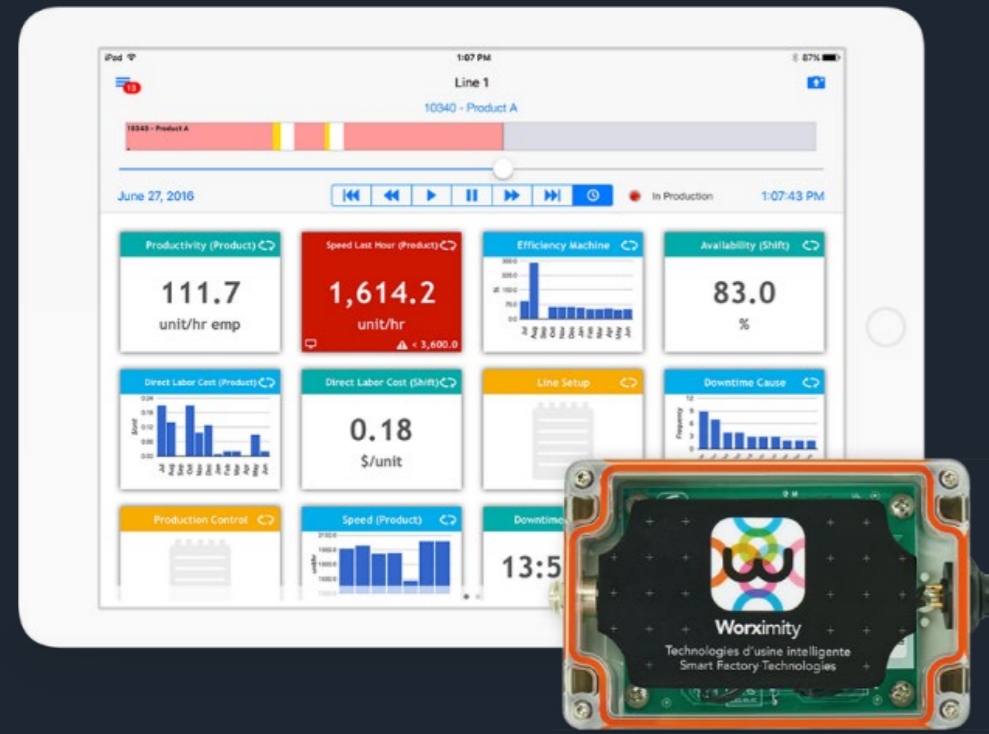
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where: $A = 1$, $B = 2$, $C = 5$, $D = 10$

Heuristic: match the speed of the travellers as much as possible

Approach

Stages to Optimal Decision Making



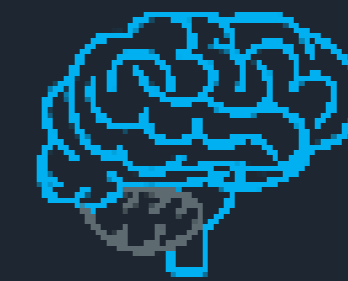
SENSE

Real Time Data Capture



ANALYSE

Data Analytics with Prediction



OPTIMISE

Intelligent Optimisation



DECIDE

Flexible and Dynamic scheduling

IIoT

Smart Sensors



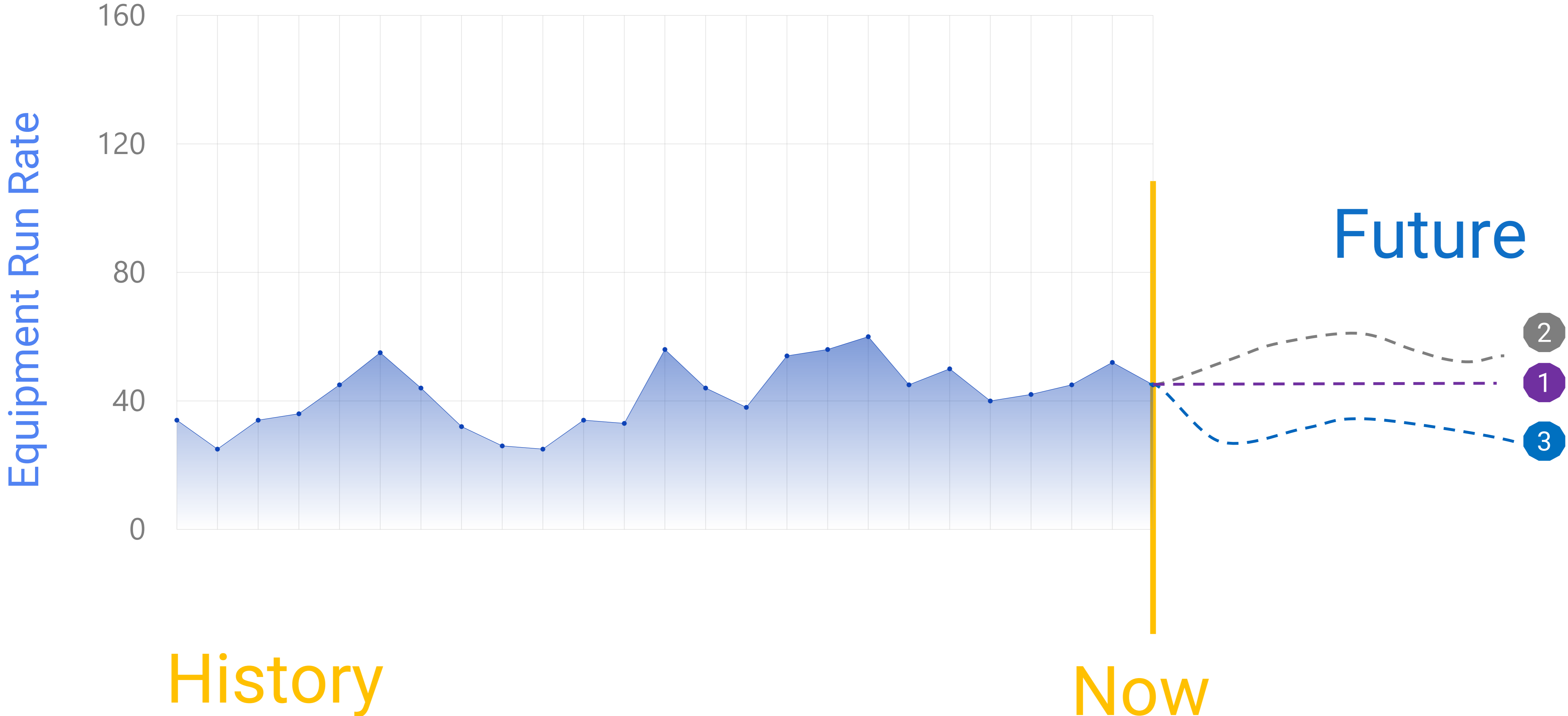
Accurate Performance Data

Continuous Improvement



Predictive Capabilities

For more accurate decision models




History

Now

Future


Optimised Schedules

Accurate Modelling of all Resources



July - August 2018

Scheduled Orders (27)



Filter Orders...

01/06/2018

Name	Wed 27/06		Thu 28/06				Fri 29/06		
Filter Resources	12:00	18:00	0:00	6:00	12:00	18:00	0:00	6:00	12:00
Machine Group 1	Code: 100671839 Details: 300 x 27483		Code: 100671840 Details: 420 x 27485				Code: 100671842 Details: 420 x 27485		
Machine Group 2	Code: 100671839 Details: 300 x 27483		Code: 100671863 Details: 450 x 27608				Code: 100671842 Details: 420 x 27485		
Machine Group 3	Code: 100671839 Details: 300 x 27483		Code: 100671863 Details: 450 x 27608				Code: 100671842 Details: 420 x 27485		
190 WIP BOWL (Tool)	Code: 100671839 Details: 300 x 27483		Code: 100671863 Details: 450 x 27608				Code: 100671842 Details: 420 x 27485		
35L WIP BOWL (Tool)	Code: 100671839 Details: 300 x 27483		Code: 100671863 Details: 450 x 27608				Code: 100671842 Details: 420 x 27485		

Order	Order Item	Quantity	Start Time	End Time	Earliest Sta...	Due Date	Personnel	Equipment	Properties
100671837	27426	150	25/06/2018...	25/06/201...	26/06/2018	27/06/2018	0	2	i
100671838	27416	500	25/06/2018...	27/06/201...	27/06/2018	28/06/2018	0	2	i
100671839	27483	300	27/06/2018...	28/06/201...	27/06/2018	28/06/2018	0	2	i
100671840	27485	420	28/06/2018...	29/06/201...	28/06/2018	29/06/2018	0	2	i
100671842	27425	420	29/06/2018...	2/07/2018 ...	28/06/2018	29/06/2018	0	2	i
100671844	27424	420	2/07/2018 ...	3/07/2018 ...	29/06/2018	2/07/2018	0	2	i
100671846	27546	200	3/07/2018 ...	3/07/2018 ...	3/07/2018	4/07/2018	0	2	i
100671849	27324	300	5/07/2018 ...	5/07/2018 ...	5/07/2018	5/07/2018	0	2	i
100671853	27547	40	22/06/2018...	22/06/201...	22/06/2018	25/06/2018	0	2	i
100671855	27558	100	22/06/2018...	22/06/201...	22/06/2018	25/06/2018	0	2	i



Levels of Maturity

Planning

(Automatic) Optimised Planning & Scheduling

Automatic generation of optimized plans based upon constraints

(Automatic) Rule Driven Planning & Scheduling

Automatic generation of feasible plans based upon rules

(Manual) Constrained Planning & Scheduling

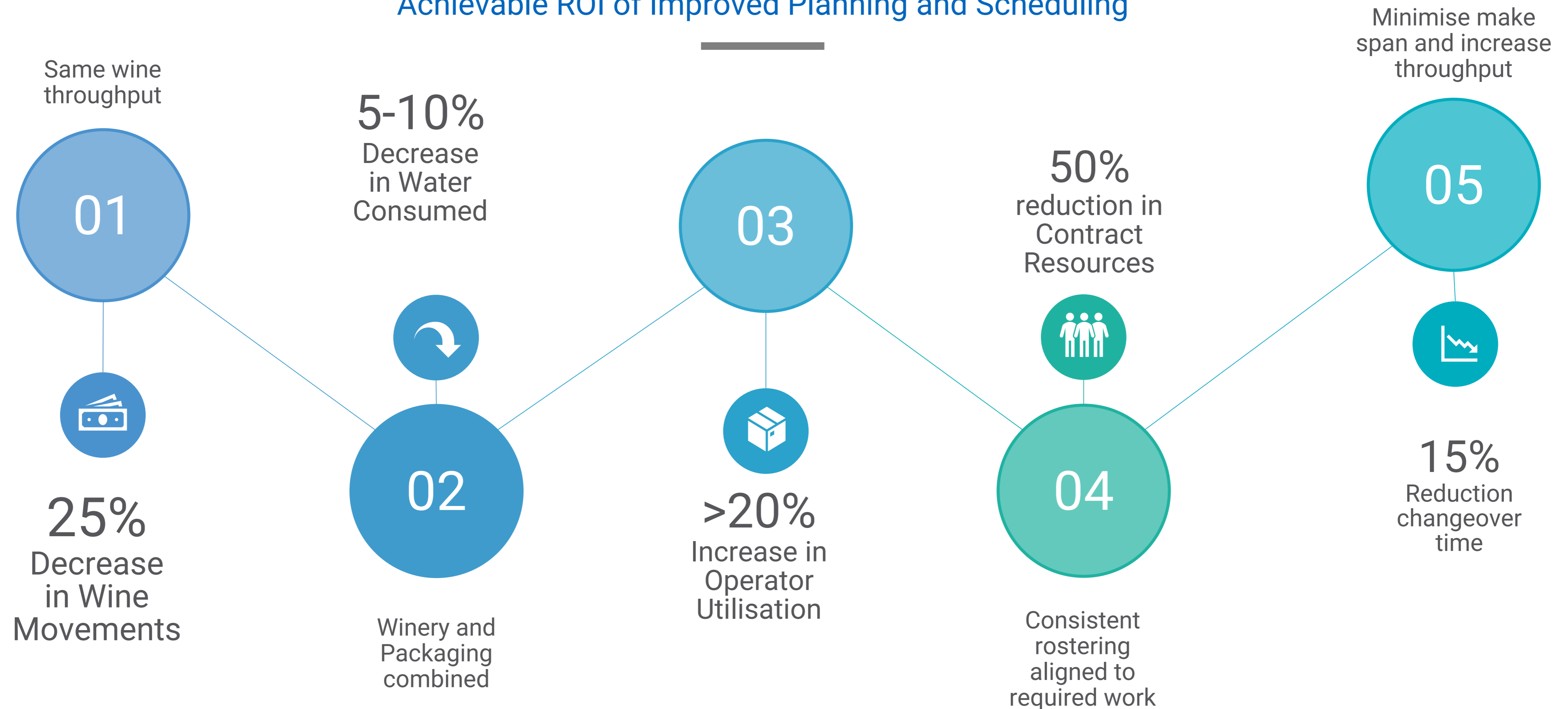
No constraint violations allowed while manually planning & scheduling

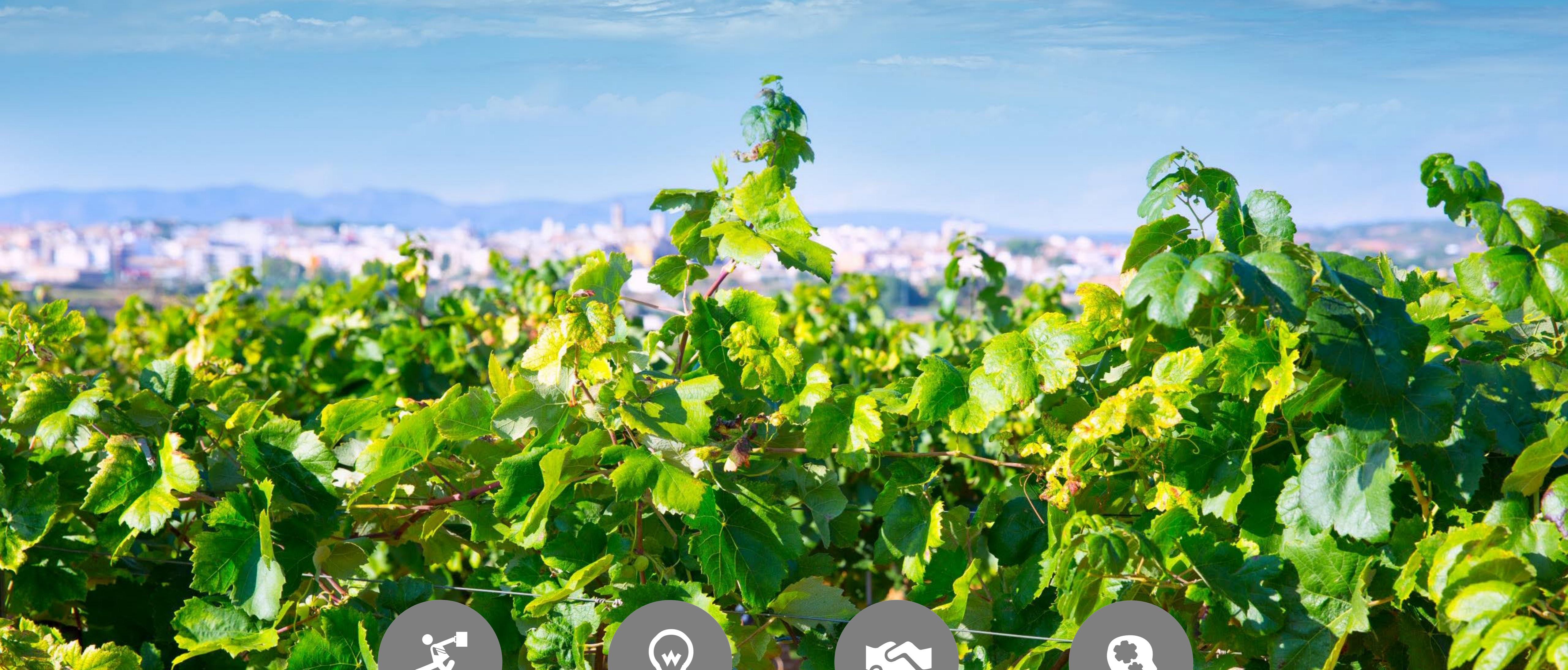
(Manual) Unconstrained Planning & Scheduling

Manual process, provides better visibility, but requires constraint checking

Benefits

Achievable ROI of Improved Planning and Scheduling





**Model
Accuracy**



**Integrate and
Optimise**



**Consensus
Visibility**



**Execution
Analysis**

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