

Challenge Statement: Modernise capacity planning approach through the development of a new capacity model

New capacity model should...

- Reduce time to model
- Ensure high realism
- Identify better ways to schedule

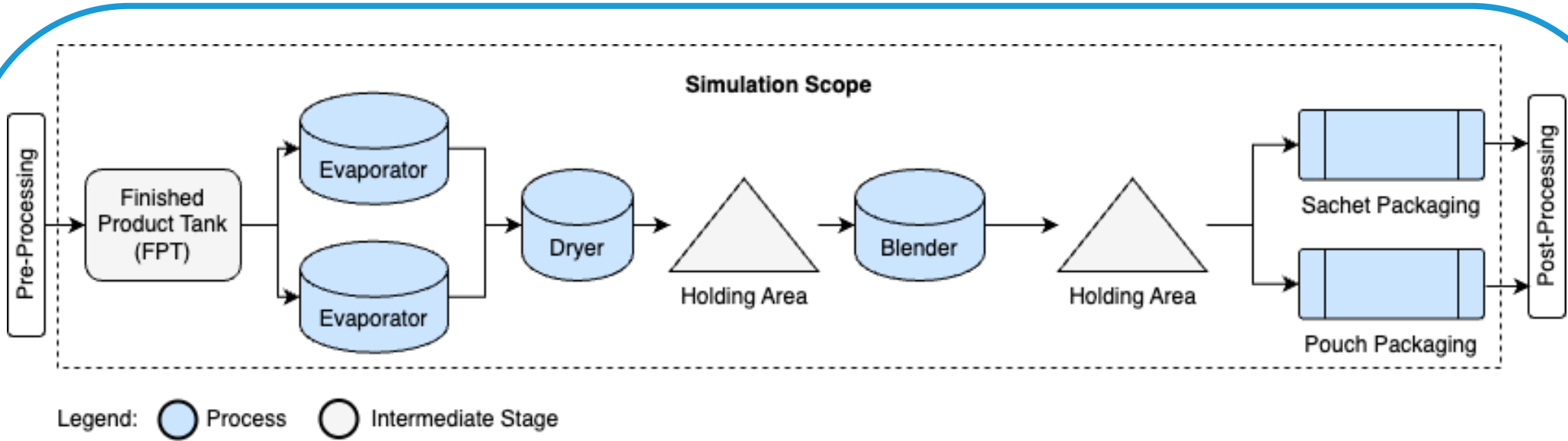
This can be achieved with...

- Automating processes
- Using statistical distributions
- Scenario analysis

Project has...

- Implemented automation scripts (M1)
- Applied probabilistic models (M2)
- Tested different crew schedules (M3)

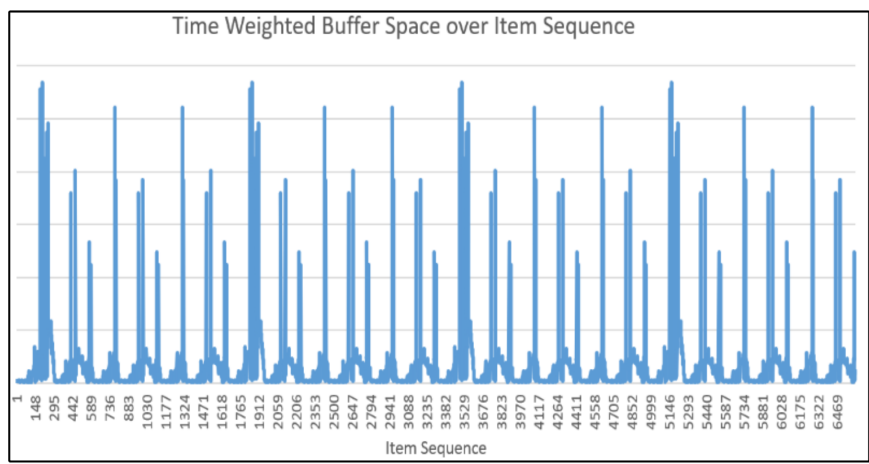
M1: Simulation Building



- Input model auto-tags products family group to determine required key processing information at each equipment
- Key components of model:**
- Queues: Prevent overcapacity
 - Databases: Record events sent from processor, important for event triggers (e.g. conditional cleaning of equipments)
 - Processors: Update item status in database to reflect processing changes

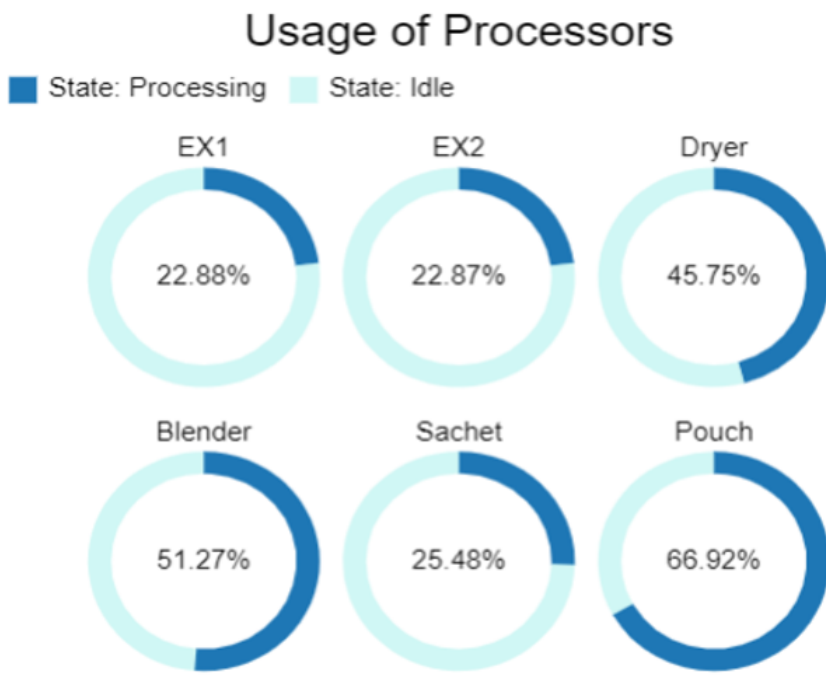
Model Validation

When compared to actual schedule, simulated total run time has a discrepancy of 0.0019%



Results¹

Processor utilisation rates highlight potential areas for optimisation



1: Not reflective of actual conditions for confidentiality

M2: Enhance model realism with statistical distribution

Situation

Single point estimates used limits model realism

Approach

Integrated ABT's empirical run time data for various products into the model

Impact

Model reflects more accurately actual production conditions

Insights²

- Probabilistic model runtimes closely match deterministic model
- Probabilistic model shows a higher mean efficiency rate than deterministic model
- Identified equipment that is pivotal to overall productivity

2: Figures have been sanitised for confidentiality

	Deterministic	Probabilistic (Pouch variability)	Probabilistic (Dryer & Pouch Variability)
Mean	1,796.5	1,796.4	1,796.1
Variance	0.0	0.1	1.7

M3: 'What-if' Analysis

Approach

- Scenarios: 5-7 operating days/week.
- Conducted 100 replications (automated) for validation
- KPIs: Median total run time, IQR

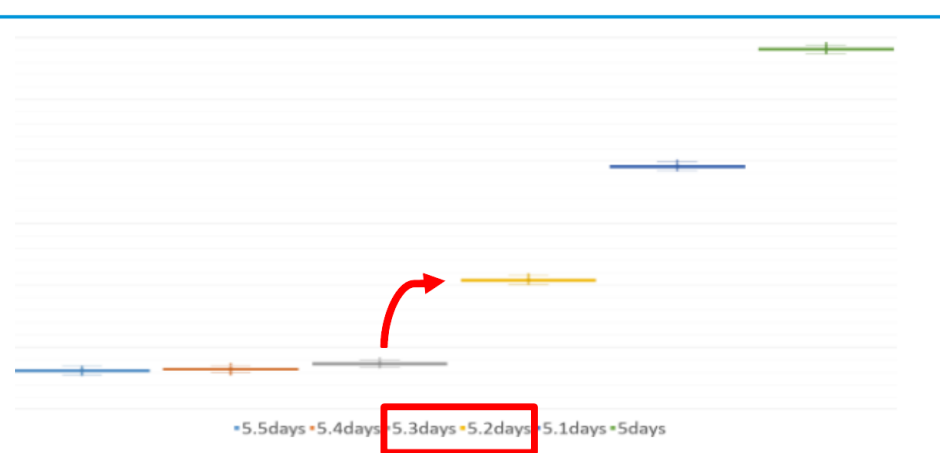
Insights

- Reducing crew workdays to 5.3 showed minimal impact on median run time, implying a feasible shorter week without efficiency loss.
- Variability in runtime rose with fewer days, especially below 5.3, suggesting a critical boundary where processes may lose effectiveness.

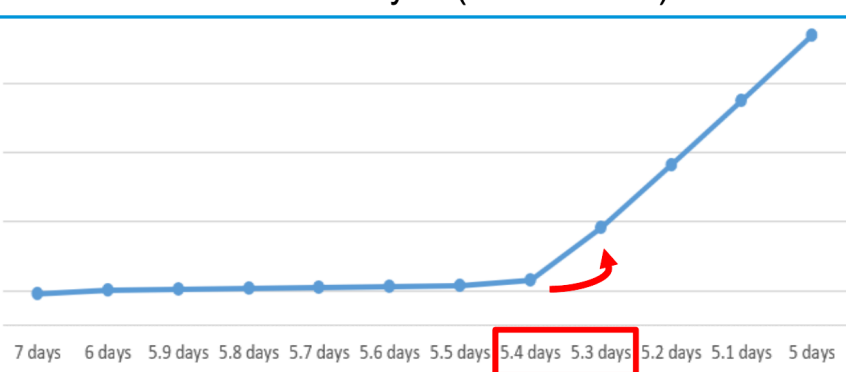
Recommendations

Opportunity to reduce operational days up to 5.3 days without production impact.

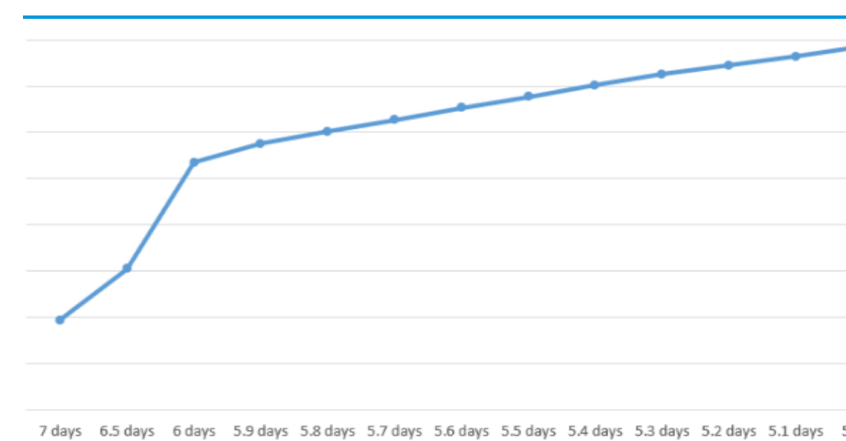
Scenario Analysis (Probabilistic)



Scenario analysis (Deterministic)



Time Weighted Buffer Space Usage



Limitations

Model limited to current products; updates needed for new integration

Future Directions

1. Perform more scenario analysis
2. Expand scope of simulation

ISE Skills

Simulation design & modelling
 Statistical analysis