milestone report

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Digital Value Chain Strategy Development and Digital Officer

Milestone 13 – Digital program development and implementation (Public)

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Abstract

Coles' Retail Ready Operations Australia (RROA) is building expertise and resources to enhance digital capability, specifically through the provision of advanced analytics of datasets, in order to gain new business insights. The goals are to analyse the value in linking existing and new company data with other data sets and mining the data in order to generate value and new opportunities. Specifically, RROA's priority is to build expertise and resources to enhance digital capability, specifically through the provision of advanced analytics of datasets in order to gain new insights for the business. The goals are to analyse the value in linking existing and new company data with other data sets and mining the data in order to generate value and new opportunities. RROA and MLA have agreed to progress a Collaborative Digital capability building Program over a three year period.

The initial stage of the project (Milestones 1, 2, 3, 4, 5,6,7,8,9, 10,11, 12 & 13) were successfully completed with the following deliverables being achieved:

- Finalise position description & commence recruitment.
- Company / MLA steering committee formed
- Draft RROA Co-Innovation Strategy including RROA's draft digital strategy and collaborative priorities – To be approved by the project steering group.

The portfolio of digital opportunities that the business will target, to implement its Partnership and Digital Transformation Strategies, will evolve over time as new opportunities arise, or as projects are completed or retired. Thus, this list below, will continue to be updated across all the milestones.

- **OEE**: Automation of OEE measurement and reporting across the RROA site production lines
- **Master Data Management Solution**: An open-source, cost-effective software data management system to replace excel management and as an alternative to costly ERP systems
- **Analytical Services Review**: A scope of works was defined to make progress on improving the usability of both RROA's operational data and archived data for improved reporting and analytics
- **Yield and Material Management**: Centralise the capture of material usage and organisational standards in a central repository to enable improved analytics
- **Building Management System with Advanced Data Analytics:** Using deep learning and AI to monitor and report on plant power issues. This system will reduce power costs and reduce damage to plant equipment from "noisy" power.
- **KPI Dashboards**: Consolidate and then leverage the plant SCADA to provide live KPI dashboards on each production line
- **Vision Systems:** Manage packaging inspection coupled with automated access and recipe modification logging/auditing to provide full a Quality Control Point (QCP) to eliminate withdrawal/recall incidents caused by incorrect product labelling.
- **Supplier Grading:** Data Analysis of JBT's DSI waterjet portioner fat metrics in order to grade suppliers and optimise SKU yields.
- **RCA Capability Through Systematic Data Capture:** Enhance organisation performance through the systematic capture of root cause data by centralising and improving accuracy of result data.
- **Analytical Support Tools:** Deliver an analytical support tool to deliver reporting, visualisation and improved access to data – currently shortlisted as Grafana and Power BI

- **Product Specifications**: Centralise the capture of product content specifications in a central repository to enable improved analytics.

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1 Project Background, Objectives & Outcomes

1.1 Background

RROA is one of Australia's larger value adding processors and is currently reviewing and evaluating options to integrate their data capture and analytical capabilities aligned with their data transfer needs. The purpose of the proposed project is to provide resourcing to develop and deliver data management and analytics solutions and build on current capabilities in data capture, management and analysis, to allow RROA to define the various processes, technologies and required metrics for optimal running of meat and livestock value chains at best practice levels. It is proposed that a Digital Officer be deployed to develop and implement RROA's digital strategy. The Digital Officer will be responsible for management and implementation of all digital initiatives undertaken over the initial three years.

This project will inform the digital strategy for RROA's supply chain. It will provide an invaluable case study for the remainder of industry. The process, tools and material developed under this project would become available for use in the wider industry. Industry will also be able to feed into this project, tools and extension materials, for testing and verification. Critically this project will allow for the analysis of the impact of adoption to be quantified through feedback channels, which will help drive similar models across industry.

1.2 Objectives

The overall objective of this work will be to develop a digital strategy and evaluate the feasibility and commercial options of data capture, management and analytics across the businesses. The primary goal is to provide support in the form of a dedicated Digital Officer resource to deliver data capture and analytics processes to allow the Australian Meat and Livestock Industry to define the various processes and required metrics for running red meat value adding production facilities through to the (Coles) customer.
Specific objectives of the project in providing a dedicated Digital Officer role will include (but are not limited to):

- Detailed data capture and management mapping exercise of RROA using existing evaluation tools developed by various providers.
- Identify gaps in existing capabilities and capacities in data capture and management.
- Evaluate and deliver a data warehousing solution that accommodates timely, diverse data and formats.
- Evaluation of greater insights into market demand and supply, pricing trends, consumer trends.
- Evaluation of the outcomes of the production pilot data management system and extrapolation across the value chain.
- Advise on a series of identified new data sensing devices and analytics to fill current production data sensing gaps.
- Evaluation of the outcomes of the production data management system and extrapolation across and integrated value chain where applicable.
- Manage third party independent review of the feasibility, cost benefit and business case associated with adoption of integrated data management system for adoption across the entire value chain.

This project will bring new data streams and significantly increasing its impact across the business.

1.3 Outcomes

The expected outcome is to develop and implement RROA's digital strategy across the business with a specific focus on secondary manufacturing, material sourcing and supply chain effectiveness. This will be managed through the provision of new data capture and storage methods and advanced data analytics to generate new insights for the business, including:

- Enhance existing production management reports to provide feedback to Coles' value chain from properties, primary processors through to customer.
- Evaluate feasibility of collecting data and reporting on other issues that could affect yield and grading outcomes.
- Review current production management systems and how they can evolve to use feedback from processors.
- Develop tools that RROA can use to maximise the benefit of feedback.
- Identify relevant external tools and systems and implement in the supply chain as required.
- Identify supply chain champions who are willing to trial innovative practices.
- Benchmark production practices at the commencement and then measure annually to assess productivity improvements and provide case studies for other value adding operations to follow.
- Evaluate data management processes and systems using various data management tools to capture and collect data

The contribution of the RROA Digital Officer to the overall success of the Digital Strategy will be determined by:

- Evidence of effective implementation of RROA Digital strategy in agreed areas.
- Evidence of improvement in company innovation culture and capability.
- Quantifiable improvements in company innovation measures (as agreed).
- Efficient project delivery in accordance with budgets and timelines.
- Quality of reports.
- Contribution to Digital Officers Networks

Final report:

The Final report must:

- be submitted in accordance with MLA's style guide and report guidelines (available at http://www.mla.com.au/Research-and-development/Project-reporting-templates).
- include sections that address all the items in the Objectives.
- be supplied in electronic Microsoft Word format.
- include any associated material such as spreadsheets, decision support tools, multimedia either within the report or as separate electronic files
- duly acknowledge participating producer groups, Research Organisation(s), Consultant(s) and Funding Contributors (including the Commonwealth Government).

MLA is committed to demonstrating transparency and communication of our R&D activities to stakeholders. Separate confidential and non-confidential versions of the Final report may be provided if a single report cannot be published on MLA's website.
New technology: Nil
Commercialisation/Dissemination Strategy: Nil
Other comments: Nil

2 Methodology

2.1 Milestone 1 - Finalise Position Description

Finalise Position Description - ACHIEVED

Position Title:	**Digital Officer**	**Location:**	54 Templar Road Erskine Park
Department:	Supply Chain	**Pay Grade:**	PG 9
Reports to (Title):	Enterprise Planner	**Direct Reports (Title):**	N/A

Organisational Environment

Retail Ready Operations Australia (RROA), is the first Coles' owned retail ready meat facility. Based at Erskine Park, our new site is highly automated, sophisticated and equipped to global best practice. We have a strong focus on team member safety, quality and continuous improvement whilst ensuring that customers' security of supply, quality, availability of product and value for money expectations are met.

We are committed to building an environment where all team members genuinely feel included and valued and our Code of Conduct, Values and Behaviours shape the way we behave in this environment.

Primary Function

Coles' Retail Ready Operations Australia are looking to build expertise and resources to enhance digital capability, specifically through the provision of advanced analytics of datasets in order to gain new insights for the business. Goals are to analyse the value in linking existing and new company data with other data sets and mining the data in order to generate value and new opportunities.

The role is part of an adoption strategy for the Coles supply chain but also part of a collective investment by the Red Meat industry in technology and systems that will generate more and more data for use by supply chain participants. With the aim of using data and analytics to improve performance (and profitability) and to ultimately improve the optimisation of the supply chain. The challenge of presenting complex information in a simple and actionable way is significant and this project is exactly the type of strategy that is required for supply chains to be successful in the longer term.

Focus Area	Outcomes	Key Accountabilities
Digital Capability	Comprehensiveness of gap analysis and benefits analysis Delivery of new data capabilities and associated new capabilities	• Identify leading practices in data sharing, analytics and collaboration between retailers and meat processors • Conduct routine gap assessments on capabilities and define requirements to deliver requirements and investigate alternative solutions • Enhance visibility of mechanical and supply chain data and apply new analytical methodologies to improve management decision making and focus continuous improvement initiatives relating to yield and waste reduction throughout the production process • Source data from primary or secondary sources to build a more comprehensive data model • Investigate opportunities to deliver real-time operational monitoring of productivity, yield and machine downtimes with the intent of installing new capabilities to reduce the response time to correct exceptions on cost or waste • Work with SMEs to understand and clean data as well as develop insights into business processes to suggest improvements • Develop custom data models and algorithms to apply to datasets Develop processes and tools to monitor and analyze model performance and data accuracy
Analytical Insights	Quality and accuracy of insights Benefits derived from analytical projects	• Work with stakeholders throughout the organization and industry to identify opportunities for leveraging company data to drive business solutions. These may include, but not limited to: o Investigate opportunities to improve product freshness by measure latency and dwell of materials within production facility and wider the supply network o Investigate opportunities to improve supplier quality and performance by generating insights from production data focusing collaborative and data-driven initiatives focusing on yields, productivity and consistency o Identify relevant external tools and systems and implement in the supply chain as required • Identify local champions who are willing to trial innovative practices • Coordinate with various functional teams to implement models, incorporate insights into managerial decision making and monitor outcomes
Delivery	Existence of comprehensive documentation regarding	• Collaborate with organizational stakeholders and industry representatives to priorities and evaluate analytical projects to maximize returns where outcomes may not necessarily be clear on commencement • Develop extension material related to delivery of key initiates and the development of potential or new capabilities

	organizational data and models Delivery of workshops and extension material	• Deliver producer workshops covering the feedback and learnings from insights, processes and capabilities implemented by the role • Catalogue available data and metadata for reference and maintain documentation on core processes and models • Maintains professional and technical knowledge by attending educational workshops; reviewing professional publications; establishing personal networks; participating in professional societies

2.2 Milestone 1 - Commence Recruitment

Commence recruitment of the Digital Officer – ACHIEVED

2.3 Milestone 1 - Form Steering Committee

Form RROA / MLA steering committee – ACHIEVED

The Steering Committee members are as follows:

RROA members

- Larry Kavanagh – General Manager
- Suvir Salins – Digital Officer
- Patrick Youil - Head of Supply Chain and Transition
- Jordan McIntyre – Co-Innovation Manager/Enterprise Planner
- Mitchell Crowe – Principal Automation Engineer

MLA members

- Richard Apps
- Dean Gutzke
- Darryl Heidke
- Michael Lee

2.4 Milestone 1 - Overarching Goals, Metrics and Outlines

Set overarching goals, metrics and outline (to be presented to the Steering committee for input and signoff) – ACHIEVED

2.4.1 Overarching Goals

The overarching goal is to build expertise and resources to enhance digital capability, specifically through the provision of advanced analytics of datasets in order to gain new insights for the business and to analyse the value in linking existing and new company data with other data sets and mining the data in order to generate value and new opportunities.

2.4.2 Metrics

Required metrics for optimal running of meat and livestock value chains at best practice levels will be linked to the three year Coles meat strategy which encompasses both local and export market opportunities. This role will crystallise this strategy and link supporting co-funded projects to deliver the red meat growth agenda for Coles' supermarkets around innovation in packaging, quality, and cost improvements (See Appendix 1 in Section 5.1).

2.4.3 Outlines

The Coles RROA / MLA overall three year plan detailed in Appendix 1 (See Section 5.1) will be further enhanced over the coming months to extend coverage across a five-year horizon, with defined projects and initiatives that will deliver innovation, drive down costs and improve shelf-life and presence of Coles red meat products with a primarily export growth focus. As part of this overall strategy, the Digital Solutions strategy outline is detailed with a focus on planning optimisation tools, end to end carcass balancing, enterprise resource planning and integration of customer feedback into production decision making.

2.5 Milestone 2 – Appoint Suitable Candidate

Appoint suitable candidate – ACHIEVED

The Digital Officer role has been filled by Suvir Salins of Meehan & Associates.

2.6 Milestone 2 – Develop Framework for Digital Strategies

Develop framework for development and implementation of red meat digital strategies – ACHIEVED

With the formation of the steering committee, Digital Officer and the existing Collaborative Innovation Strategy (Appendix 1), a suitable framework has been developed within which the development and implementation of red meat digital strategies can be actioned.

2.7 Milestone 2 – Target Digital Application List

Define preliminary list of target digital applications - ACHIEVED

The Digital Officer in conjunction with the steering committee, with reference to the Digital Solutions strategy section of the Collaborative Innovation Strategy, defined the following preliminary list of target digital applications.

- **OEE**: Automation of OEE measurement and reporting across the RROA site production lines
- **KPI Dashboards**: Consolidate and then leverage the plant SCADA to provide live KPI dashboards on each production line
- **Fault Monitoring**: Develop an advanced plant monitoring and workflow system to pinpoint equipment faults, deploy resources and track live status of repairs. System will provide the business with insights which improve Mean Time Between Failures (MTBF), Mean Time To Recovery (MTTR) and Downtime.
- **Early Detection**: Advanced Data Analytics to monitor production equipment characteristics against a baseline to provide early detection and rectification of issues before they cause breakdowns.
- **Vision Systems**: Manage packaging inspection coupled with automated access and recipe modification logging/auditing to provide full a Quality Control Point (QCP) to eliminate withdrawal/recall incidents caused by incorrect product labelling.
- **Building Management System with Advanced Data Analytics:** Using deep learning and AI to monitor and report on plant power issues. This system will reduce power costs and reduce damage to plant equipment from “noisy” power.
- **Pallet Inspection and Sorting utilising advanced 3D laser imaging systems:** Reduce equipment and product damage in the ASRS at the Distribution Centres feeding RROA
- **Supplier Grading:** Data Analysis of JBT’s DSI waterjet portioner fat metrics in order to grade suppliers and optimise SKU yields.
- **Engineering Knowledge Base** for faster resolution of production breakdowns

2.8 Milestone 2 – Digital Portfolio Data Availability, Metrics and Resourcing

The preliminary target list of projects will each have a defined list of data availability, metrics and resource planning to achieve their goals.

Where data is not available for a project, additional data integrations or field sensors will be developed/installed.

Key metrics for each project will be defined, baselined and then measured upon project implementation to determine whether goals have been achieved.

Project Managers will be assigned to each project who will assign teams from internal and external resources to develop and implement the project.

2.9 Milestone 2 – Digital Strategy and Priorities Report

Progress Report including Digital Strategy and Priorites - ACHIEVED

RROA's digital strategy across the business has a specific focus on secondary manufacturing, material sourcing and supply chain effectiveness. This will be managed through the provision of new data capture and storage methods and advanced data analytics to generate new insights for the business.

The Digital Strategy and Priorities is defined as follows.

2.9.1 Data Driven Decision Making

- Planning optimisation using solver engines
- Develop a data model specific to packaged meat production
- Predictive modelling and analysis
- Data capture and migration program

2.9.2 Data Collaboration

- Develop and extend platform to balance primals to drive improved yields and market capitalisation
- Data model pilot studies
- Data Feedback systems to kill and bone /primary producers

2.9.3 Business Optimisation

- World class ERP system implementation
- Leverage data sharing via cloud, blockchain and other data streaming technologies

2.9.4 Production Data Analytics

- Automate OEE measurement and reporting
- Live KPI dashboards in factory
- Data mining using deep learning and AI to guide initiatives
- Automated workflows for production efficiency improvements
- Leverage Industry 4.0
- Predictive modelling systems
- Cyber-physical systems

2.10 Milestone 2 – Steering Committee Meeting Outcomes

Complete 1st Steering committee meeting and submit report to MLA of key outcomes for review and approval - ACHIEVED

The key outcomes from the initial steering committee meeting were as follows:

- Digital Strategy development within the larger Coles RROA Collaborative Innovation Strategy (Appendix 1)
- Preliminary list of target projects to implement within the Digital Strategy
- Approval of Milestone 2 Report

2.11 Milestone 3 – Digital Program Development and Implementation

2.11.1Milestone 3 - Develop strategic portfolio of digital opportunities

To achieve its objectives and priorities, as detailed in the Digital Strategy developed in milestone 2, the business has developed the following strategic portfolio of digital opportunities from the preliminary list of target projects listed in section 3.7.

The strategic portfolio of digital opportunities is to be considered an evolving list that will change as new opportunities arise for the business. This dynamic portfolio has been included in the appendices to be updated through the life-cycle of all milestones, as the digital opportunities change over time.

- **OEE**: Automation of OEE measurement and reporting across the RROA site production lines
- **Yield and Material Management**: Centralise the capture of material usage and organisational standards in a central repository to enable improved analytics
- **Building Management System with Advanced Data Analytics:** Using deep learning and AI to monitor and report on plant power issues. This system will reduce power costs and reduce damage to plant equipment from “noisy” power.
- **KPI Dashboards**: Consolidate and then leverage the plant SCADA to provide live KPI dashboards on each production line
- **Vision Systems:** Manage packaging inspection coupled with automated access and recipe modification logging/auditing to provide a full Quality Control Point (QCP) to eliminate withdrawal/recall incidents caused by incorrect product labelling.
- **Supplier Grading:** Data Analysis of JBT’s DSI waterjet portioner fat metrics in order to grade suppliers and optimise SKU yields.
- **RCA Capability Through Systematic Data Capture:** Enhance organisation performance through the systematic capture of root cause data by centralising and improving accuracy of result data.
- **Analytical Support Tools:** Deliver an analytical support tool to deliver reporting, visualisation and improved access to data – currently shortlisted as Grafana and Power BI
- **Product Specifications**: Centralise the capture of product content specifications in a central repository to enable improved analytics
- **Business Process Management Application**: Deliver 6 new workflows using new BPM (business process management) capability to ensure the capture of accurate master data and manage change control

- **Generate Business Questions**: Engage a consultant to map the critical questions that would deliver the greatest impact to performance if answered
- **Data Model Specific to Red Meat**: Deliver an analytical data model specific to the production of Red Meat to navigate the specific industry challenges of serialisation and substitution of materials (and lack of ERP)

2.11.2Milestone 3 - Data analysis and insight generation process

2.11.2.1 OEE Pilot Study – Line 24

OEE is the industry best practice for measuring manufacturing productivity. Used to identify the percentage of manufacturing time that is truly productive. An OEE of 100% represents production which is only manufacturing Good Parts, as fast as possible, with no Stop Time. In the language of OEE that means 100% Quality (only Good Parts), 100% Performance (as fast as possible), and 100% Availability (no Stop Time).

By measuring OEE and the underlying losses, the business will gain important insights on how to systematically improve the manufacturing process. OEE is the single best metric for identifying losses, benchmarking progress, and improving the productivity of manufacturing equipment (i.e., eliminating waste).

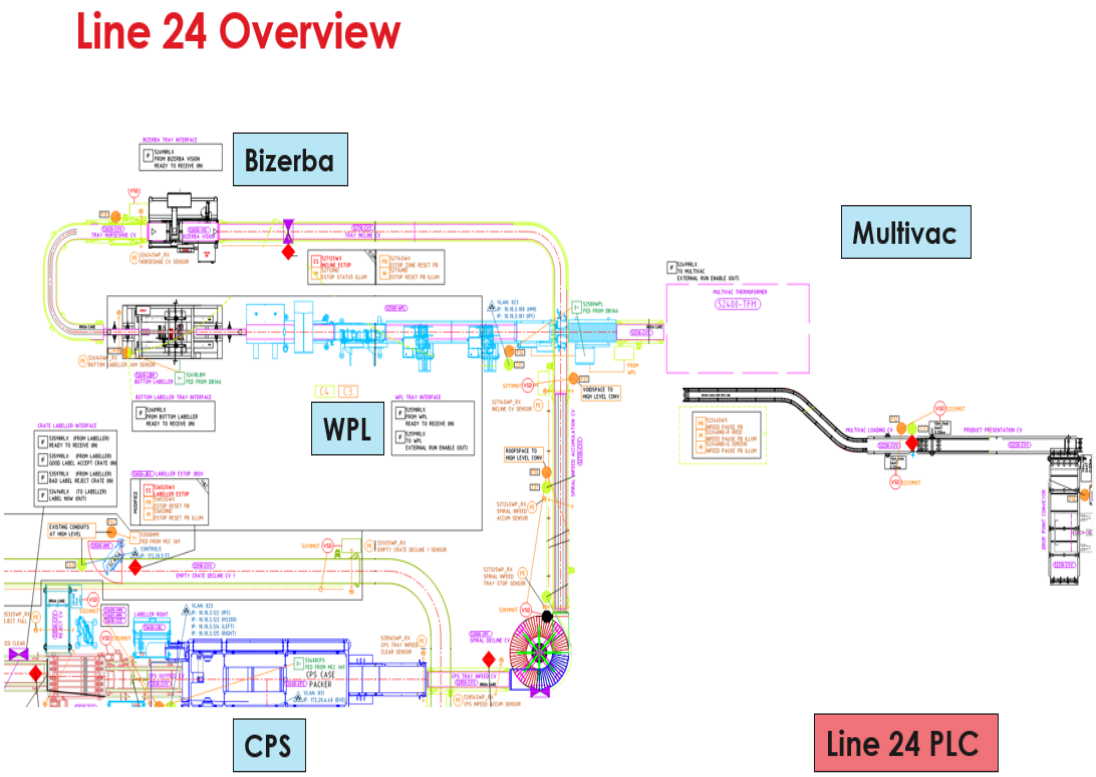
As part of the projects in the preliminary list of target digital applications, the Automation of Overall Equipment Effectiveness, OEE, measurement and reporting, across the RROA site production lines, will begin with a pilot study. The pilot study will assist in defining the overall design of the production rollout before implementation. This pilot study will target Line 24.

The business currently records OEE via adhoc manual reporting and paper or excel based logging and reporting. ***The goal of this project is to automate the collection of OEE data, log the information in a database and report via digital dashboards and easily accessible information portals.***

As a first step the main focus of the ***pilot study will centre on Availability data (Uptime/Downtime)***, while Quality and Performance data will be collected in a future phase.

2.11.2.1.1 Data Collection Points

The following four machines have been targeted on Line 24, as key points for OEE measurement and reporting (See Process Flowchart 1).



Process Flowchart 1: Targeted machines in Line 24 as key points for OEE measurement and reporting.

2.11.2.1.2 Machine Availability State Definitions

The following defines the standard availability states that have been implemented on the Line 24 machine data points (See Figure 1).

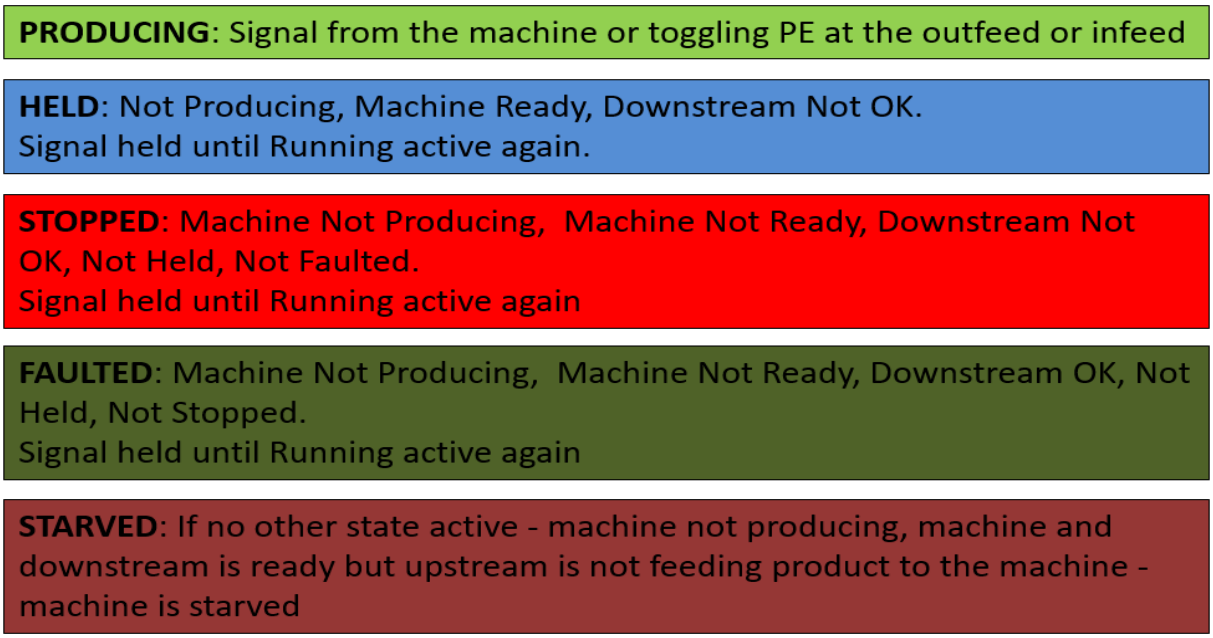


Figure 1: the standard availability states that have been implemented on the Line 24 machine data points.

2.11.2.1.3 Data Availability and Validity

Machine data availability was reviewed on Line 24 to ensure sufficient visibility of required data with which to measure availability states on each of the key machine points.

Additional sensors were installed on Line 24 at each machine to record Producing states accurately.

The existing interface signals from each machine for Ready and Downstream OK are being utilised.

Work with machine vendors has been initiated, in order to access internal machine states, such as fault codes, paused conditions and other relevant machine state information, to remove any ambiguity which exists using the current data signals.

Daily shift data was collected over a period of two weeks both manually and via the new automated collection code, in the Line 24 controller. The automated data was validated and any code issues were rectified where necessary.

2.11.2.1.4 Business Insight - Baseline Data Report

Once the automated OEE data was validated, using the procedure defined above, the following baseline data was collected and reported for a one week period across the four machines on Line 24. These are excel reports using data collected automatically, but manually entered into the spreadsheets.

The results from the baseline study showed a large machine availability range, as shown in the charts below (See Figures 2-6).

These results gave the business insights that were being missed in the manually reported downtime figures. Operations could clearly see that small but regular machine pausing, was having a large cumulative effect on machine availability, causing high downtime. Some equipment was being run at high speeds, causing the operators to pause the machine intermittently rather than running it at moderate speeds more consistently. Reducing the machine speed in order to run more continuously, dramatically improved machine availability.

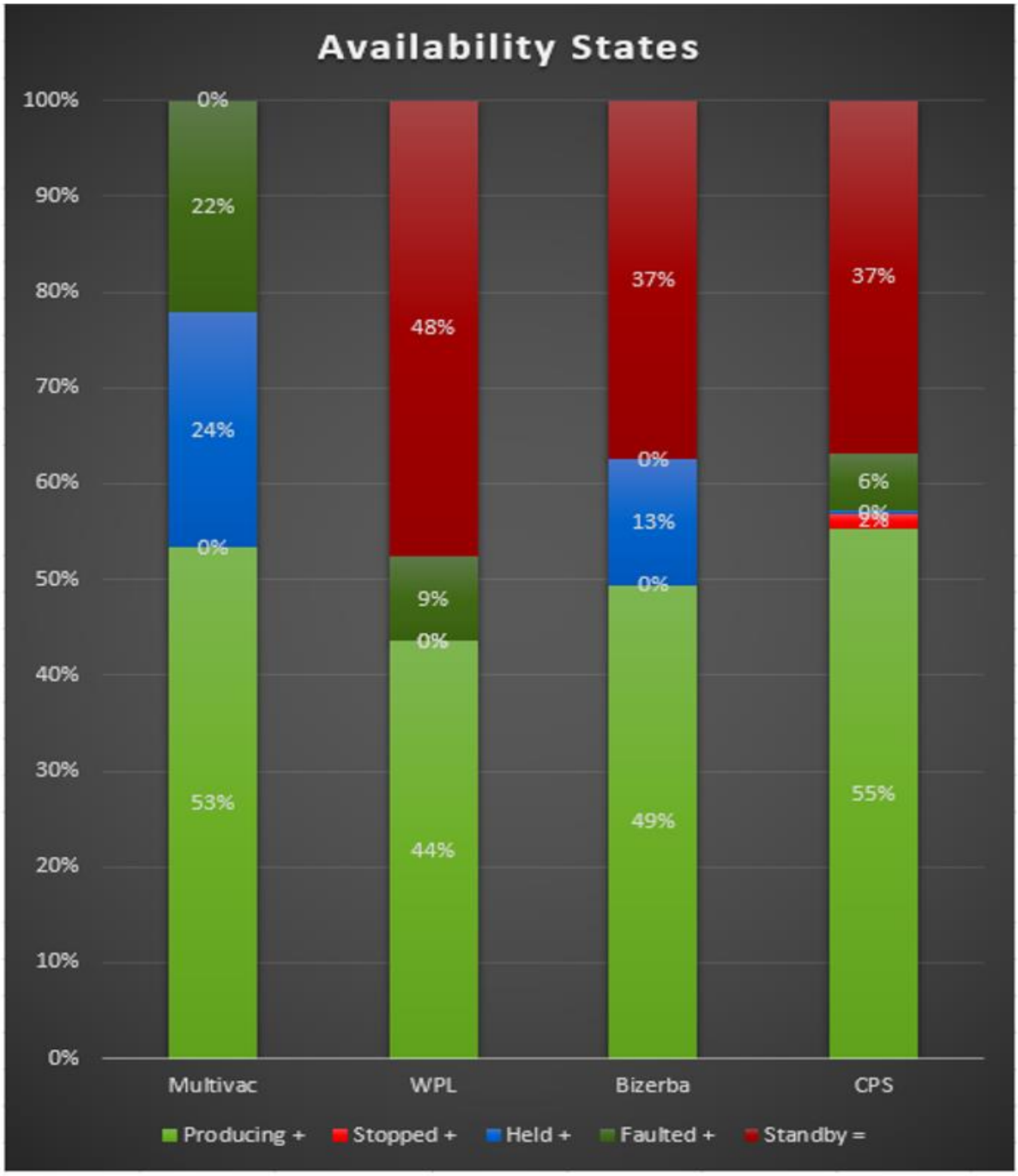


Figure 2: Baseline data was collected on 20 January 2020 and reported for a one week period across the four machines on Line 24.

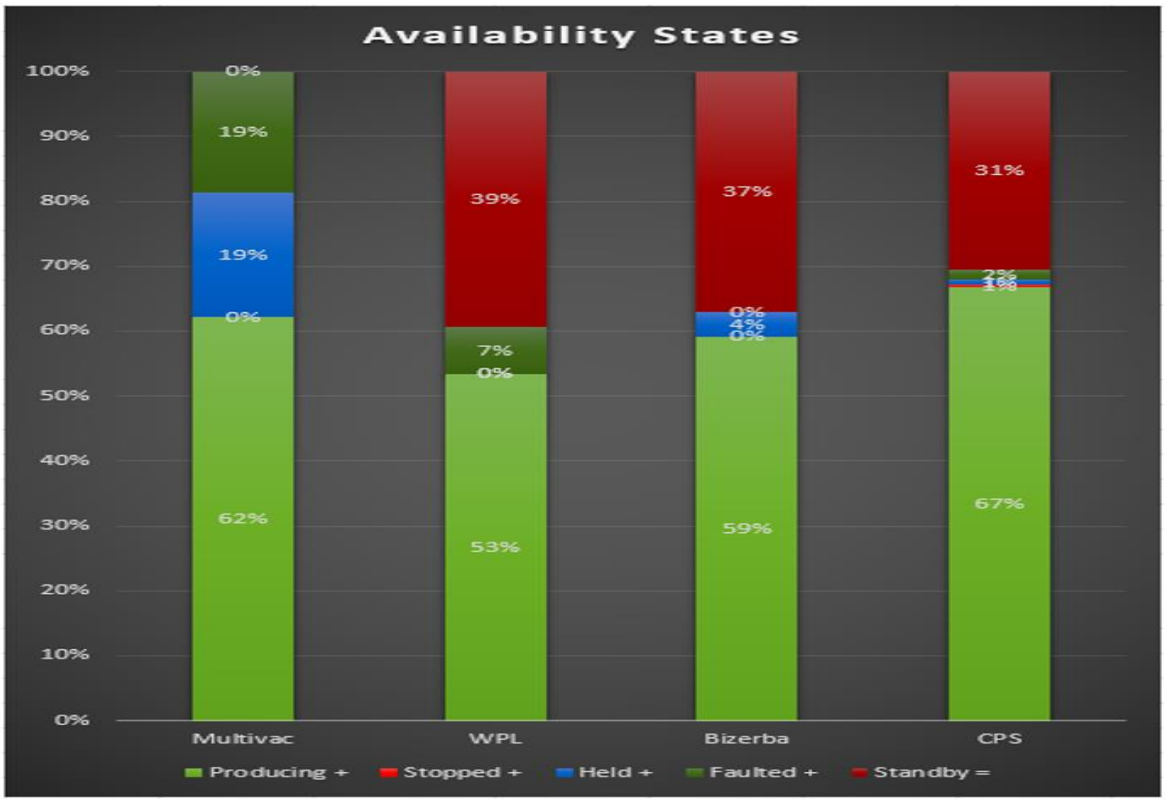


Figure 3: Baseline data was collected on 21 January 2020 and reported for a one week period across the four machines on Line 24.

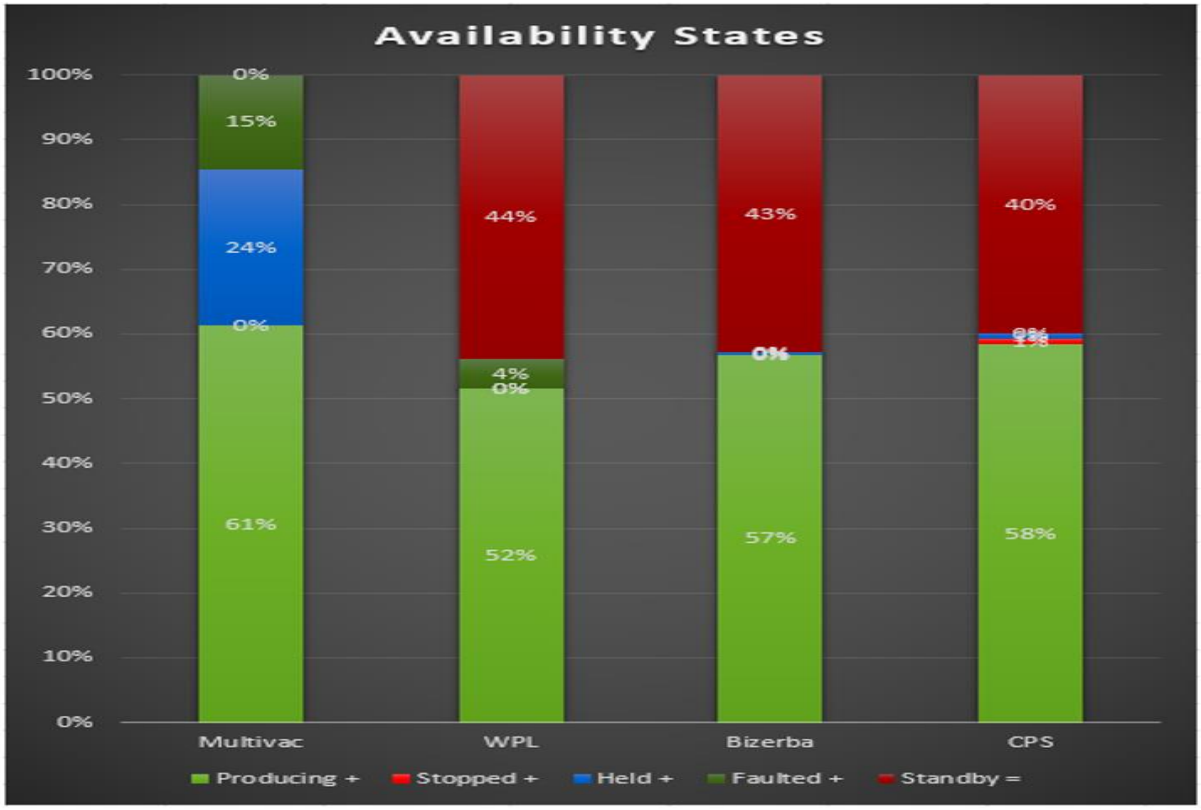


Figure 4: Baseline data was collected on 22 January 2020 and reported for a one week period across the four machines on Line 24.

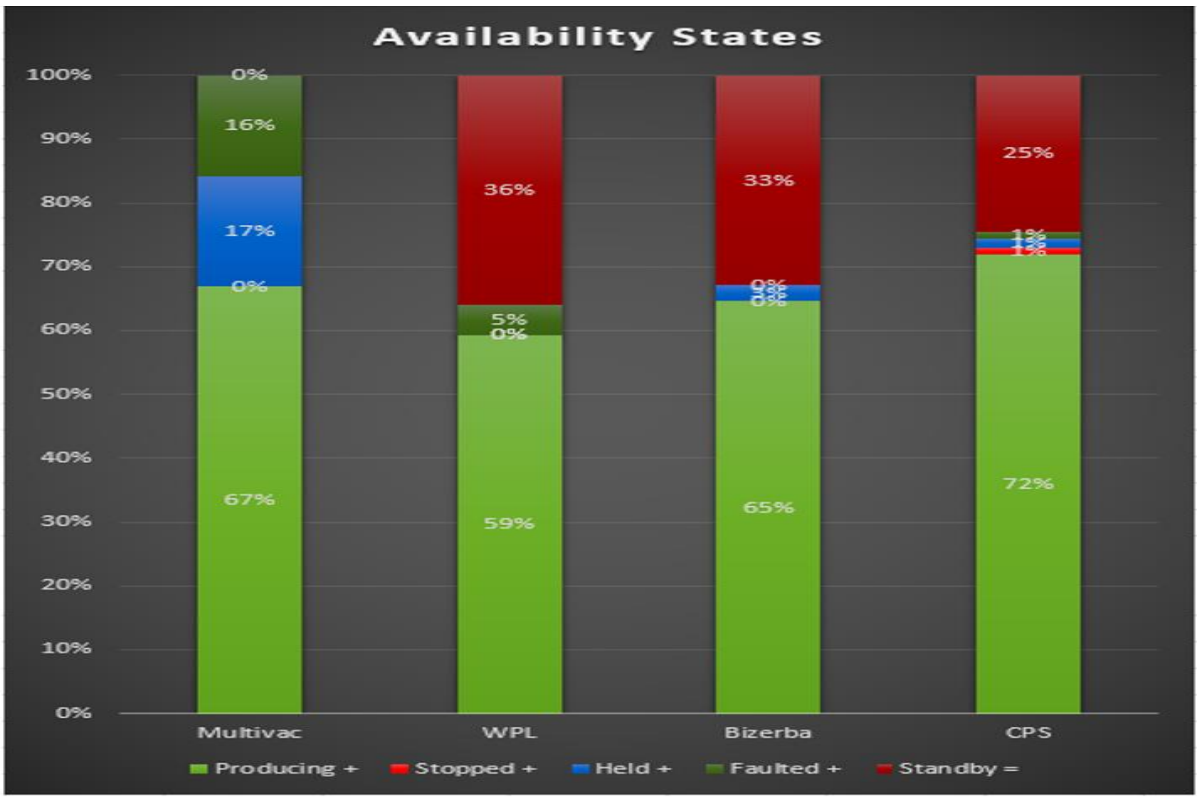


Figure 5: Baseline data was collected on 23 January 2020 and reported for a one week period across the four machines on Line 24.

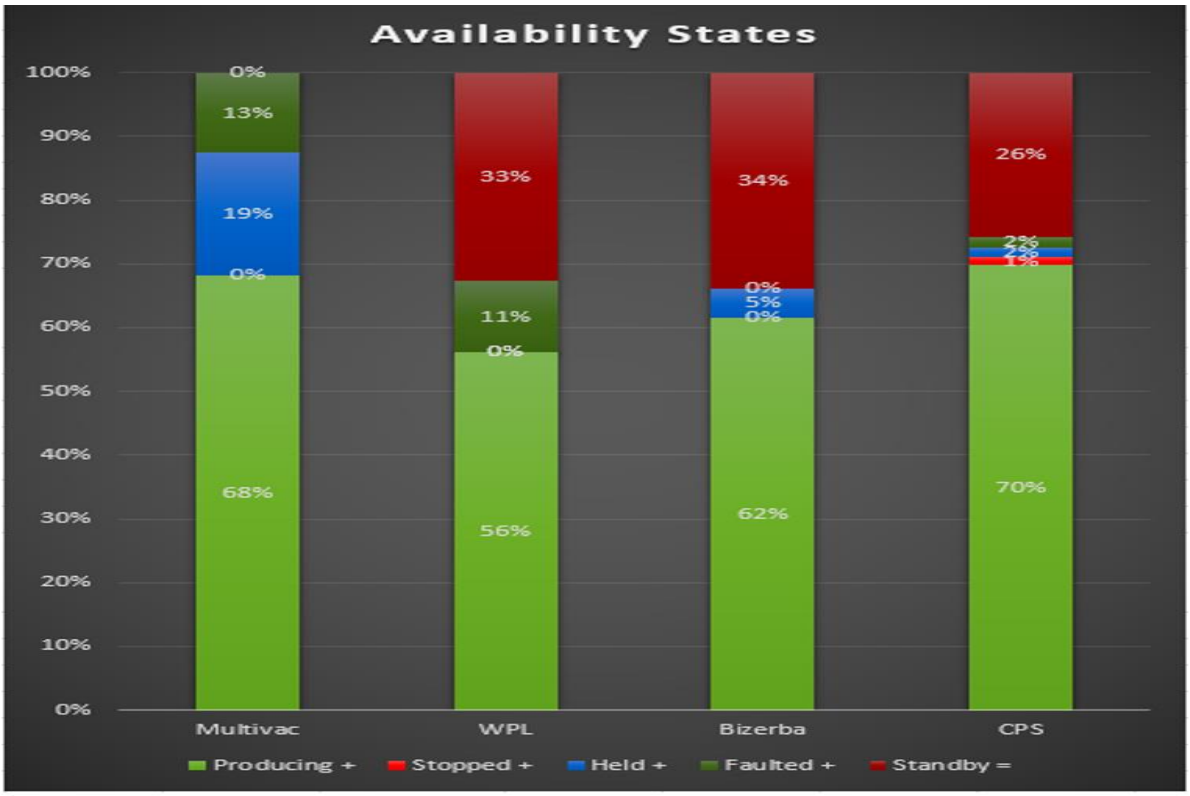


Figure 6: Baseline data was collected on 24 January 2020 and reported for a one week period across the four machines on Line 24.

2.11.2.1.5 Quantifiable Benefits

Once Operations gained these insights into the cause of the majority of machine downtime, they were able to work with their teams to focus on reducing the small machine pauses and run the line at a more manageable and consistent rate.

The benefits of acting on the business insights gained from the data was a dramatic improvement in machine availability, as shown in the week of data below (See Figures 7-11).

20th March, 2020

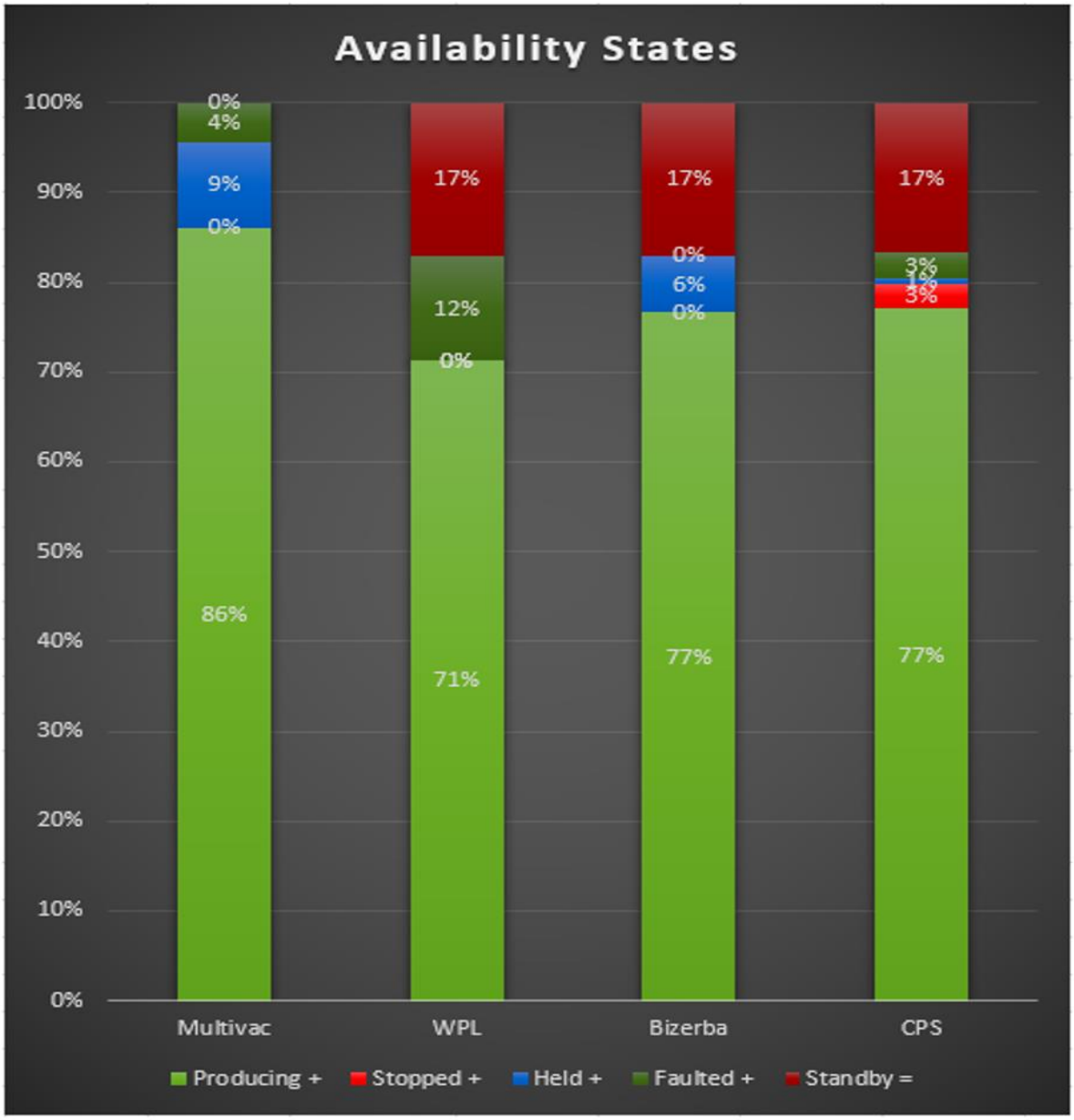


Figure 7: Baseline data was collected on 20 March 2020 and reported for a one week period across the four machines on Line 24.

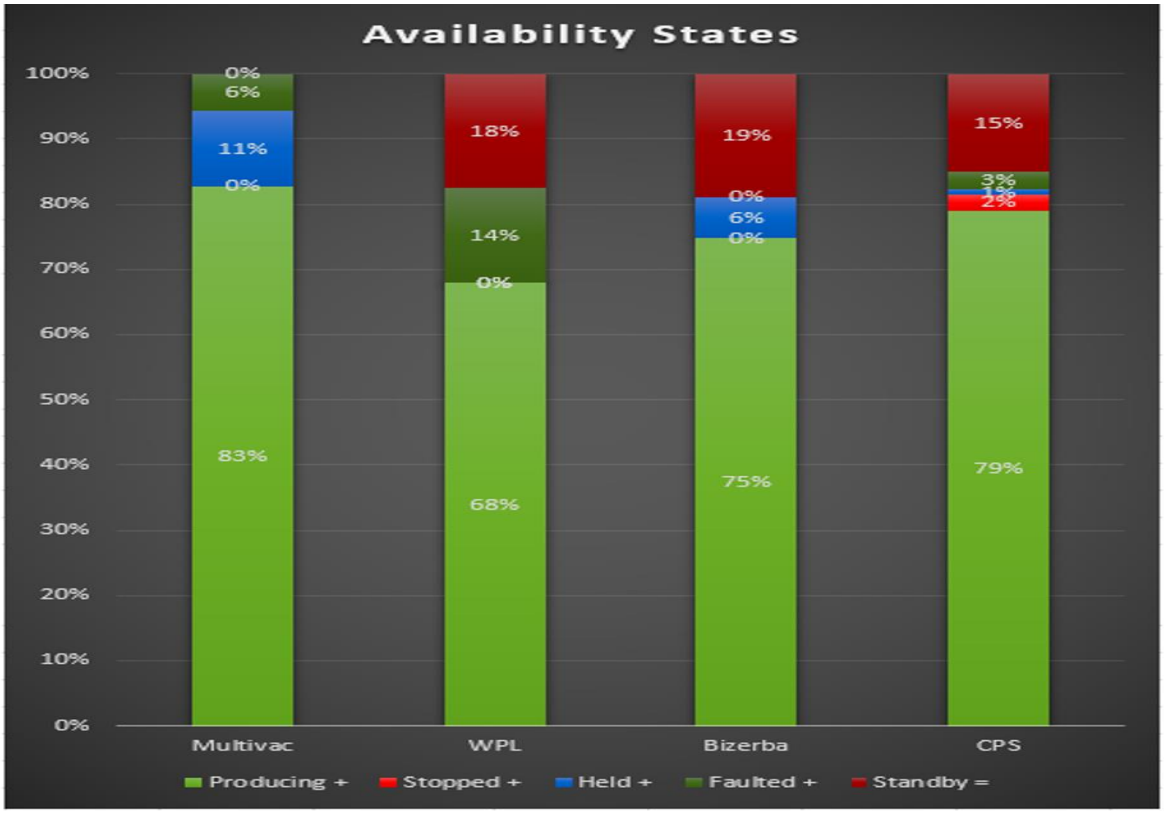


Figure 8: Baseline data was collected on 22 March 2020 and reported for a one week period across the four machines on Line 24.

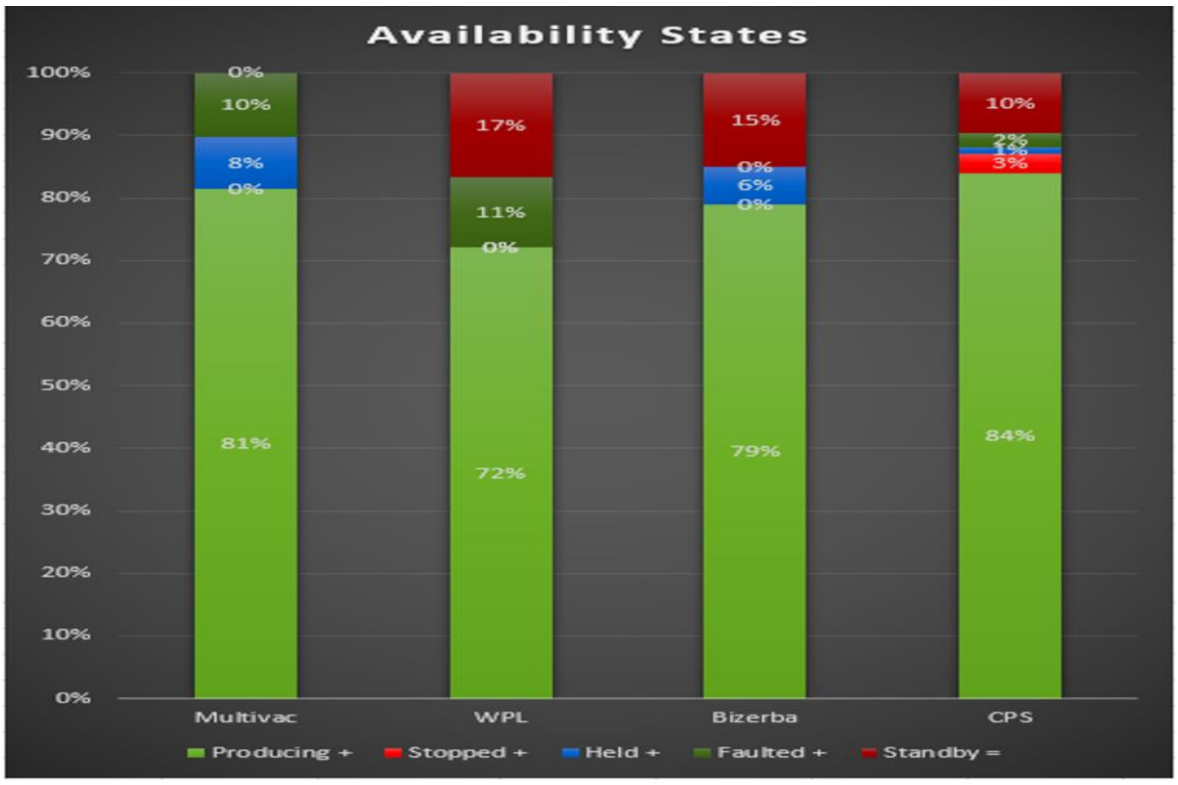


Figure 9: Baseline data was collected on 23 March 2020 and reported for a one week period across the four machines on Line 24.

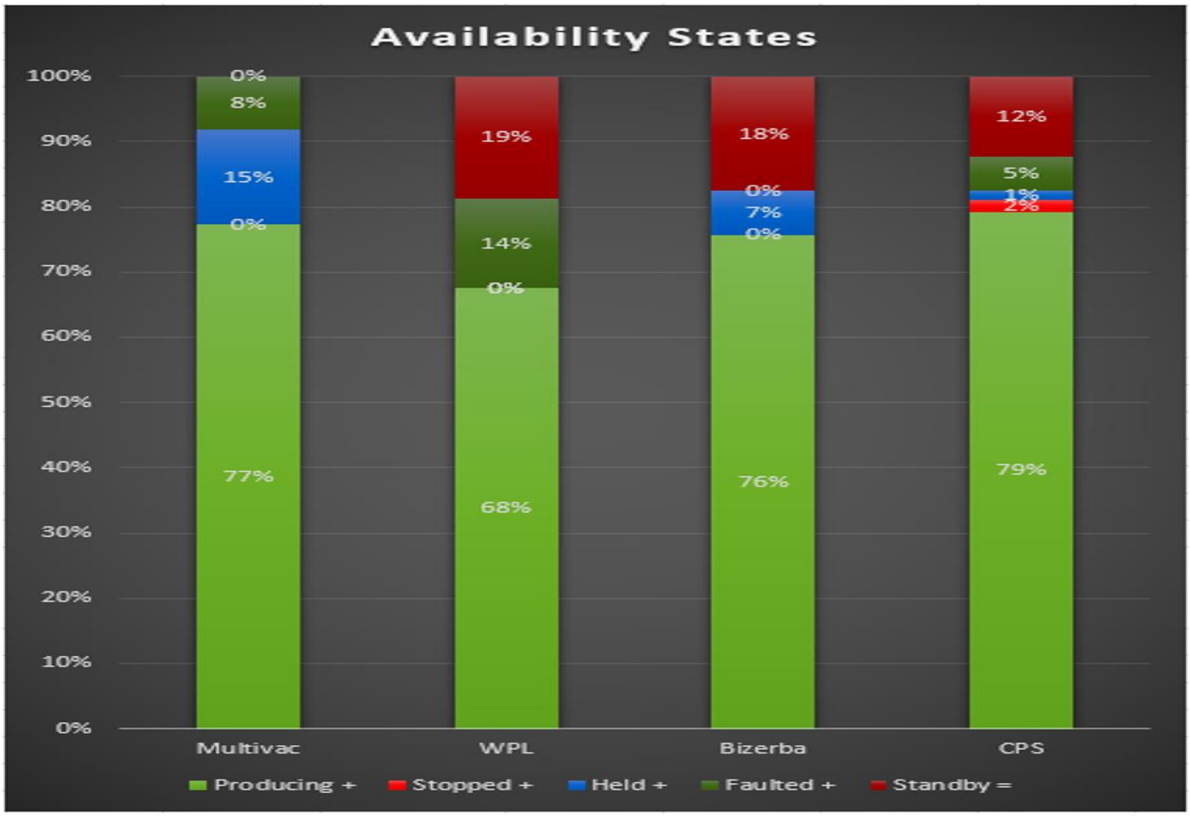


Figure 10: Baseline data was collected on 24 March 2020 and reported for a one week period across the four machines on Line 24.

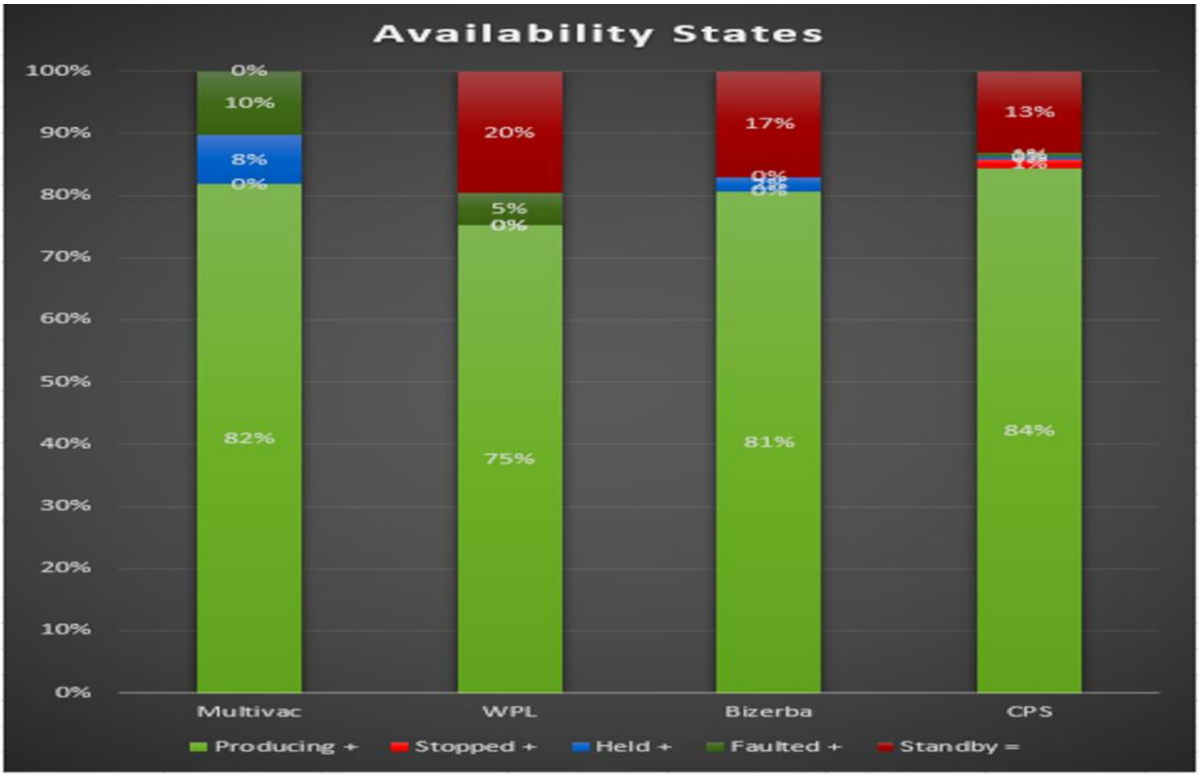


Figure 11: Baseline data was collected on 25 March 2020 and reported for a one week period across the four machines on Line 24.

2.11.2.1.6 Data Accuracy Improvements

The trial results detailed above, utilised field sensors, and available machine signals, to determine machine and line state. There are multiple states which relied on inference rather than unambiguous state information.

The next phase is to establish direct communications with the machine controllers in order to read these machines states more accurately.

This will provide more accurate insights into the actual root cause of remaining downtime, on each machine.

2.11.2.1.7 Quantifiable Benefit - Main OEE Project

The proof of concept phase was concluded by engaging the Finance stream in order to quantify the benefits to the business based solely on improvements in availability. ***An annual cost saving in the order of several hundred thousand dollars, based on a 5% increase in availability***, was determined. This stage gate allowed the business to approve the team to move towards developing a complete business case, in order to secure capital funding for an OEE system across the Red Meat lines.

2.11.2.1.8 Participate in internal and external networks to accelerate outcomes - Operations Workshop

As part of the business case development, OEE Workshops were held with Operation teams. The workshop's objectives were two-fold; to determine the content for line digital dashboards, and to determine the best display format for that content.

The feedback from these workshops informed the design phase of the main OEE project.

2.11.2.2 Yield & Supplier Grading

The Red Meat area utilises JBT's DSI Waterjet Portioning System to cut meat into desired portions. The business required insights into the relationship between the yield of the products, as measured against the supplier, in order to grade suppliers and optimise product yields.

The following steps were required to initiate the process, collect the data and then finally analyse the data to generate the required insights for the business.

1. Enable secure communications between the JBT cloud servers and the Coles RROA DSI
2. Work with JBT to develop SKU and Supplier configuration relationships in the DSI
3. Configure the iDSS database connectivity module to view and analyse the collected data
4. Develop Product Yield vs Supplier reports to generate insights for the business

2.11.2.2.1 Data Access

There are two levels of access to the data being collected from the DSI Portioning System.

The iOPS Portal provides live and historical access to the data through a web-based portal. The reports generated through this portal are pre-configured by JBT to provide the most commonly required reports.

The second method of access is via the iDSS which is a database interface to the cloud server database. This allows the business to access the raw data and develop custom reports to provide various insights into the products, DSI machine, suppliers and the relationships of these to each other.

2.11.2.2.2 Business Insights

Analysing the data reported on the iOPS Portal with JBT consultants, allowed the business to gain several insights into the performance of the DSI Portioning System as detailed below.

Insight 1 – Unprocessed Portions

There were high amounts of unprocessed portions. This was due to the infeed line speed being set too high, at 15m/min, rather than the optimum line speed of 12m/min. Furthermore, the downstream machines were not able to handle the excessive DSI speed, and thus would issue a "downstream not ready" signal back to the DSI. This signal would cause the DSI to continually pause. The DSI pausing, resulted in lower machine availability.

Dropping the infeed conveyor speed back to 12m/min resulted in high machine availability and less unprocessed portions.

Insight 2

The business is currently working with operations to run trials which segregate product fed into the DSI to one supplier for each run. In this way yield data can be attributed to the

supplier in order to grade and compare the suppliers with one another based on yield data. These trials are ongoing.

2.11.2.3 Building Management Services

The Building Management System (BMS) is another target area within the business, that the digital solutions strategy is focused on. The digital solutions strategy aims to utilise data mining in order to ultimately reduce plant power consumption. One area within the BMS that was experiencing significant power consumption was the compressed air supply system.

A cloud-based data monitoring system, CALMS, was installed to collect and analyse compressor data. The data analysis had the objective of determining if there were any significant leaks, design deficiencies and operational issues which was resulting in the excessive power consumption.

2.11.2.3.1 Quantifiable Benefits – Optimum Compressor Parameter Profile

There are currently 4 profiles in operation on the compressor controller, based on the hours of operation, the efficiency of each profile was extrapolated for the entire year, in order to compare the expected cost impact to the business (see table below).

RROA Compressor Profiles				
Profile number	Ave Efficiency	Peak	Running cost	Savings potential
1 Week	10.558	27.914	$221,123.00	
Profile 1	9.042	16.506	$189,372.43	$ 31,750.57
Profile 2	8.888	14.073	$186,147.11	$ 34,975.89
Profile 3	13.386	84.366	$280,351.63	-$ 59,228.63
Profile 4	13.646	112.25	$285,796.97	-$ 64,673.97

Utilising this information, Profile 2 was selected to optimise the compressor's efficiency and thus ***reduce operating costs by $35k***.

2.11.2.3.2 Participate in internal and external networks to accelerate outcomes – SME Consultancy

Further analysis of the data by a compressed air consultant, highlighted the fact that running the two fixed speed compressors as the primary units, and only bringing in the third compressor, which was a variable speed unit, was also wasting power. During off-peak production loads, the plant's compressed air requirements was less than the capacity being delivered by the two fixed speed compressors. Switching the variable speed compressor to the role of primary compressor, and only bringing in the fixed compressors as load increased, further reduced the overall yearly power consumption.

2.11.3 Milestone 3 - Track and report on quantifiable benefits of digital projects

Please see above details on quantifiable benefits in each project.

2.11.4 Milestone 3 - Participate in internal and external networks to accelerate outcomes

As detailed above, various workshops and consultants were engaged to accelerate outcomes for each project.

2.11.5 Milestone 3 - Action steering committee tasks

Due to COVID-19 travel restrictions, with resultant increases to workloads, no action steering committees were able to be convened.

2.11.6 Milestone 3 - Submit Quarterly Report to MLA for review and approval

This document forms the submission report for Milestone 3 to the MLA for their review and approval.

3 Milestone 4

3.1 Introduction

Milestone 4 has been developing the portfolio of projects targeted in milestone 3. However, it should be noted, as project results are analysed, some projects will be removed while others are added to the portfolio.

3.2 Project Portfolio Updates

A new project focusing on pathogen reduction has been added to the portfolio. This project has direct implications for the Building Management Systems focus of reducing costs associated with power consumption related to services. Furthermore, it is expected there will be water and cleaning agent usage and cost reductions.

Existing projects detailed in milestone 3 will be further developed in milestone 4, including initial studies for the OCR Vision project.

3.3 New Project Studies

3.3.1 Pathogen Reduction

3.3.1.1 Introduction

New technology exists which can proactively clean air and surfaces. This project seeks to determine the best in class technology in this industry which can be utilised at RROA.

The initial aim for this technology is to combine it with the Building Management System data analysis, to determine if savings in power consumption, water and cleaning agent usage can be achieved.

With the onset of COVID-19 further aims were added to this project, namely reduction in health risks in the workplace and improved food safety. Additional side benefits to be analysed are possible shelf life extensions for food products.

3.3.1.2 Technology Research

The technology being considered is known as Photocatalytic Oxidation (PCO). The PCO phenomena was originally discovered by Akira Fujishima in 1967, the so-called HondaFujishima effect. This phenomenon was developed into an air purification system by NASA scientists in the 1990s for use on the Space Shuttle and International Space Station. Some of the key patents for this NASA technology were later acquired by several different entities.

Interviews with the CEOs/Founders of the patent holding entities, such as RGF Environmental Group, Inc., Wein Products Inc., GreenTech Environmental, Airocide, Radic8, Sharp and Puradigm assisted in determining the best in class PCO technology on the market.

Of all these vendors, only one had significantly improved the original PCO technology. Puradigm had taken the initial PCO technology and extended it with key enhancements that made it active, scalable and safe.

Global patents[1] filed between 2011 to 2013 by Puradigm, enhanced the energy levels of the bi-polar ions delivered by the PCO process, so that they had a half-life which exceeded the standard nano-second timescale to reach levels of 100s or even 1000s of seconds. This enabled the device to not only deactivate pathogens brought in the air to the device, but also pathogens in the air and surfaces of the environment the device emits ions into.

Lab and Real-world test results showed that the enhancement to the original PCO technology were safe[2,3,4,5], scalable and active (see Table 1).

Air reductions of bacteria							
Company	Companies own data	Chamber <1m3	Chamber <25m3	Real World <150m3	Real World < 450 m3	Real World < 700 m3	Real World > 700m3
Puradigm	Yes	>99%	>99%	>99%	>99%	>99%	>99%
AtmosAir	No	No data	24%	No data	No data	No data	No data
Sharp Plasmacluster	Yes	>99%	>99%	No data	No data	No data	No data
Surface reductions of bacteria							
Company	Companies own data	Chamber <1m3	Chamber <25m3	Real World <150m3	Real World < 450 m3	Real World < 700 m3	Real World > 700m3
Puradigm	Yes	>99%	>99%	>99%	>99%	>99%	>99%
AtmosAir	No data	No data	No data	No data	No data	No data	No data
Sharp Plasmacluster	Yes	>99%	No data	No data	No data	No data	No data

Table 1.

3.3.1.2.1 References

1. https://patents.justia.com/assignee/puradigm-llc
2. *Puradigm Technology Safety Report.pdf*
3. *PA HVAC 14in H2O2 certificate 211 rev 10-27-12.pdf*
4. *PA HVAC 14in ozone certificate 215 rev 10-27-12.pdf*
5. *Safety - Ions.pdf*

3.3.1.3 Data analysis and insight generation process

3.3.1.3.1 Technical Challenges

Although the general PCO technology is well understood, its application in commercial size installations pose technical challenges.

The technical challenges are as follows:

1. Managing air exchanges in each enclosed space to maximise ion efficacy while maintaining cold chain compliance
2. Device number and placement to ensure ions reach all air and surface locations within each enclosed space within spaces with ceiling heights above 3m and complex or high air flows
3. Device number and placement within high air flow Air Handling Units and ductwork within the HVAC system.
4. Device number and location to maximise pathogen reduction on meat portions for the purpose of shelf life extension.

3.3.1.3.2 Experimental Activity

The following tasks are scheduled to begin by October 2020.

3.3.1.3.2.1 Lab Validation against standard microbiological pathogens

CSIRO Microbiology department controlled trials against the following pathogens:

- *Escherichia coli* (Gram-negative rod; vegetative)
- *Listeria monocytogenes* (Gram-positive rod, vegetative)
- *Staphylococcus aureus* (Gram-positive cocci; vegetative)
- *Bacillus cereus* (Gram-positive rod; spore-form)
- Yeast
- Mould

Two inoculum levels of 10^3 and 10^6 CFUs dried on plastic plates in triplicate.
Test will be done in a manually ventilated room of 2m x 6m x 2m at 22^0C with RH% >25
Sampling frequency at 2hrs, 4hrs and 24hrs for the low inoculum level
Sampling frequency at 2hrs, 8hrs and 24hrs for the high inoculum level

3.3.1.3.2.2 Lab Validation against SARS-CoV-2

CSIRO Australian Centre for Disease Preparedness controlled trials against the SARS-CoV-2 virus.

Test design to be confirmed by the CSIRO SMEs.

3.3.1.3.2.3 Real-world validation against standard microbiological pathogens in processing

RROA Technical team to take air plates and swabs in Red Meat and Poultry processing locations as a baseline.

RROA Technical team to take air plates and swabs in Red Meat and Poultry processing locations after PCO units have been running for at least 1 day. Sampling frequency at 2 hour intervals.

Pathogens tested will be:

- *Escherichia coli* (Gram-negative rod; vegetative)
- *Listeria monocytogenes* (Gram-positive rod, vegetative)
- *Staphylococcus aureus* (Gram-positive cocci; vegetative)
- *Bacillus cereus* (Gram-positive rod; spore-form)
- Yeast
- Mould
- Total Plate Count

3.3.1.3.2.4 Real-world validation against standard microbiological pathogens in the HVACs

RROA Technical team to take air plates and swabs of supply and return locations in RR11 AHU5 and CH17 AHU4 as a baseline. Samples are taken at the beginning and end of the day at 2 and 4 hour intervals.

RROA Technical team to take air plates and swabs of supply and return locations in RR11 AHU5 and CH17 AHU4 after installation of PCO units. Samples are taken at the beginning and end of the day at 2 and 4 hour intervals.

3.3.1.3.2.5 Real-world validation against standard microbiological pathogens in the offices

RROA Technical team to take air plates and swabs in the Level 1 Production Office as a baseline.

RROA Technical team to take air plates and swabs in the Level 1 Production Office after PCO units have been running for at least 1 day. Sampling frequency at 2 hour intervals.

Pathogens tested will be:

- Mould
- Total Plate Count

3.3.1.3.2.6 Real-world validation of shelf extension in processing

RROA Technical team to take swabs

3.3.1.4 Quantifiable Benefits

The following benefits should be quantified through the above experimental activities.

3.3.1.4.1.1 Pathogen reduction

The active PCO technology should cause a 2-4 log reduction in the number of pathogens in lab and real-world validation trials.

3.3.1.4.1.2 Shelf extension in processing

The active PCO technology should extend the shelf life of all products that it is exposed to by at least 1-3 days.

3.3.1.4.1.3 Reduced Water, Power and Cleaning Agent consumption

Refer to the Building Management System project for details of savings brought about by the pathogen reduction technology in particular to mould reduction on HVAC surfaces.

3.3.2 Vision System

3.3.2.1 Introduction

The current label inspection systems on each processing line were designed to ensure the correct labels were applied to trays, and that the information on the label was accurate. However, the inspection systems have been failing in these tasks. Additionally, there is no long term record of inspection results or audit trails of changes to the parameters of the system, should inspections fail. These deficiencies have resulted in incorrect labels being

applied to trays, causing product withdrawals or recalls, with no ability to review inspection data from the batch that failed.

An updated inspection solution was required to address these deficiencies. This solution would represent a quality control point (QCP) removing the need for the current risk management systems which are all based on human resource workflows.

3.3.2.2 Technology Research

The Digital Officer is an SME in vision systems, and as such was able to review all applicable inspection system vendors to determine the best in class solution for the requirements. Solutions from vendors such as Omron, Cognex, Adept Turnkey and SICK were analysed.

All solutions offered robust OCR, various lighting products and networking options. However, none of the systems provided the required QCP audit logs.

Various vendor trials were conducted which resulted in SICK being selected as the preferred vendor.

The benefits of the SICK solution are as follows:

- Smart camera technology - all image processing done on-board without the need for an external computer
- In-built web server – ability to access the camera UI via a standard web browser
- OCR with in-built fonts and AI – no need to teach fonts with on-board deep learning algorithms that can read label fonts automatically
- Networking capability – ability to transfer image data to external servers for long term storage
- Turnkey QCP solution – customised software development service to provide all required QCP features without the need for a 3rd party. This ensures a fully integrated and supported solution from the one vendor.

3.3.2.3 User Requirement Specification

Description:	Vision system required to confirm labels on red meat and poultry products - Match content of product tray - Information is accurate - Local printed information is legible
Special functions Required	QCP Ready - Log configuration changes - Log user - Log date time - Log validation carried out (“Challenge Test”) - Log confirmation of correct recipe by appropriate user level Local storage of one month’s results of images and logs

	Ability to perform logic tasks between inspection tool results (localized to each station regardless of camera taking image) – Logic parameters stored to recipe Date validation to be possible based on fixed input, and/or via formula (eg today's date + 14days) – Date validation to be stored per recipe FTP output of results and images and logs Centralized storage of recipes Centralized user management Time synchronization to local server Built in Challenge test procedure

3.3.2.4 Data analysis and insight generation process

3.3.2.4.1 Technical Challenges

Once the vendor was selected, the following technical challenges were addressed.

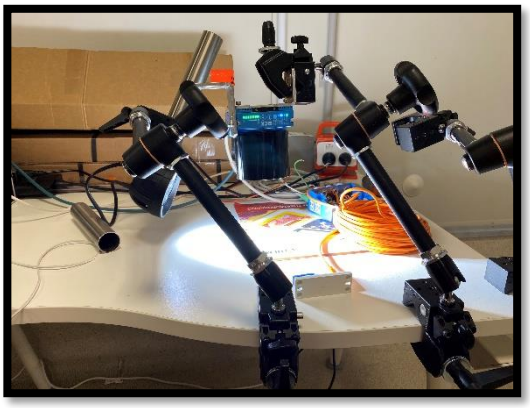
1. Lighting design – currently labels come in various formats eg. matte/gloss, flat/undulated etc. and the current lighting design causes labels to occasionally be over-exposed.
2. Processing speed – ensure pack orientation, size, height and pack to pack gap variations are handled to ensure 100% inspection ie all packs inspected

3.3.2.4.2 Experimental Activity

3.3.2.4.2.1 Lighting Design

In consultation with SICK SMEs various lighting types and configurations were trialled to create an even light scape to provide a consistent label image to the camera.

Bright, white, multiple light sources mounted at a low angle relative to the labels and on both sides were found to meet the lighting requirements.



Using configurable arms to test multiple lighting angles

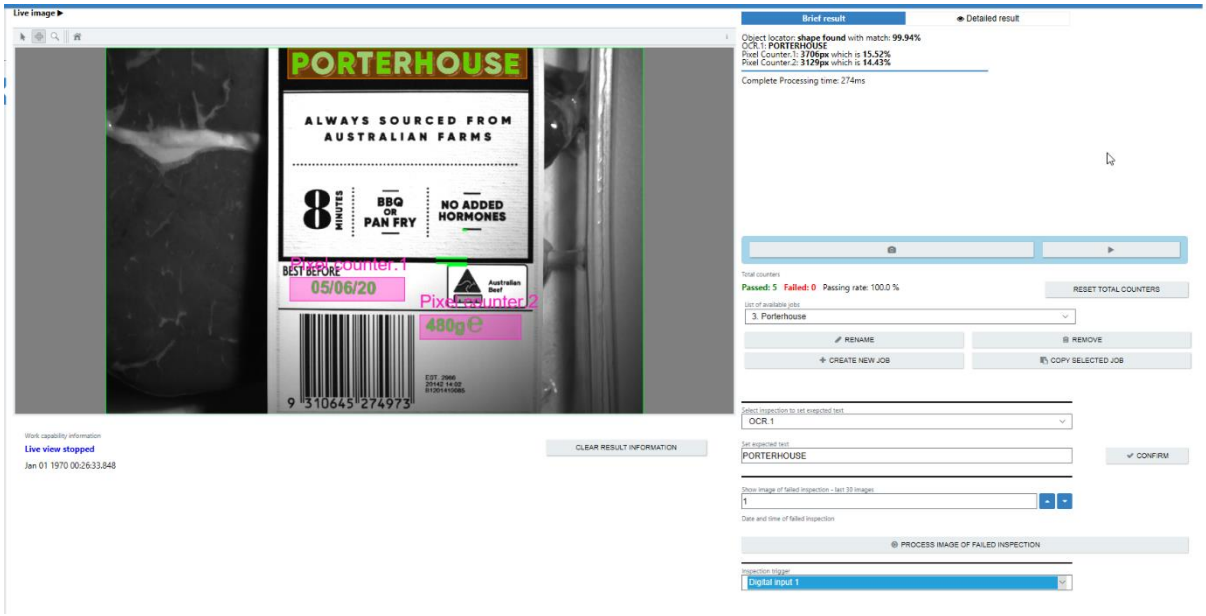
Testing worst case gloss and undulated label types

Frame design to allow configurable light locations

3.3.2.4.2.2 Processing Speed

The current line speed requires each label image to be processed within 300ms to avoid missing any inspections.

The challenge is to balance the number of label inspection tools, their parameters and complexity to ensure accuracy of inspections while remaining within the processing time constraints.



OCR tool reading the label text

Presence detection tool checking for Best Before date

Presence detection tool checking for eWeight value

Allowance for labels skewed up to +/- 10^0 captured all labels without exceeding time constraints

3.3.2.5 Quantifiable Benefits

Production trials are due to commence in September 2020. These will collect statistics such as:

- Number of inspections relative to labels to ensure a 100% inspection rate
- Max inspection time to ensure 100% inspection rate
- Number of false positive rejects <1%
- Number of true positive rejects >99%
- Ensure all label types have consistently clear images, <1% unable to be read

3.4 Existing Project Studies

3.4.1 Details of Data Analysis

3.4.1.1 OEE

Refer to section 4.5.1.1 for a new data approach. Once this is fully implemented further data will be available for analysis.

3.4.1.2 Yield

Refer to section 4.5.1.2 for a new data approach. Once this is fully implemented further data will be available for analysis.

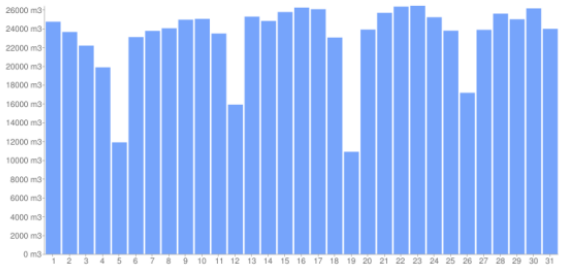
3.4.1.3 BMS

Once the system parameters were adjusted, as detailed in section 3.11.3.2.1, ongoing data analysis using the CALMS cloud reports allow the engineering team to be alerted to leaks or compressor issues before they become major issues and maintain the power savings gained.

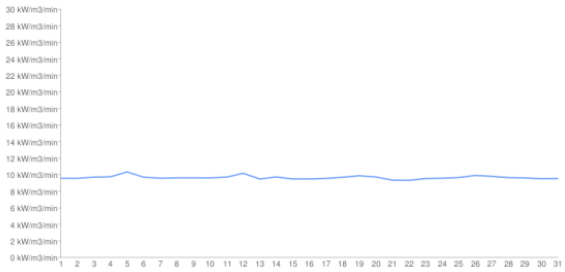
CHART VIEW: Retail Ready Operations Australia

Time Period: 07-2020

Compressed Air Consumption



Compressed Air Energy Efficiency



WARNINGS AND ALARMS

Time	Location	Type	Description
01/07/2020 11:51	Erskine Park Meat Processing	Warning	Low Dry pressure: 5.18 barg
02/07/2020 09:56	Erskine Park Meat Processing	Warning	Low Dry pressure: 5.96 barg
03/07/2020 09:31	Erskine Park Meat Processing	Warning	Low Dry pressure: 5.50 barg
04/07/2020 09:31	Erskine Park Meat Processing	Warning	Low Dry pressure: 5.95 barg
04/07/2020 10:16	Erskine Park Meat Processing	Warning	Low Dry pressure: 5.19 barg

SUMMARY

Location	Air Consumption	Electricity	Specific power	Air Cost	Average Pressure
	m3	kWh	kW/m3/min	AUD	barg
Erskine Park Meat Processing	717218.33	111348.86	9.32	16702.33	6.82
Total:	**717218.33**	**111348.86**	**9.32**	**16702.33**	**6.82**

Electricity cost: 0.150 AUD/kWh, Compressed Air Cost: 0.150 AUD/m3

3.4.1.4 Vision System

Refer to section 4.3.2 for the preliminary tasks for this project. Once these are completed new data will be available for analysis.

3.4.1.5 Pathogen Reduction

This project is being formalised into a separate MLA project with its own milestones.

3.5 Development of New Digital and Data Approaches

3.5.1.1 OEE

Milestone 3 data analysis provided the insight that the majority of line availability was being dictated by the Multivac at the source of the line.

The Multivacs provide an OPC DA Server to access machine states and data. This data access is more accurate that the data provided solely by the sensors on the line.

The WPL, Bizerba and CPS were not contributing much to line downtime. However, the CPS was able to be interfaced via a direct communications protocol similar to the Multivac. As the CPS is at the end of the line, it was felt a focus on just the Multivac and CPS was an efficient way to determine overall line availability metrics with little cost.

3.5.1.1.1 Data Measurement Foundation

Trials were required to enable these communication pathways to determine the optimum architecture. These trials were as follows:

1. OPC DA Server installed on a laptop connected via ethernet to one Multivac
2. OPC DA Server installed on a laptop connected via ethernet to one Multivac communicating to multiple Multivacs over the machine network. Communicating with one Multivac at a time
3. Worked with IT to open the corporate network to allow OPC traffic from Multivacs on the machine network
4. OPC DA Server installed on a laptop connected via WiFi over the corporate network to multiple Multivacs, one at a time
5. OPC DA Server installed on a server connected via ethernet over the corporate network to multiple Multivacs, up to 4 at a time
6. OPC DA Server on the server trying to connect to 5+ Multivacs simultaneously is a challenge. Working with the vendor to experiment with configuration files to enable 9 Multivacs simultaneously.

Utilising the Wonderware System Platform applications the OPC DA Server data was interfaced to an inbuilt OPC Client. This enabled the System Platform to have visibility of the live data.

Live data was then stored in Wonderware Historian, a high-speed, compressed database. This database allows the availability data to be queried in real-time for any desired time period.

3.5.1.1.2 Data Visualisation

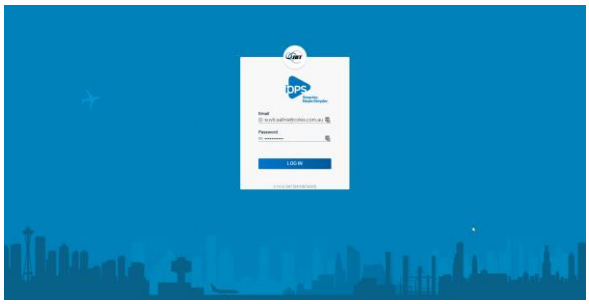
The above approach constitutes the foundation for the measurement of data from each line in the RROA processing plant.

A new approach was desired for data visualisation in order to provide a flexible, fast and cost-efficient method for data analysis.

Grafana and DrawIO are two tools we have selected to meet the above requirements. They are license free software tools, full featured with industry acceptance which means the Coles IT department support their use on the servers and corporate network.

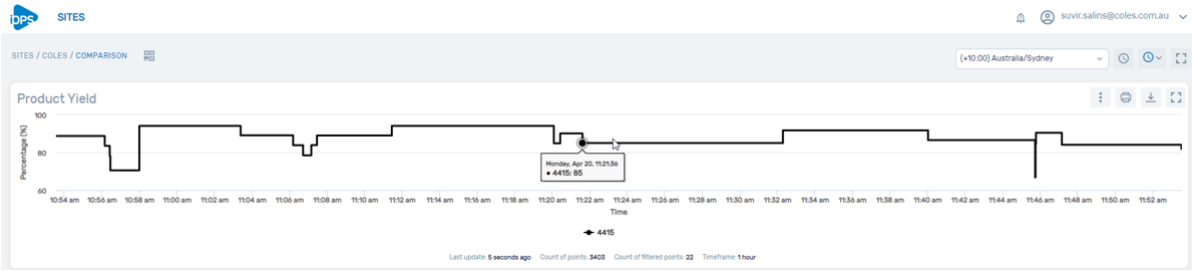
3.5.1.2 Yield

To access the iDS data in order to calculate yields per producer new data approaches were required that the vendor didn't generally provide. Using a unique combination of the vendor's data visualisation product, JBT iOPS Cloud Portal and their iDSS application which provided access to their cloud database, we have created a data approach which will allow full interrogation and visualisation of datasets.



iOPS Data Storage Services (iDSS)

iOPS Data Storage Services (iDSS) gives you simple and secure access to your data. All the complexity of migrating your data to a redundant cloud services has been removed. Now you can easily access this data through an ODBC connection. This guide will take you through the setup process and provide a few tips and tricks for getting started.



3.5.1.3 BMS

The use of the CALMS cloud logging and reporting system has allowed the engineering site services team to have a tool which quickly directs them to issues and gives them an overview of performance. Prior to this data centric approach, the engineers would only have visibility of individual data points with no context of past data or associated costs.

3.5.1.4 Vision System

Refer to section 4.3.2 for the preliminary tasks for this project. Once these are completed new data will be available for analysis.

3.5.1.5 Pathogen Reduction

This project is now being formalised into a separate MLA project with its own milestones.

3.6 Analytical Tools

3.6.1.1 OEE

Refer to section 4.5.1.1.1 and 4.5.1.1.2 for a new data approach. Once this is fully implemented further data will be available for analysis.

3.6.1.2 Yield

Refer to section 4.5.1.2 for a new data approach. Once this is fully implemented further data will be available for analysis.

3.6.1.3 BMS

Refer to sections 4.4.1.3. and 4.5.1.3 for details on the CALMS cloud system analytical tools.

3.6.1.4 Vision System

Refer to section 4.3.2 for the preliminary tasks for this project. Once these are completed new data will be available for analysis.

3.6.1.5 Pathogen Reduction

This project is now being formalised into a separate MLA project with its own milestones.

3.7 Application of Business Decision Tools

3.7.1.1 OEE

Refer to section 4.5.1.1 for a new data approach. Once this is fully implemented further data will be available for analysis.

3.7.1.2 Yield

Refer to section 4.5.1.2 for a new data approach. Once this is fully implemented further data will be available for analysis and the development of business decision tools.

3.7.1.3 BMS

The report detailed in sections 4.4.1.3 and 4.5.1.3, is automatically produced by the CALMS cloud system. These reports help to diagnose if compressed air usage is trending correctly and assisting in managing costs or alerting the team of issues with any of the compressors or whether there are leaks in the system.

3.7.1.4 Vision System

Refer to section 4.3.2 for the preliminary tasks for this project. Once these are completed new data will be available for analysis and the development of business decision tools.

3.7.1.5 Pathogen Reduction

This project is now being formalised into a separate MLA project with its own milestones.

3.8 Skills Development

3.8.1.1 OEE

One of the biggest challenges in a large corporate environment is balancing the need for data availability with that of security. New skills have been developed in managing these at times competing requirements. In particular:

- IT Network port rules to allow data to traverse between the less regulated machine network (source of data) and the corporate network (data consumers)
- IT account privileges to allow access to various databases across domains
- Data visualisation techniques using Grafana and DrawIO
- OPC DA protocol configuration to allow easy integration between many disparate data sources and data consumers

3.8.1.2 Yield

Due to COVID-19 face to face training sessions have been limited. However online screen sharing sessions were conducted to train the Digital Officer on the operation of the iOPS Portal and iDSS application in order to view and interrogate the data.

3.8.1.3 BMS

Consultant from Compressed Air Alliance provided training on the use of CALMS, the cloud-based data logging and reporting tool to monitor the compressed air usage and accompanying power costs associated.

3.8.1.4 Vision System

Refer to section 4.3.2 for the preliminary tasks for this project. Once these are completed new data will be available for analysis.

3.8.1.5 Pathogen Reduction

This project is now being formalised into a separate MLA project with its own milestones.

3.9 Participation in Digital Networks

3.9.1.1 OEE

Due to COVID-19 face to face external networking sessions have been limited. However internal Coles RROA workshops were organised to share knowledge gained from online learning sessions with SMEs such as Beckhoff, Multivac and Grafana.

3.9.1.2 Yield

Due to COVID-19 face to face external networking sessions have been limited. However online workshops with the MLA gave insights into the larger market trends and issues facing producers which highlighted possible avenues of data analysis.

3.9.1.3 BMS

Due to COVID-19 face to face external networking sessions have been limited. Online sessions with Schneider Electric and Compressed Air Alliance to discuss power monitoring options and solutions.

3.9.1.4 Vision System

Due to COVID-19 face to face external networking sessions have been limited. An online session was organised by Coles corporate with partners who have vision system experience, such as Matthews and Cognex. The team was able to learn of various vision solutions and options available to take into account when developing the User Requirement Specification.

3.9.1.5 Pathogen Reduction

This project is now being formalised into a separate MLA project with its own milestones.

4 Milestone 5

4.1 Introduction

In milestone 5, efforts have been focused on two main areas; a new master data management system and further development, and implementation of the ongoing OEE project.

4.2 New project Initiative on Master Data Management Solution

4.2.1 Problem Statement

To progress with more complicated digital insights, improving data accessibility and quality was a key enabler of the wider digital roadmap.

RROA does not have an application solution to manage organizational Master Data. Currently organisational data relating to product and distribution structures, financial, processing and supply networks and target data is stored in an array of excel spreadsheets. This approach limits the ability to have comprehensive, accurate and uniform definitions of data across transactional systems of record. As a result, the capability to perform complex analytics is reduced.

Applications such as ERP solutions exist to resolve these problems but have a long implementation time and a high cost. A solution was investigated by RROA and its technology partner as an alternative to an ERP solution based on open source applications which the technology provider had consolidated into an alternative solution to deliver many of the needs at a lower cost and shorter implementation time.

To run RROA's operations, just on the planning system, there are about 700 items (materials and finished goods) with close to 10 thousand parameter values, a thousand bill of material records, and 380 production routes records. Any one of these records being wrong or outdated can cause serious impact to operations.

4.2.2 Project Background & Rationale

RROA has engaged Nukon, a digital transformation consulting company, to address the problem stated above by building a framework to handle master data in a new Supply Chain

Management System called TilliT – an application based on multiple open source applications designed to deliver similar functionality to that of an ERP platform.

This master data management system is structured into 4 main components:

4.2.2.1 Master Data Process Mapping (Item Record Creation Workflow)

a. Design Workflow for Create, Update, Inactivate
b. Define People and Systems involved
c. Define Profiles - Roles & Responsibilities

4.2.2.2 Master Data Modelling

a. Create Master Data Model
b. Relate model with existing systems Database, Tables & Fields
c. Create workflows

4.2.2.3 Master Data Consistency Rules (Master Data Consistency Check)

a. Define Rules
b. Create Consistency Check on Entities
c. Run check on save and as a batch job

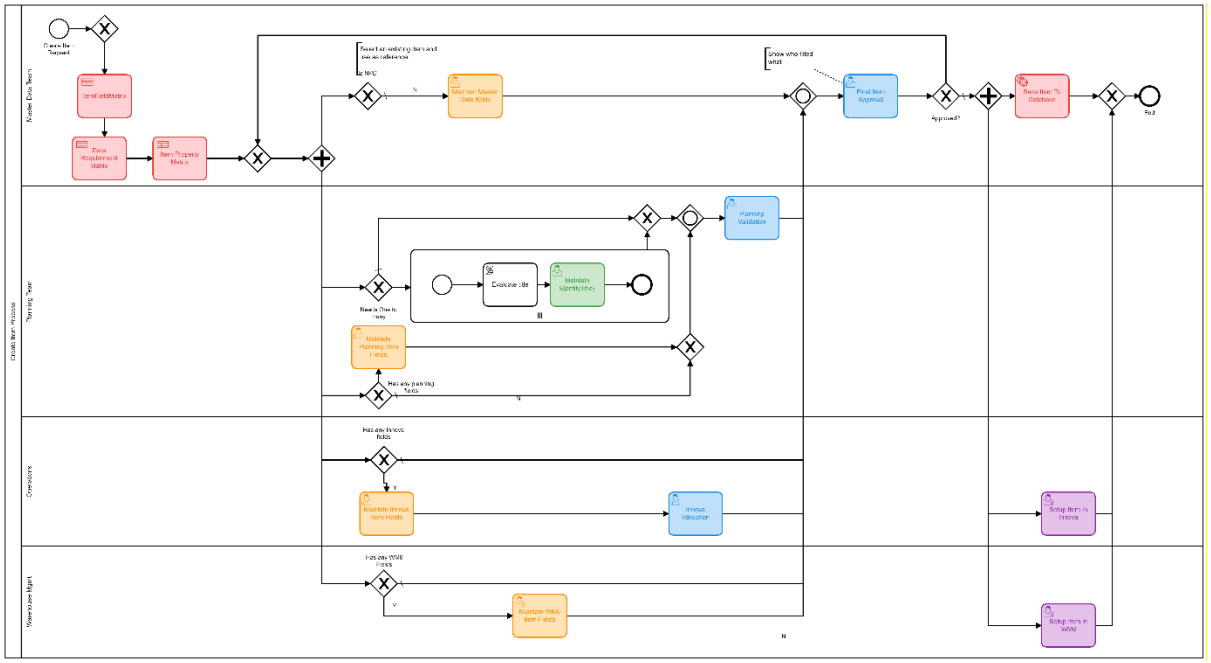
4.2.2.4 Data Compare and Reconciliation (Master Data System Reconciliation)

a. Define Data Mapping for RROA Mater Data, Targets and Financial Data points
b. Build query to compare
c. Create Business Process Modelling Tasks to solve differences

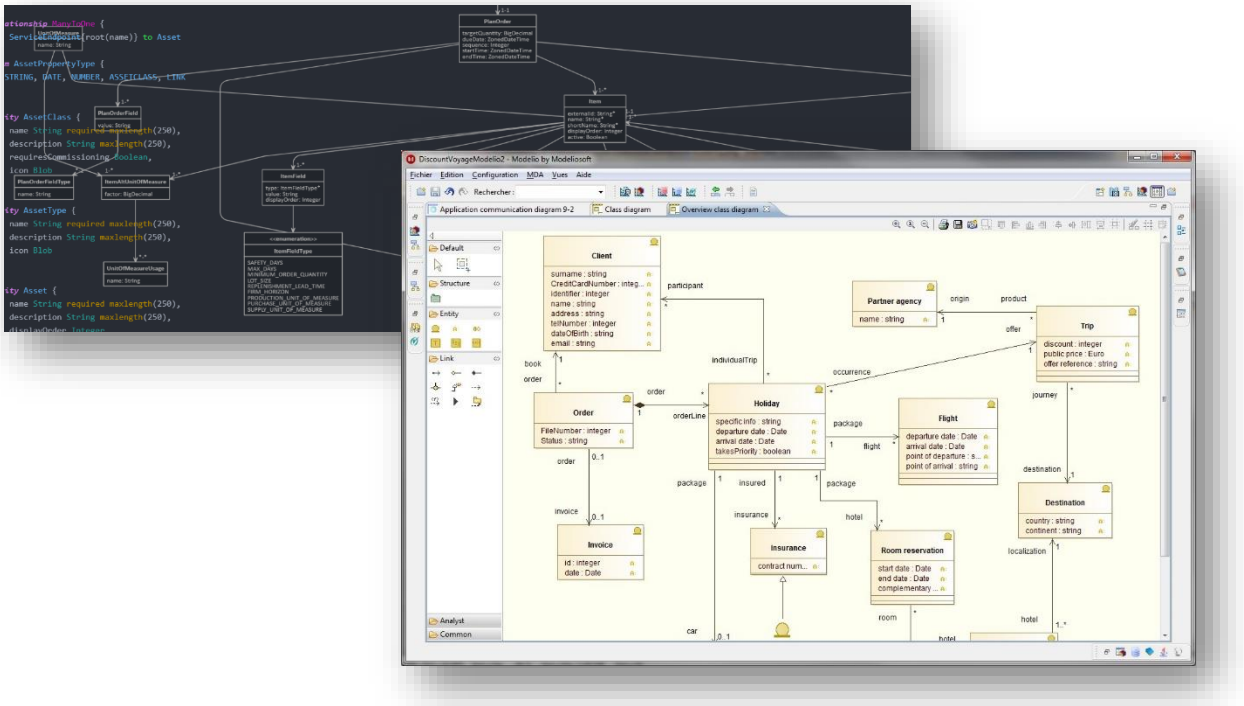
By design these components will rely on a Business Rules engine in the format of a Decision Matrix to drive rules on how the master data should be maintained. These rules are looking at different types of records (Finished Goods, Raw Material, WIP) and different groups of products (Poultry, Red Meat, Value Added). Different combinations of these attributes will define different rules on how the master data needs to be maintained.

In the material record creation process the business rule definition allows the system to query the user to maintain all the required fields for the type of material being created. It also allows the system to go through all records on a daily basis to validate each is in alignment with the current set of rules. The result is an efficient and highly automated way of guaranteeing data quality.

“Master Data Modelling (MDM) Process Mapping” (Item Creation Workflow):



Example of “Master Data Modelling”:



Example of “Master Data Consistency Rules”

DataRequirementMatrix

R	Input +		Output +
	ItemType	ItemSubType	Data Entity
	string	string	string
1	"FG"		"bill-of-material"
2	"WIP"	-	"bill-of-material"
3	"PRIMAL"	-	"item-supplier"
4	"FG"	-	"route"
5	-	-	"unit-of-measure-conversions"
+	-	-	-

ItemFieldMatrix

R	Input +		Output +	
	Item Type	Item Subtype	Field Key	Team
	string	string	string	string
1	"FG","PRIMAL"	-	"shelfLife"	"master-data"
2	"PACKAGING"	-	"leadTime"	"planning"
3	"FG"	"POULTRY"	"piecesPerCrate"	"planning"
4	"FG","PRIMAL"	-	"cratesPerPallet"	"warehouse"
5	"FG","PRIMAL"	-	"safetyDays"	"planning"
+	-	-	-	-

4.2.3 Project Objective

Many of the various sources which feed into master data are scattered across different systems and excel spreadsheets, the main objective of this project is to integrate these sources into a framework which will then rely on automatic daily checks to assess and identify gaps between the current master data and these various systems. This would include:

- Implementation of BPM to manage data by workflow-based solution and quality
- Systemize data integrity checks using bulk data comparisons and business rule sets to govern data (rules defined to identify discrepancies in data formats, illogical data etc - in the current framework and start using the daily check to assess and identify gaps in the current master data)

With the above in place, we can expect to see:

- reduction in data integrity issues impacting operational performance
- reduction in data change management activities / effort
- improved data quality enabling improved business decisions

This new tool will reach multiple departments, from outbound, material purchase, production planning and finance. The way the TilliT Database is setup and how it is integrated to the Master Data Management module will allow the system to hold information about the material as a master database. The consistency check will then validate its accuracy and finally, with the reconciliation process, validate that companion systems (Swisslog and Innova) are aligned with the same values.

4.2.4 Project Methodology

The following steps are laid out to achieve the business outcomes.

- Identify Data requirements, sources and stakeholders
- Define and agree on implementation plan
- Collate and convert core data from spreadsheets into TilliT.
- Develop and replace any existing data access tools / capability to feed from this new master
- Define handover documentation and support for initial user adoption
- Obtain user feedback, learnings, and governance from steering group

4.2.5 Project Output / Deliverables

This project will deliver the following items:

- A detailed report on the business process and data quality map.

The report will be in a document format highlighting the business process implemented, the data rules engine and achievements during the data validation process.

- Create Master Data Model

Master data model with the relation model with existing system database, tables and fields

- Implement Finance MDM Process.

Bring some of the key finance attributes to be managed in the database as opposed to Excel spreadsheets. Have these attributes validated against the business rules engine and maintained through the master data creation process.

- Implement the Data Reconciliation Feature.

Once the data in TilliT's database is validated and kept consistent by using the daily validation check, any parameter that is shared between the different systems in the landscape will need to be validated to ensure all of the common data parameters are aligned.

For example, TilliT needs to know what kind of crate a specific item is associated with as this will impact the estimation of trucks required on any given day. Swisslog also needs to know the crate type as it does its own calculation of a pallet. For every item, the crate type must be aligned between the two systems. This is the process of data reconciliation.

4.2.6 Proof of concept of the TilliT platform

4.2.6.1 Open source modules

Businesses today have access to thousands of open source software solutions: from enterprise resource planning, finance and accounting, and customer relationship management to ecommerce and communication systems.

The main advantages of using such open source manufacturing software over the traditional vendor offerings are:

- It allows to fast track improvement and growth: In a manufacturing context, giving an in-house developer access to the source code means they can manipulate the code and make changes as needed, rather than having to wait for the vendor to release software updates that may or may not be relevant.
- Affordability; Open source software has fewer (if any) licensing fees and there's no limit on licences making it incredibly easy for businesses to try the software before they invest in it. On the other hand, a proprietary MES can be over $100,000 a year just for the licence, with upfront support and maintenance costs on top of that. Open source can allow a business to redirect these funds into making enhancements to the system, providing a competitive edge.
- Access to lightning-speed, reliable support; This might seem counter-intuitive, but the level of support offered by the open source community is often as good or even better than what proprietary application vendors offer. Using an open source component that has a network of 10,000 users allows all users to reach out to the network with questions and get a response within an hour or so. Because of this transparency, developers are highly responsive, bugs and issues can be found and fixed quickly. In comparison, lengthy support ticket processes with proprietary software vendors can take weeks or even months to resolve. In addition, closed software vendors may not release new updates until a few months down the line.
- Control is brought back to the business and user; Traditionally, the manufacturing sector has left software implementation and upkeep to their vendors. Now an increasing number of companies have realised that outsourcing this responsibility brings considerable limitations because no closed-source software is going to fulfil every single one of their needs. Being able to tailor software to their requirements gives them a competitive advantage, especially as we move into information technology (IT) and operational technology (OT) integration, data analytics and the Internet of Things (IoT).
- Allows the business to leverage untapped IoT technologies; Open source is driving some major IoT initiatives that have immediate impact for manufacturing. Microsoft Azure and Amazon Web Services are other IoT platforms that handle connectivity between devices and cloud storage. Both their own proprietary applications and open source applications can be plugged in to achieve a customised system approach. Proprietary software can be limiting if they haven't got the ability to get into that 'ecosystem of components' arena.

As competition in the industry intensifies, success, more than ever, will rely on the speed and reliability of data analytics and other IoT technologies. As we've seen, open source software is already playing a starring role in this space. Finding the best blend of proprietary and open source software will be a key part of ensuring business competitiveness in this space for the next 5–10 years and beyond. Achieving integration across manufacturing operations software can increase production and business performance across the board.

4.2.6.2 Contractor support to progress data quality

Nukon is well placed to support Coles through this work, as the team has been working with RROA for 5 years and has delivered multiple iterations and provided 24/7 support of the TilliT Planning solution. Nukon also worked on the scope definition, high-level architecture, delivery roadmap, and business case for the Coles Meat ERP system implementation at the Coles head office in 2018. Through these engagements the Nukon team has gained an intimate knowledge of the Coles ordering, replenishment, and ERP systems, and is the best-placed partner to assist with this initiative.

Nukon will also act as a bridge between RROA and the open source community.

4.2.6.3 Capabilities

- Database x Excel; All the master data creation, change, and logging is done in excel today. Also, all the approval and requests are made through email and paper. With the adoption of this new solution, these actions will be automated and standardized. This will bring more reliability to the process and more visibility to the stakeholders.
- User Interface, consistency rules; Business rules will be mapped with consideration of how the process should flow and that the master data is following what was previously defined. This means that a set of master data fields need to be populated by specific team members and that consistency between systems is also in place.
- Business process management, workflows -> accountability; Automated workflows equip employees with the right data at the right time where routine tasks are automated. This allows to redirect attention towards more valuable activities like continuous improvement. They also ensure every workflow is executed according to the standard operating procedure, every time. Workflow here will ensure that the process is being followed and the proper accountability is being followed. It will be very important for audits when creating a new item (NPD) or when a change is necessary to a specific master data item.
- The analysis and reporting tools also provide visibility into “production costs and opportunities for improvement”. This level of integration is harder to achieve with proprietary software because they are often limited to exclusively using their own suite of solutions – which may be both cost-prohibitive and not the right fit.

4.2.6.4 Data Map

- Definitions of Core Product Content Data; When a new product is created and changed, it is not just the data that needs to be captured but also the process needs to be logged. With this initiative, it will be possible to audit all the fields and all the workflow details of when the action was made and by whom.
- Accountabilities; Accountability will be defined against an item field and a task. This means that a specific task of the workflow will be assigned to a specific team in the process of creating or changing an item.
- System source; It is possible to mix-and-match open source and proprietary components. One of the biggest benefits of exploring open source is that it provides the ability to select the best open source and proprietary applications to suit production needs. The two can work in tandem. For example, an off-the-shelf

enterprise resource planning (ERP) could be paired with a custom, open source MES. This allows to enhance the system using the best products available on the market. The benefits of a mix-n-match approach include:

- Choice: There's an enormous marketplace for applications that build into ERP systems and other open source manufacturing software
- Easy integration: Open source components are designed to 'fit together', so they can be simply integrated with the current proprietary system
- Lower risk: The 'all your eggs in one basket' mentality is erased
- Flexibility: All options can be explored
- Customise and build at any pace: It's possible to get a lightweight, customised and integrated system through small, segmented installations using a variety of products on the market

4.2.6.5 Data to improve Business Decisions

Development of the data map will deliver a foundation for centralizing core financial, production and supply chain dimensions into an integrated database. RROA's ability to generate future insights will be significantly improved through faster sourcing of data (as it will already be mapped in a more comprehensive framework) and there will be significant improvements in accuracy of data and the accessibility to structure insights involving transactional systems or records (WMS, MES, ERP etc).

As RROA does not have an ERP solution, the current excel based solutions have led to a lack of consistency rules in data sets and structures. The consistency checks and definitions will provide necessary structure to enable cross system analysis and improve the timeliness of reconciliations and audits of core organisational data.

4.2.6.6 Quality

- The project will introduce new workflows focusing on improving New Product introduction and Change Management. The selection of these processes is aligned with functionality of the software and has been identified in the scoping of a critical area of improvement to achieve objectives of:
    - Reducing process time for new products and changes
    - Improve change scoping to produce improved definition of specifications – ultimately relating to improved quality
    - Reduce communication and assessment errors to deliver an improved result

4.2.7 Value Proposition to the Red Meat Processing Sector

The main value proposition to the Red Meat Processing Sector is to evaluate the use of an open source system as a low-cost alternative to Excel and other common methods to data management. This project is anticipated to deliver significantly improved capabilities to manage organisational data.

The quality and structure of data is a particular challenge in the Red Meat industry as the products do not conform to a fixed definition. ERP solutions offer a solution but generally have

a high price and are not suited to dealing with challenges such as variable weight and complex substitutions of specifications. Proving and generating learnings from an open source application may provide alternatives to the current more popular solutions – likely in the areas of smaller operations that do not have the investment potential of larger businesses.

The process of developing a data model will allow improved insight into data points within the RROA operation and Coles Red Meat Supply Chain - reducing the investigation stage of future analytical projects. The consolidation of Excel based data will enable improved analytics from integrated databases. Analysis of data will become more accurate through both quality of data and improved capability to transform data into insights – including those across the Red Meat Supply Chain.

4.3 Existing project - OEE

4.3.1 Details of Data Analysis

4.3.1.1 Multivac Availability Calculations

As detailed in 4.5.1.1 each Multivac's running, stopped and paused discrete signals were historized in the Wonderware Historian database at every data change event.

The availability percentage is defined as running time/total elapsed time x 100.

Three separate availability percentages were displayed, the last 10 minutes, last hour and total shift.

The system first determined which shift was running, morning or afternoon for the designated area ie Red meat or Poultry. This then determined the start time of the shift. Using the current time – the shift start time, the total elapsed time was determined for the shift.

The last 10min and last hour calculations were of course current time – 10 mins of current time – 1 hour to determine total elapsed time for those availability calculations.

To determine the total running time for the period, a stored procedure was used to iterate through all the running events and aggregate the total running time.

4.3.1.2 Multivac Paused Time

It was discovered that the Multivacs were able to be paused, causing unavailability, without the machine state transitioning to stopped. Thus, the calculation for true availability had to be adjusted as follows:

Availability Percentage = (Total Running Time – Paused Time) / Elapsed Time x 100

4.3.1.3 Multivac Cleaning Time

Currently there is no integration with the scheduling system, so the Elapsed Time definition is based on the fixed shift times. However, if the Multivac is in cleaning mode, this should be

regarded as unscheduled time. The Wonderware system was integrated with the cleaning tags from each Multivac and the Availability calculation updated as follows:

Availability Percentage = (Total Running Time – Paused Time) / (Elapsed Time – Cleaning Time) x 100

4.3.1.4 Multivac Top 5 Downtime Reasons by Occurrence

The Multivac Fault codes were historized and analysed for the same period as the Availability Percentage for the current shift. The top 5 downtime reasons by occurrence were returned for this period.

4.3.1.5 WPL Availability Time

No direct communication was available to the WPLs in order to capture the machine state. However, via the Multivac's interface to its associated WPL, the WPL's state could be inferred from the downstream fault or jammed signal and thus the WPL availability calculated.

4.3.1.6 Data Analysis Findings

Using the Wonderware SCADA system an Operations Dashboard was developed to display the availability and downtime data for each Multivac and WPL across the site.

Analysis of both the live and historical results across several days showed several consistent trends.

1. Multivacs set the speed of the overall line (as was seen on the Line 24 proof of concept system).
2. The WPLs experienced very little downtime running at high availability. The WPLs were mostly being starved by the Multivacs
3. Multivacs were being paused by operators, to keep up with the infeed volume, while maintaining product presentation.
4. Lines which run in a push mode ie Lines 5 and 6, don't get paused very much.
5. The lines generally achieve average availability, but if this pausing was removed, they would achieve high availability.

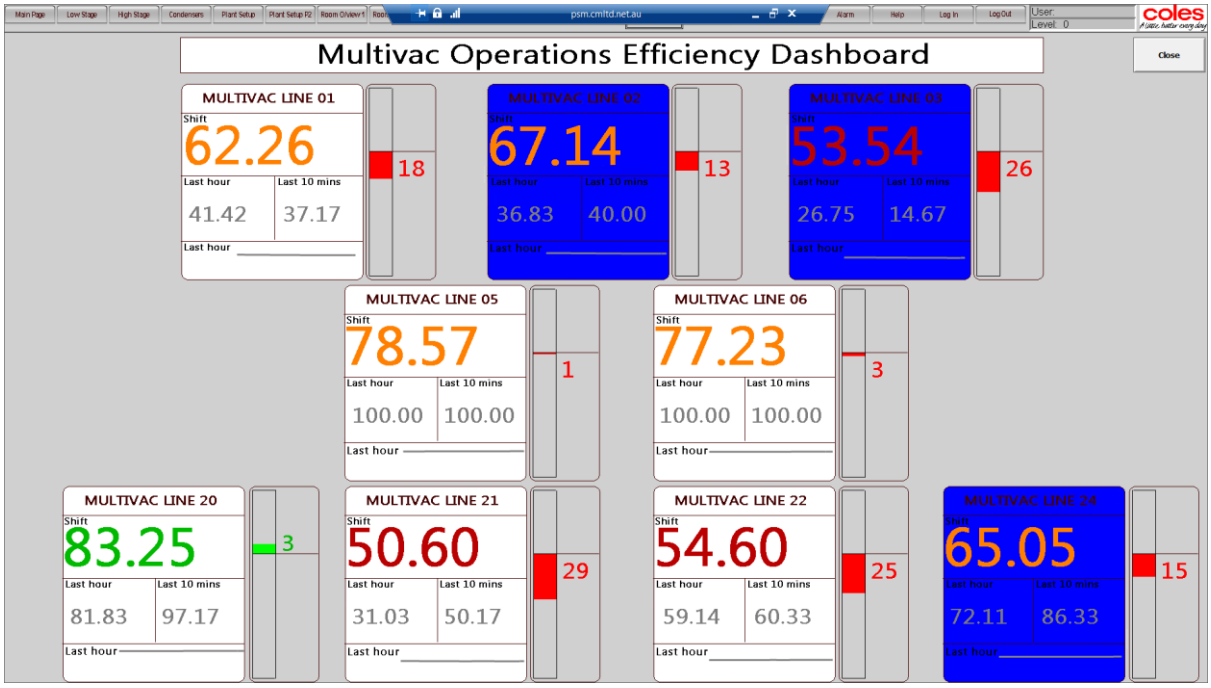
Operations are focusing on slowing overall line speeds down, while ensuring the infeeds are full, to run the lines more consistently without pausing. This should increase overall availability of the Multivacs and thus the line.

4.3.2 Development of New Digital and Data Approaches

4.3.3 Analytical Tools

Several tools using the Wonderware SCADA development environment were utilised to create operations efficiency dashboards as shown below. These live and historical data analysis tools were used to analyse the data and inform business decisions.

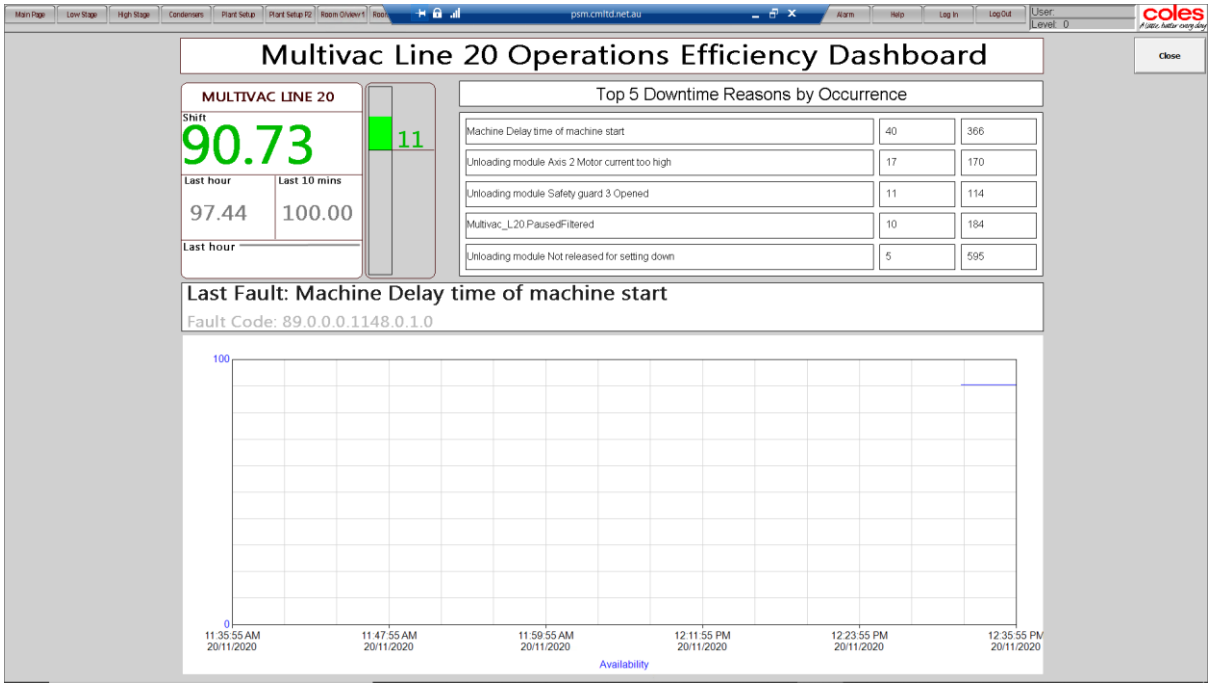
Operations Efficiency Dashboard



Downtime Reasons by Shift

Top 5 Downtime Reasons by Occurrence		
Multivac_L01.PausedFiltered	455	9208
Unloading module Not released for setting down	135	2171
Machine Delay time of machine start	95	973
Forming station 2 Forming Pre-heated film has cooled down	22	507
Forming station Safety light barrier Light barrier interrupted	19	176

Operations Efficiency Dashboard per Multivac



Wonderware Historian Trend Client

4.3.4 Skills Development

4.3.4.1 OEE

Managing complex historized data queries on large datasets can place a large burden on server memory and processors. Various skills were developed to refine queries to minimise these loads and ensure fast data access without impinging on the general performance of the servers.

4.3.5 Participation in Digital Networks

4.3.5.1 OEE

Due to COVID-19 face to face external networking sessions have been limited. However internal Coles RROA workshops were organised to share knowledge gained from online learning sessions with SMEs such as Beckhoff, Multivac and Grafana.

5 Milestone 6

5.1 Introduction

In milestone 6, efforts have been focused on two main areas; a new master data management system and further development, and implementation of the ongoing OEE project.

5.2 New project Initiative on Master Data Management Solution

The co-funded digital project relating to the improvement of a master data was proposed to the RROA capital approval group on a 7/01/21 and was approved for funding. The proposal was chaired by the digital officer and was an opportunity to highlight the opportunities of the program to the recently appointed Head of Site.

The project was endorsed by all Heads of Department and Head of Site, recognizing the value of digital developments to improve overall data quality of the site and as a critical enabler of future analytical works.

The capital request was segmented into several modules, with some being optional. Each module was approved, these included:

- Building of Master Data Management Workflows for managing New Products and Managing Changes to Product Data
- Migration of existing data housed in excel spreadsheets
- Reconciling data from operational systems
- Rollout and user support

The benefits cited by the leadership group as being the most important contributors were:

- Centralization of data to reconcile records in operational systems to reduce data discrepancy issues
- Improved quality of data in the New Product Development process by enforcing linear processes and having transparent data during development
- Ability to perform more complex analytics around validating product costs / performance and as a foundation for future analytical processes where questions are unable to be answered accurately due to data limitations

5.2.1 Development Partners and Subject Matter Experts

The cross functional and introduction of technical personnel from a technology partner enabled a solution specific to the equipment, processes and materials for the Red Meat data capture at RROA. RROA subject matter experts consisted of experienced financial, manufacturing systems and technical experts with the objective of identifying the key data and definition processes to further optimize the site.

The Nukon team (technology partner for this initiative) assembled a multi-disciplinary skill set that combined to provide configuration and best practice support for process automation and data management. Rafael Amaral as the CTO of Nukon, has a long history with Coles and RROA and a deep understanding of the facility's supply chain components. Levi Martins as a Business Analyst, has experience on both the RROA dispatch solution as well as a background in Supply Chain systems like SAP. Frazer Porter has extensive experience in the Manufacturing Execution System space for the Meat manufacturing sector.

Through the partnership with Nukon participation with the open-source digital network was enabled which contributed to the design and implementation of the project solution.

5.2.2 Requirement Workshops

In addition to the digital development, the development of the solution has included workshops with several key RROA personnel to define the correct operational requirements.

Workshop	Attendees
Problem Statement and Requirements Definition	Jordan McIntyre (Digital Officer / Planning Mgr) Levi Martins (Solution Consultant) Sheetal Maharaj (Technical Mgr) Ravi Kumaranayake (Master Data Mgr Finance) Lillie Vrga (Finance Mrg) Tom Chow (Quality Systems Mgr)
Solution Design Session #1	Jordan McIntyre (Digital Officer / Planning Mgr) Levi Martins (Solution Consultant) Sheetal Maharaj (Technical Mgr) Ravi Kumaranayake (Finance Mrg)
Solution Design Session #2	Jordan McIntyre (Digital Officer / Planning Mgr) Levi Martins (Solution Consultant) Sheetal Maharaj (Technical Mgr) Ravi Kumaranayake (Finance Mrg)
Technical Solution Design Session #1	Jordan McIntyre (Digital Officer / Planning Mgr) Levi Martins (Solution Consultant) Rafael Amaral (Chief Technology Officer) Frazer Porter (Solution Consultant)
Technical Solution Design Session #2	Jordan McIntyre (Digital Officer / Planning Mgr) Levi Martins (Solution Consultant) Rafael Amaral (Chief Technology Officer) Frazer Porter (Solution Consultant)
Technical Solution Design Session #3	Jordan McIntyre (Digital Officer / Planning Mgr)

	Levi Martins (Solution Consultant) Rafael Amaral (Chief Technology Officer) Frazer Porter (Solution Consultant)
Detailed Data Mapping	Jordan McIntyre (Digital Officer / Planning Mgr) Kia Chang (Application Support Analyst) Sam Truong (Application Support Analyst)

5.2.3 Solution Partner Perspective on Uniqueness of Data Model Requirements

It is normal to see companies living without a Master Data Management System. Even if they are using an ERP, satellite systems such as WMS, CRM, and MES create the same master data scenario being saved and maintained on multiple systems. RROA is not an exception. RROA in fact, has a specific situation of relying heavily on high-quality master data because the data volumes processed daily results in RROA being highly sensitive to bad data records. Considering that a bad data record can lead to bad decision-making that can in turn can result in thousands of dollars in losses, it stands that RROA should have a mature master data management system.

The key systems in place at RROA are: The MES (Innova), the WMS (Swisslog), the Planning System (TilliT) and several tools running the Finance and Costing functions. Having a central placeholder where we can maintain one source of truth while having user access control and versioning or auditing capability become crucial.

During the process of designing the solution, the business chose to make some decisions that would result in a higher level of flexibility and extensibility of the master data. Starting with a set number of data points being recorded per material, RROA is able to add new attributes to be recorded by simply adding an attribute type to the database. This allows the business to adapt without requiring code to be changed.

5.2.4 Solution Partner Perspective on Uniqueness of As-Is Data Quality and Transition Plan

The challenge with the current system of using Excel spreadsheets as a data repository, is that the tool does not enforce data integrity. A data management system which uses a database as its foundation can enforce data integrity.

The next phase in the project is thus to migrate existing data from Excel into the database which is at the heart of the newly designed data management system.

When the business starts the migration phase, there is an awareness that the existing data source may include errors which will require rectification pre and post data migration.

Another potential migration challenge is seen between the time the master spreadsheet is analysed and the time when the migration is initiated. There may be structural changes made to the source data within this time window, which will require re-work for the data migration team once the migration is completed.

5.2.5 Value Proposition to the Red Meat Processing Sector

The main value proposition to the Red Meat Processing Sector is to evaluate the use of an open source system as a low-cost alternative to Excel and other common methods of data management, such as the very costly Enterprise Resource Planning (ERP) applications. This project is anticipated to deliver significantly improved capabilities to manage organisational data.

The quality and structure of data is a particular challenge in the Red Meat industry as the products do not conform to a fixed definition. ERP solutions offer a solution but generally have a high price and are not suited to dealing with challenges such as variable weight and complex substitutions of specifications. Proving and generating learnings from an open source application may provide alternatives to the current more popular solutions – likely in the areas of smaller operations that do not have the investment potential of larger businesses.

The process of developing a data model will allow improved insight into data points within the RROA operation and Coles Red Meat Supply Chain - reducing the investigation stage of future analytical projects. The consolidation of Excel based data will enable improved analytics from integrated databases. Analysis of data will become more accurate through both quality of data and improved capability to transform data into insights – including those across the Red Meat Supply Chain.

The business looks forward to the migration phase as data is moved from the current Excel system into the newly developed database-centric, open-source Data Management System.

5.3 Existing Initiative on Operational Efficiency Data

5.3.1 Introduction

Milestone 6 sees the continued development of the OEE Digital Dashboard project which aims to automate the capture and reporting of OEE data (Availability, Quality and Performance) from key equipment on each line in the Red Meat and Poultry areas.

5.3.2 Design and Implementation

Up till Milestone 5, only Availability data was being retrieved from any of the equipment on the production lines. In Milestone 6, Quality and Performance was included in the data being retrieved from the Multivac machines on each line.

The Quality percentage is defined as the number of Good Units/Total Produced Units x 100.

The Performance percentage is defined as the Actual Machine Rate / Target Machine Rate x 100.

Milestone 6 also sees the addition of an OEE Dashboard screen which displays the OEE calculation for each line ie OEE = Availability x Quality x Performance. Additionally, each

line's individual dashboard now includes Availability, Quality and Performance metrics for the shift.

Milestone 6 also saw the use of the TV screen for continuous display of the OEE Digital Dashboard overcoming several IT challenges which up till recently were blocking the use of the screen for extended periods of time.

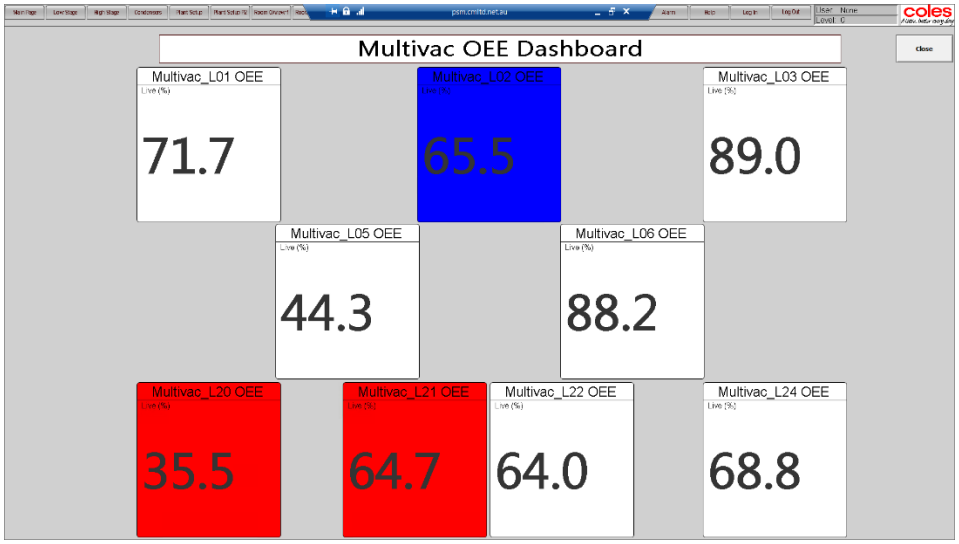
Although the Quality and Performance data have been added to calculate the OEE, the Availability data is still the key metric that determines the operational success of each line.

Work has begun on automating the SQL database queries which return the Availability data for each line's Multivac and emails this to key stakeholders.

5.3.3 OEE Dashboard

Access to both Quality and Performance Data has now allowed full OEE to be calculated. The following screen shows the OEE for each line's Multivac machine.

White = Running, Blue = Paused, Red = Stopped.



Digital Dashboard – OEE Display for all Multivac Lines

The Live OEE Digital Dashboard is displayed on a TV monitor installed in the Engineering office which is adjacent to the Operations teams.

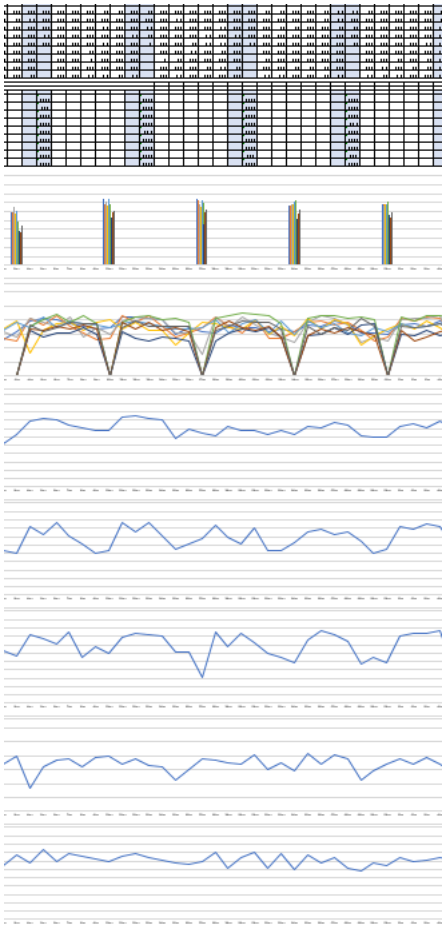
Photo 1: Digital Dashboard – Live Data View in Engineering

5.3.4 Application of Business Decision Tools

Based on intelligence gathered from the Live Dashboards and Historical data queries on availability data and downtime occurrences, operations were able to make informed decisions around line speed, infeed capacity and focus on operator behaviour to increase line availability.

A key take away from the last 3 months of data analysis, as the system has been rolled out to all Red Meat, Mince and Poultry lines, has been the confirmation that the operator behaviour seen on the Line 24 pilot line, is also prevalent on other lines. Looking specifically at the total amount of time that a line is in a paused state, has revealed that many lines are paused for a considerable time. As a result, operations have altered several operational parameters. Firstly, there has been a high level of focus on keeping the infeed lines as full of product as possible. Conveyor speeds have been altered and alarms added to ensure product is properly paced and operators alerted if not enough product is present on the infeed lines. Secondly the line speeds have been reduced so that all manual operations can be performed by the operators at a comfortable rate without needing to pause the line. Thirdly, rather than pausing the line, if operators need more time they are allowed to reduce the speed of the line even further and then increase the speed back to normal when able. In this way the lines are run more continuously.

Availability has been able to be increased up to the 70-80% range with these operational changes.



3-Month Availability Trend

5.3.5 Participation in Digital Networks

Due to COVID-19 face to face external networking sessions have been limited. However internal Coles RROA workshops were organised to share knowledge gained from online learning sessions with SMEs such as Beckhoff, Multivac and Grafana.

5.3.6 Next Steps

Operations are focusing on continuing to slow overall line speeds down, while ensuring the infeeds are full, to run the lines more consistently without pausing. This should increase overall availability of the Multivacs and thus the line. These actions will be done in conjunction with the live digital dashboard as well as the historical reports which are generated and shared with Operations and Engineering on a weekly basis.

Work on overcoming IT challenges to distribute data reports via automated emails will continue to enable the sharing of data to key stakeholders on a daily basis.

6 Milestone 7

6.1 Introduction

In milestone 7, efforts have been focused on further developments on the Master Data Management Solution.

6.2 Existing Project on Master Data Management Solution

The co-funded digital project relating to the improvement of a master data management solution has commenced development to deliver new capabilities. In conjunction with the Solution Partner Nukon the configuration has commenced using a group of open source applications to improve the collection of New Product data and changes in key product specifications as part of a systemized workflow and stored in an integrated database.

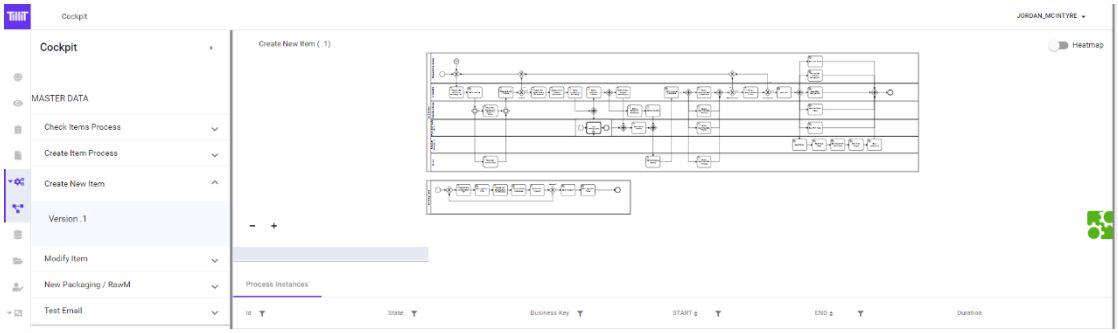
The key architecture of the solution includes:

- Vuetify — A Material Design Framework for Vue.js
- Camunda - A Workflow and Decision Automation Platform
- Microsoft SQL Server – A database platform

The progression of this milestone predominately included:

- System Implementation of a Data Structure in a database – ready to load the organization's core product details in an improved analytical platform

- Development of a New Product Development and Item Change Workflow



- Development of Data Integrations between Specification data, the Manufacturing Execution System, Warehouse Management System and Planning Systems

The analysis of data and development will expect to deliver benefits outlined in the report.

6.2.1 Improvement of Data Quality During Transition and Insights

A data audit and re-costing of products were undertaken as a cross functional project between the digital officer, finance, operations and technical departments to validate and update data prior to the transition to new data capture processes.

The collaborative nature of this project has enabled improved discussion of costing parameters and trade-offs to operational efficiency. An example of the new analytics being used in product optimisation included the re-costing of previously discontinued Vacuum Sealed (VSP) products based on accurate product change over data and efficiencies. The outcome of the review has provided new data in the consideration to relist and expand ranges to deliver a more viable offer.
These products will include 6 new Beef products that will be ranged to Coles longest lead time stores in the Northern Territory, South Australia and Northern Queensland.

6.2.2 Enrichment of Organisational Data

The decision was made as part of the integration strategy to identify some key data changes that will improve the capabilities to conduct additional analysis. The changes are aimed at improving capability over and above the data integration and accuracy in capturing new data benefits that were a direct intention of the solution design.

The changes to the data generally took the following forms:

- Changes to the transposition of data in user extracts intended to enable more complexity in data (more complex ingredient lists, and manufacturing processes)
- Change to formats of specific data types e.g. text to values, to enable numerical validations and ranged comparisons
- Addition of new data fields to capture new data to remove current analytical limitations

As part of the data transition, opportunities were taken to improve the data structure through the restructuring of data and capture or new information to improve analysis.

These changes are listed below:

Data Development	**Potential Analytics Enabled**
Equipment register, linked to each product and manufacturing line	• Scheduling conflict analysis & equipment utilization • Mass yield comparison – long term regression
Alternate production route and alternate material configuration data for products	• Live alternate production configurations and impact to yield, efficiency and crewing
Standard yield loss configuration/standards based on part process	• Intra-Line Yield Analysis against Standard/Target
Master Tray Definitions	• Crate utilization against optimum crate fill (enabling reduced production and logistics cost) • Waste analysis based on tray die lines vs consumption standards
Aligned data structure for Bill of Material Records	• Ingredient audit capability
Product weigh and slice thickness tolerances	• Tray Weight Comparison to Specification

6.2.3 New Capabilities and Potential for Future Analytical Projects

The business has shortlisted some of the analytical projects listed as part of the data development based on the strategic benefits for the site:

1. Crate utilisation base on optimum crate fill -

   In the last 12 months, RROA has increased Red Meat production to QLD, SA, and Vic by over 50 tonnes through the introduction of products such as Corned Beef and Graze Lamb where RROA is the sole distributor for the Coles Eastern seaboard stores.

   Identifying opportunities in crate fill will have a direct impact to reducing cost involved in logistics, reduce CO2, and reduce pressure on site operating constraints to enable future growth.

2. Scheduling conflict analysis & equipment utilization -

   Equipment availability has been identified as a key factor in yield loss of specific Beef Cuts.
   RROA has invested in equipment due for installation in May 2021 to improve yield.

   Identifying equipment scheduling conflicts and defining operational processes to prioritise certain SKUs, will reduce capital expenditure and improve yields – previously demonstrated as up to 7% due to equipment conflicts.

6.3 New Project on Analytical Services Review

Retail Ready Operations Australia has a database which has archived of over 1.5 million megabytes (MB) of compressed production data from MES, WMS, and MRP systems.

To make a significant step in improving access and usability of data, RROA has commissioned a project to deliver a proof of concept business intelligence application and a review of data archiving capabilities.

6.3.1 Problem Definition and Scope

A scope of works was defined to make progress on improving the usability of both RROA's operational data and archived data for improved reporting and analytics. The initial scope of works included:

- Introduce a visualisation/presentation service (previously investigated Power BI & Grafana)
- Review and recommendations of the fit for purpose current integration solution
- Delivery of a development roadmap based on a review of the data model and database performance opportunities relating to table design, indexing etc

The current barriers to the current solution to effectively perform advanced analytics are:

- Inability to access data and limited or no visualisation/presentation services
- Poor loading times of data from source databases to the reporting database – delaying availability of data and reducing the "usable" window of analytics to 2-4 business hours per day
- Long running queries on the reporting database driven by a lack of a data model, aggregated data and limited partitioning and indexing of data

6.3.2 Solution and Development Partner Selection

Business Intelligence Application

The application requirement is to enable self-serve information requirements including connection to data sources (primarily intended to be the data archive) and ability to transform and visualise data to make usable reports and illustrate data.

Power BI was shortlisted as the preferred solution by Coles due to existing licencing agreement and support base.

Power BI will allow users to access common data sources through an application layer that can manage access. The application enables users to more easily transform data to usable visualisations and metrics; as well as displaying and sharing reports/visualisations with other users.

Alternatives to Power BI which were considered

- Tableau Desktop
- Qlik Sense
- SAP Business Objects

Analytics Platform Specific for Dashboarding

In addition to a Business Intelligence solution, requirements to meet business needs of providing live visibility of operational data were likely not going to be met by the same solution.

Grafana is an analytics platform specialising in dashboarding. Grafana is very good at managing live/operational data and displaying visualisations to end users. Because it is open source it is designed for a more technical audience and is limited when managing complex metrics or hierarchical datasets (i.e. reporting hierarchies).
Grafana will be a great solution for operational performance or system monitoring but would not be suitable for business KPI management or exploratory analysis.

A small investment was already made to deliver server configurations for Grafana based on a solution partner recommendations.

Alternatives to Grafana which were considered

- Splunk
- Graphite
- Tableau

Business Intelligence Solution Vendors

InfoSys was selected as the preferred solution provider to undertake the scope of works. This selection was primarily driven by an existing relationship with Coles based on similar sourcing principles and have demonstrated their ability to deliver solutions to previous Coles projects in the Meat Business unit.

Infosys have an existing relationship with Coles Database administrators related to RROA's data archive and have experience working within the Coles Enterprise licences of Power BI. The solution provider's knowledge of Coles process, existing access and knowledge of stakeholders, were the primary reasons for selection.

Alternatives to InfoSys

- Wardyit
- WIPRO
- Managility
- NTT

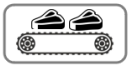
6.3.3 Initial Scope Development and Expected Recommendations

Size of the Prize

RROA's operation has a sizeable impact on the financial performance of the Meat business due to the scale of operations.

A small investment in improving access, visibility and timeliness of information to the business could would allow RROA to deliver initiatives to better optimise supply chain operations or improve operational performance would deliver significant financial benefit.

Red Meat Yield



$20m annual size of the prize in Red Meat yield.
Yield reports used for CI involve significant user manipulation, lack financials and are not timely.

DIFOT & Freshness

RROA impacts Coles W&MD results by approximately **$52m** annually.
DIFOT impacts cause a loss of margin of up to **$1m** annually for RROA.
Supply Chain KPIs have data / report limitations particularly in areas monitoring supplier and network performance.

Labour Optimisation & Operational Monitoring and Supply Chain Decision Making

Direct labour spend for production is **$26m** in Red Meat, **$18m** in Poultry.
RROA does not have accessible data where performance is compared to standards on a near real time basis.
$800K (11 HC Poultry, Red Meat, Outbound) involved in Controlling production and logistics operations.
Ordering and messaging issues impact supply of over **$1m** in FG value per year

Systems Development and Reporting

RROA has historically invested in application solutions to address reporting limitations with an estimated value of over $250,000. RROA may further invest in solutions where reporting solutions could significantly reduce cost.

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6.4 New Projects - Digital Solution Analysis for Red Meat Growth Initiatives

RROA has an aspiration of increasing Beef and Lamb supply by 50 – 100 T year on year production growth between 2021 and 2023. However, the facility operates within several constraints e.g. logistics, business rules governing acceptable life etc

The digital officer has been involved in the development of a number of solutions to resolve operational constraints and improve efficiency.

6.4.1 Solution Delivery for Storage of Red Meat Primals

It is a common industry practise to use third party logistics solutions. The Coles meat business has had challenges in working with these solution providers to ensure the correct data is captured when introducing a new network element.

RROA has limited storage space to manage the storage of Red Meat primals prior to secondary processing. Delivering a capability to store product offsite will deliver the following advantages to the network:

- Resolution to on-site storage constraints as a dependency to increase production volumes
- Trade-offs to availability through to lowering safety stock, necessary to accommodate for demand and supply volatility, will not need to be made
- Delivery of a location which can centralise excess primals to manage network imbalance and primary production constraints, strategically located to RROA (with the distribution of approximately 50% Coles Retail Ready meat distribution)

RROA currently has a process to manage the physical storage of inventory; however, the existing solution lacks the digital capability to meet several business and industry objectives / requirements. In the current state:

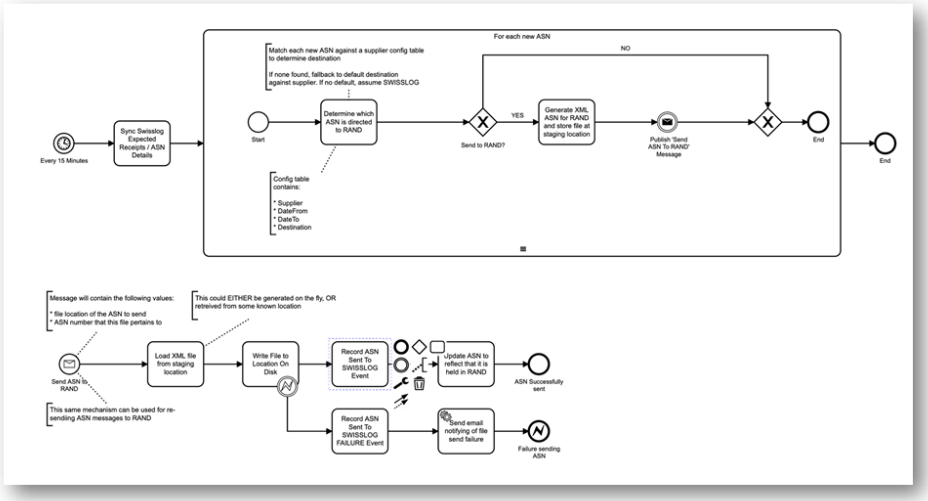
- ASNs (Advance Shipment Notices) cannot be used due to limitations in systematically passing the data to an alternate site
- Inconsistencies in supplier barcodes create challenges in identifying necessary data, driven through the industry challenge of substituting specific materials or having multiple suppliers of the same SKU
- Requirements to collect quality product attributes such as lot codes, kill and pack dates, supplier details

Definition of the requirements have been championed by the digital officer as well as the solution design. As part of this works over 40 business requirements have been detailed, schema definitions have been developed for each system integration point and process flows have been created to map each of the system processes.

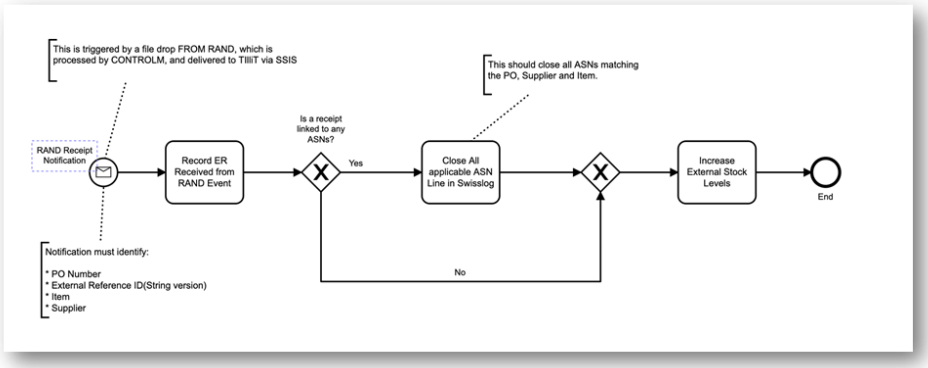
Business requests for capital to support the development of necessary functionality will be delivered in Milestone 7 while support for future development will be updated in future milestones.

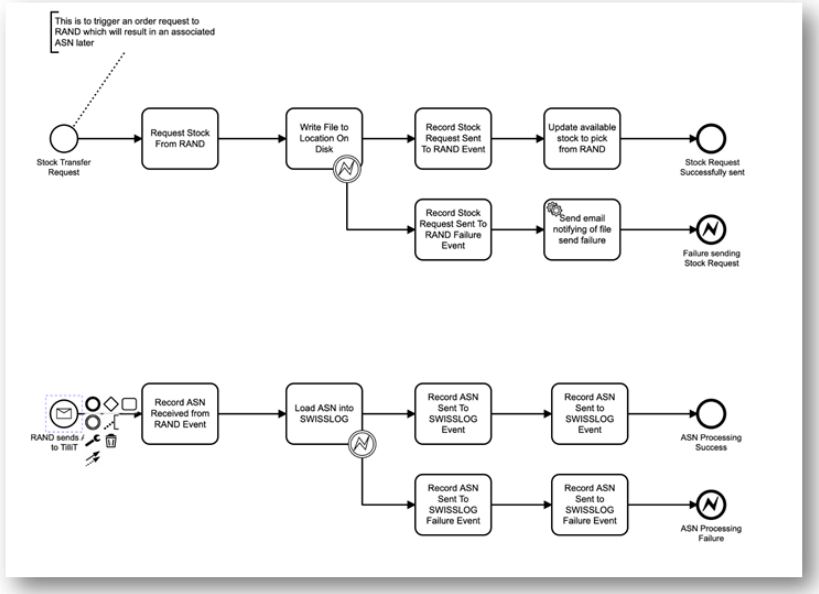
Example process workflows for integration solution:

ASN Integration



Inventory / Receipt Data





6.4.2 Solution Deliver of Beef Mince Finished Goods Order Selection and Storage

Product life is a key challenge for Retail Ready Red Meat production. RROA has effectively shortened the lead time from production to customer by creating capability to:

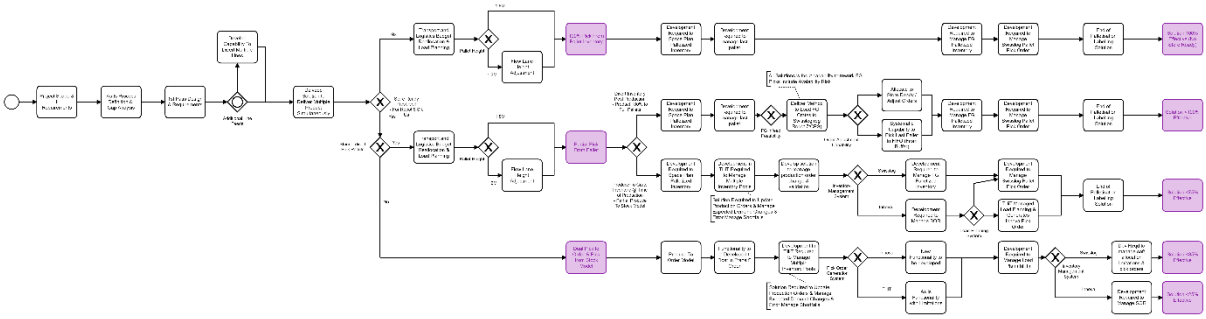
- pick both store ready orders and bulk pallets to reduce handing points (and time) at DCs
- create expedited transport routes from RROA to Townsville to reduce the transport time to the furthest lead time stores

This capability to develop “expediting channels” is a critical imperative to manage the centralised production in the Australian short product life production environment.

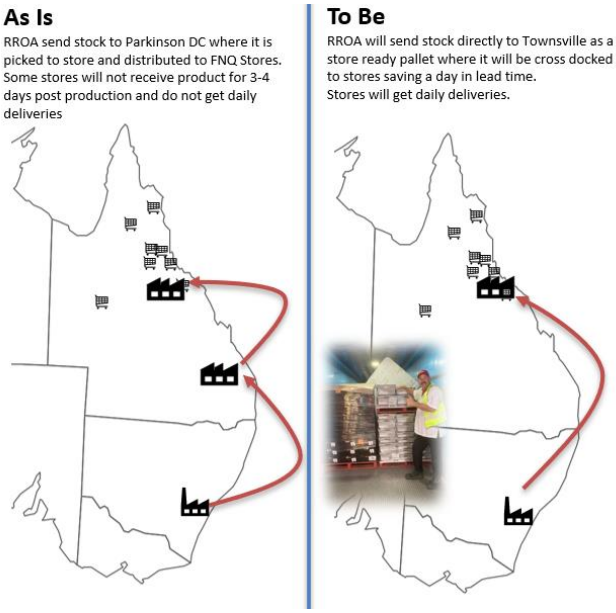
RROA has recently invested in installing an automated picking solution to direct palletise mince, by bypassing crate finished goods storage and existing automated picking capability. This will have the effect of increasing the outbound capacity of the facility but has come with a trade-off with the ability to fully utilise the solution and deliver initiatives aimed at maximising freshness.

The digital officer is working with the operational and engineering teams to identify digital solutions to manage the additional complexity of alternate processes and managing “expediting channels”. The support provided has been to shape the digital solution design and identify the design gaps in the current solution by working as a facilitator and SME to a cross functional working group.

Solution Roadmap



Supply Chain Efficiencies Through Direct Supply and Store Ready Palletisation



6.4.3 Solution Delivery of Network Optimisation Initiatives

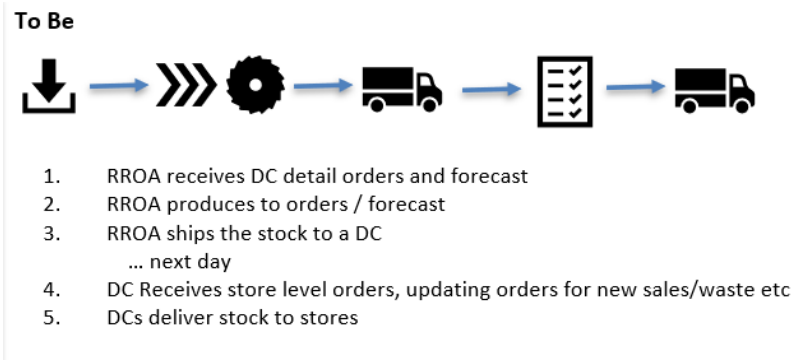
The digital officer has contributed to a series of supply chain optimisation initiates to deliver a more efficient supply network from Retail Production facility to store.

The contribution to the project will address critical solution requirements and will assist the business in delivering the following step changes:

- Better availability and better freshness of RROA products through a more accurate customer order – which will improve by approximately 30%
- Orders that RROA receives can be rounded to a pallet or layer – reducing transport cost by up to $2 million per annum, and reduce the CO2 footprint
- Warehousing efficiencies targeted at a 17% throughput increase for interstate distribution, enabling volume growth of approximately 50 tonnes per week

Order Flow Initiative

1. RROA receives store detail orders and forecast
2. RROA produces to orders / forecast
3. RROA ships the stock to a DC
   .... next day
4. RROA sends a picklist for the DCs to send stock to stores
5. DCs deliver stock to stores



To date, two proof of concept order flow applications have been delivered, identifying critical gaps to an end state solution. Next steps will be to define and develop the requirements to transition to the new ordering methods.

7 Milestone 8

7.1 Introduction

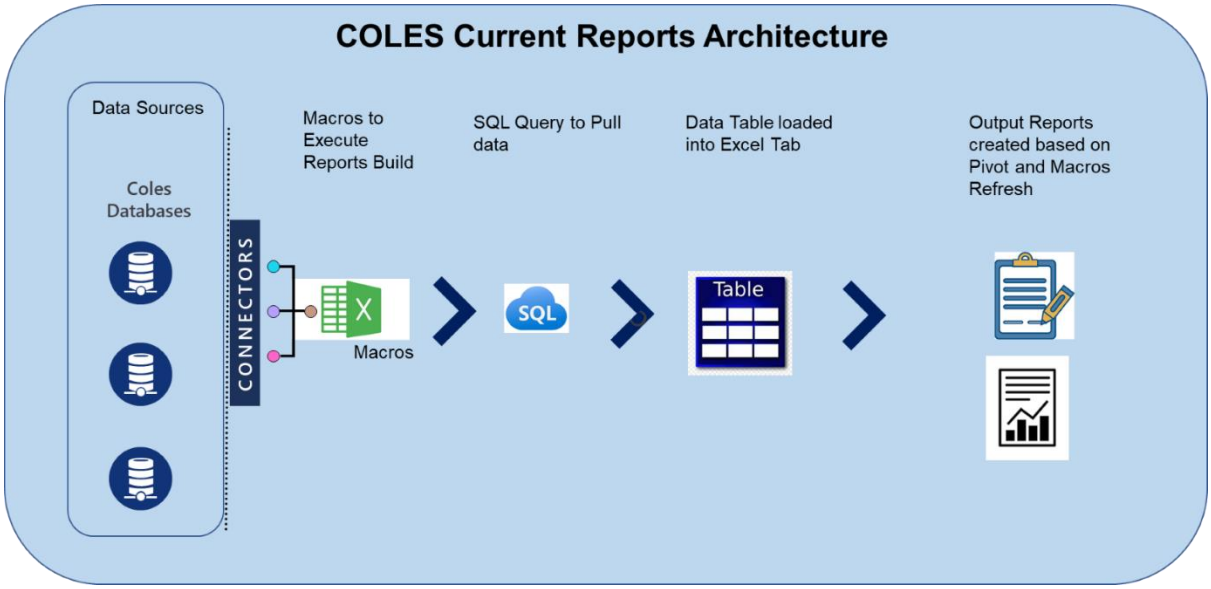
In milestone 8, efforts have been focused on further developments on the Master Data Management Solution by way of a Proof of Concept (POC) illustrating the use of Power BI as an analytical reporting tool.

7.2 Details of data analysis

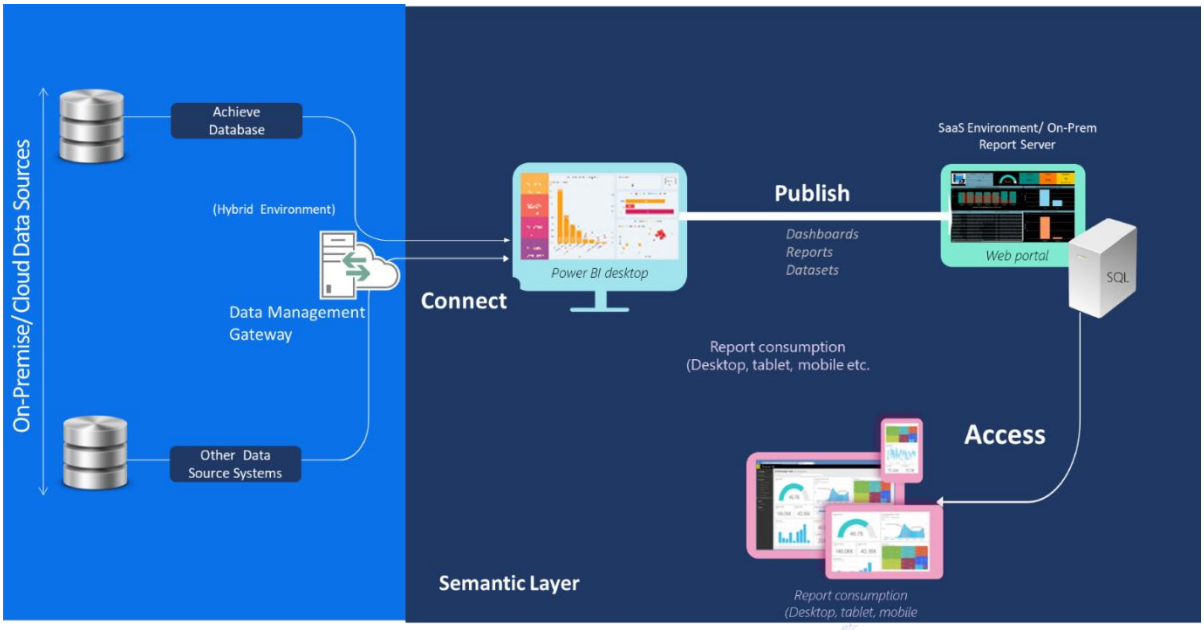
The next process in the journey towards understanding which reporting data analysis tool would be best for the business, was a gap analysis of the current reports. Understanding how current reports are built, used and how reporting can be made user friendly and easy to read, were analysed in order to make a recommendation of the best reporting tool. The gap analysis resulted in a final recommendation of Power BI as the reporting tool of choice.

7.2.1 Current Architecture

- The Data is being pulled up from the SQL in Excel
- Macros are used to in Excel for Refresh of data
- This can be run as many times as we want and reduces repetitive tasks which are required to be done frequently
- Since the SQL Script used is complex, run time is more than required, each time the data is refreshed.
- Reports are build based on data extracted by Macros/ SQL and Reports are created.



7.2.2 Power BI Architecture



7.2.3 Gap Analysis On Current Architecture

S. No.	Current State	Gap	Actions to close gap
1	Data is coming from Sql script	Sql Script is complex so users can not easily understand	Load Individual tables directly so it will be easy to understand Create Views and provide access to views
2	Sql Script has lot of tables joined together so it is taking time to load. Sql Structure has some null entries	Taking time to load the data from query Some column entries are null in Sql	Option to be evaluated to load direct tables. Power BI can access Multiple data tables and build relationships between them to pull relevant data
3	Refresh time / Load Time	When we are loading data using query it is taking approx. 45 minutes.	Loading tables by filtering data, Loading tables into Memory. Creating Views ….. Power BI provides capability of data modelling which helps load data queries separately using conditions and use data modeling feature of Power BI to join tables.
4	Less interactive visuals in excel	Visuals are interactive	Creating Reports that give capability to drill down and viewing differences in interactive visualizations. Power BI visuals are interactive and we can also add custom visuals.
5	Report Security (Data level)	Ensuring right person sees right set of data. Today anyone who has access to Excel can see the Report Output	Creating Reports and Providing access to users helps ensure that right data is seen by right set of business users. Admin also holds/ ensures that reports are given access to right set of users by using service level security.
6	Adding another data source or table from a different database	Technical Knowledge on SQL/ Macros is needed to edit any of the current report	Using Power BI reduces to amount of learning needs by users to build or edit additional reports.

	Editing the report to add additional content		Most of the business users have capability to build simple reports Except for Tabular data/ Pivot Tables where EXCEL is still the best option to pick
7	Data Refresh today is being done manually by Macros	Reports are showing data based on when the data was refreshed and not live production data	Using Tools to connect to database and by pulling live data must be used for building reports. Power BI has multiple connectors to connect to any of the database(s), Files etc to pull live data
8	Adding Visualizations	Currently data is in tabular format with no summary view and no drill down capability. Visualization provides a better view into the data and are easy to read	Visualizations tools like Power BI help showcase data in a way that will help users to understand the details in a better way.

Power BI features fulfill all the requirements to close the gaps in the current system.

See Appendix 11.4 for the full list of Power BI features.

7.3 Development of new digital and data approaches

7.3.1 POC Scope and Solution Approach

7.3.1.1 Purpose

The purpose of this exercise is to build a Proof of Concept (POC) using Power BI reporting tool and show how Power BI can solve the problems faced today at Coles. We will be using Power BI to address the issues below:

- Access restrictions to Data and current application/database capabilities
- Use Power BI for showing better visualizations
- Use Power BI to access real time data
- Sharing of Reports using Publish capability

7.3.1.2 In Scope

Two dashboards have been identified to be in scope of this POC engagement. Scope of visualizations to give a feel of how Power BI can be used for the dashboards below and business users will have flexibility to change/update dashboards/reports as needed.

7.3.1.3 Dashboards

- Migration/Built from the Auto Yield reports

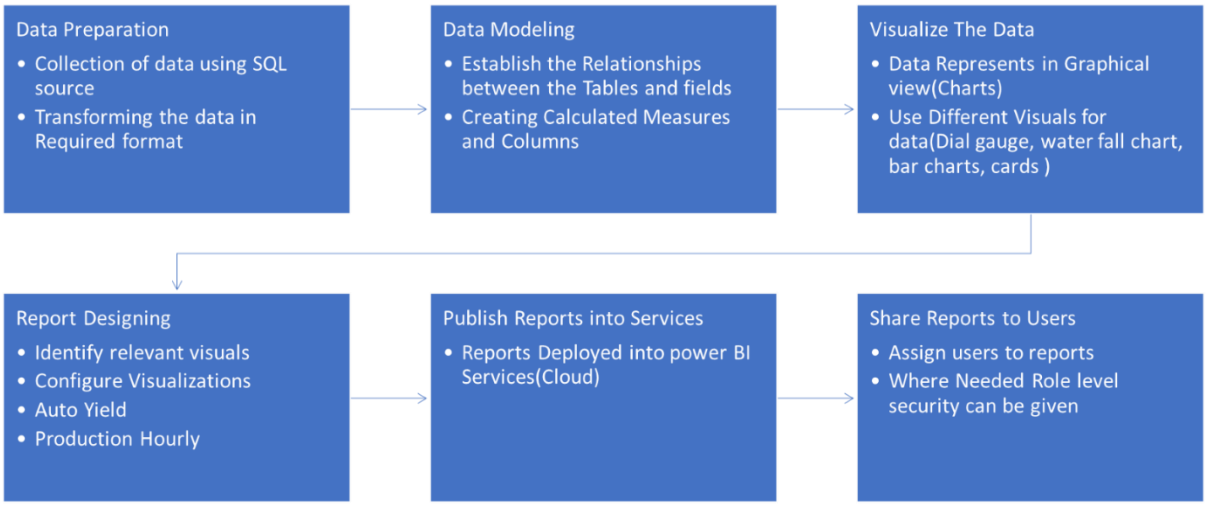
Auto Yield Includes 3 Reports:

- Yesterday (day wise),
- WTD (current week till current day)
- Last Week for actual consumption, target consumption, yield.

7.3.1.4 Out of scope

- Data refresh through Power BI Desktop must be manually done.
- Overall Database recommendations

7.3.1.5 Reports/ Dashboards building steps



See Appendix 11.5 for the Reports / Dashboard building steps

7.3.2 Proof of Concept Recommendations

7.3.2.1 Why Power BI Over Current Reporting

Advantages of PBI over the current Reports

- Better Visualizations
- Drill down
- Real Time Dashboards/ Reports
- Row Level Data Security
- Publish of Reports
- Easily configurable Summarized Dashboards
- Dax Data Analysis
- Q&A Question Box
- Filter Options
- Help and Feedback buttons

See Appendix 11.6 for details of each PBI feature listed above.

7.3.2.2 Database level recommendations

Here are few of the key report challenges businesses have.

1. **Challenge1**: Performance is too Slow – Reports take too much time
   Approach:
   1. Ensuring database level Views, tables, Keys and data are correctly done
   2. Consolidation should be done if data is being pulled from multiple tables
   3. Creating Dynamic views with proper data should be created

2. **Challenge2**: Reports don't have the level of detail that businesses need
   Approach:
   1. Creating Reports that have drill downs
   2. Creating view to access the core data
   3. Summarizing the data as needed by the business

3. **Challenge3**: Reports are not real time or dynamic
   Approach:
   1. Creating reports based on database tables
   2. Building reports based on dynamic views

4. **Challenge4:** Need to Combine Multiple reports/ data from multiple systems
   Approach:
   1. Using a data warehouse to pull together data from multiple systems
   2. Create a single source of truth and single database will ensure faster and more accurate data

5. **Challenge5:** Reports cannot be accessed on mobile
   Approach:
   1. Report can be accessed through Power BI Mobile which comes in Power BI Pro and Power BI Premium subscription.
6. **Challege6:** Want to control the level of access of reports

Approach:

1. Row-level security (RLS) with Power BI can be used to restrict data access for given users. Filters restrict data access at the row level, and you can define filters within roles. In the Power BI service, members of a workspace have access to datasets in the workspace. RLS doesn't restrict this data access.
2. You can configure RLS for data models imported into Power BI with Power BI Desktop. You can also configure RLS on datasets that are using DirectQuery, such as SQL Server. For Analysis Services or Azure Analysis Services live connections, you configure Row-level security in the model, not in Power BI Desktop. The security option will not show up for live connection datasets.
3. Based on our understanding Power BI Desktop is the best version to use since this POC requires two dashboards, also the number of concurrent users are low.

7. **Challenge7:** Minimal Insights in Reports

Approach:

1. PBI gives features that enable us to get more insights in to data
   i. Drill down
   ii. Real time dashboards
   iii. Security
   iv. Dax Analysis
   v. Publishing reports
   vi. Timeline Views
   vii. Navigation Panes
   viii. Flexible Pane
   ix. Q&A Question Box
   x. Help and Feedback Buttons

Having a data warehouse where all the relevant data for reports is stored, will make the reporting architecture and performance faster. It will also create simpler views on the database to directly pull data into Power BI Reports.

7.3.2.3 Power BI version recommendations

Features	Power BI Free	Power BI Pro	Power BI Premium
Space allocation	1GB	10GB *	100 TB
Power BI Desktop	✓	✓	✓
Development features	✓	✓	✓
DirectQuery	-	✓	✓
Gateways	-	✓	✓
Row- level security	-	✓	✓
Content pack	-	✓	✓
Work spaces	-	✓	✓
Data streaming	up to 10K rows per hours	unlimited	unlimited
Dataset refresh frequency	up to once a day	up to 8 times a day	Up to 48 times a day

Table 1: Power BI Version Features

		Users with the license type can view/access the content			
		Free	Pro	Premium Per User	Premium Per Capacity User(no named License)
If you create/share Power BI content in the Power BI Service in this type of workspace/app	Free	No	No	No	No
	Pro	No	Yes	Yes	No
	Premium Per User	No	No	Yes	No
	Premium Per Capacity	Yes	Yes	Yes	Yes

Table 2: Power BI Version Licenses

See Appendix 11.7 for details of the Power BI versions.

Power BI Pro version is recommended for the following feature reasons:

- Power BI Users
- Storage Space
- Development Features
- Pricing
- Performance
- Data Streaming
- Data Refresh Frequency
- Workspace
- Report sharing

Based on our understanding of User Group, # of reports and listed reporting needs at Coles and considering factors and the requirement of features like sharing of reports and development requirements of dashboards, we recommend **Power BI Pro** License.

See Appendix 11.8 for details of each Power BI Pro license feature.

7.3.3 Migration Strategy for Current to Power BI Reports

7.3.3.1 Reporting Strategy and Approach

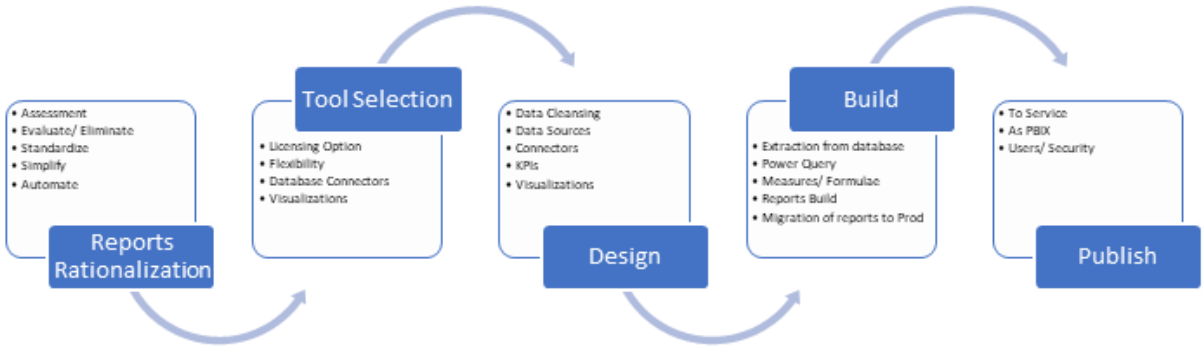
The purpose of this reporting strategy and approach is to establish a common basis for determining:

- Which reports are required to migrate
- What data do the reports serve
- How the reports are delivered

This would include:

- Identifying data sources
- Tables and columns
- Difficulties in existing reports and approach
- Reporting tool
- Design and build of reports

Key steps in the Reporting migration strategy



See Appendix 11.9 for details for each of the Report Migration Strategy Step Details.

7.4 Analytical tools

7.4.1.1 Current Report Information

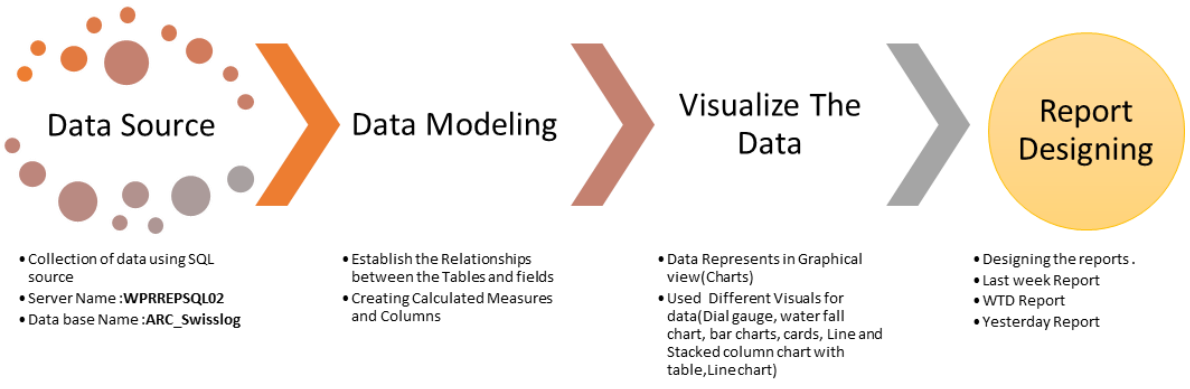
7.4.1.1.1 Auto Yield Report

1. In Auto Yield report, there are four tabs Yesterday, WTD and Last Week and Summary.
2. Yesterday report is showing details of species of the date that was loaded one day before, when data was loaded/refreshed.
3. WTD report is showing week to data for the species.
4. Last Week report is showing data of last week (One week before the date when data was loaded/refreshed) for species.
5. Summary tab showing high level data for all the three reports like last week, WTD, Yesterday.

6. All the reports are showing actual consumption, target consumption, yield based on species and date.

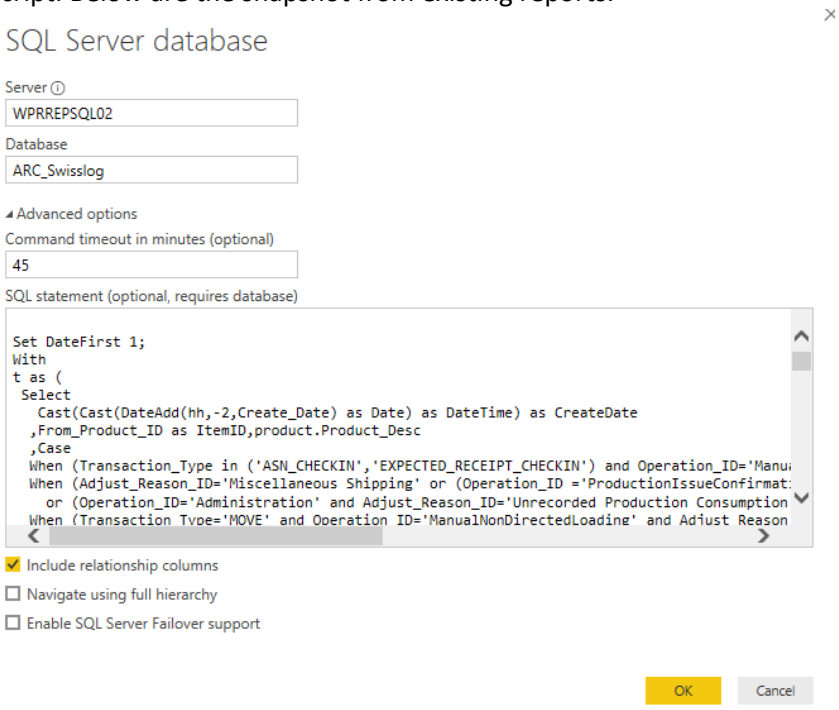
#	Dashboard Name	Report Name	KPI	Database	Source
1	Auto Yeild	Yesterday	Dataseq	Archieve	SQL Query
2	Auto Yeild	Yesterday	Createdate	Archieve	SQL Query
3	Auto Yeild	Yesterday	primal	Archieve	SQL Query
4	Auto Yeild	Yesterday	itemshortname	Archieve	SQL Query
5	Auto Yeild	Yesterday	itemtype	Archieve	SQL Query
6	Auto Yeild	Yesterday	Av price	Archieve	SQL Query
7	Auto Yeild	Yesterday	RM actual	Archieve	SQL Query
8	Auto Yeild	Yesterday	RM TARGET	Archieve	SQL Query
9	Auto Yeild	Yesterday	PRODUCTION ACTUAL	Archieve	SQL Query
10	Auto Yeild	Yesterday	tgtconsumption$	Archieve	SQL Query
11	Auto Yeild	Yesterday	consumptionRM$	Archieve	SQL Query
12	Auto Yeild	Yesterday	target %	Archieve	SQL Query
13	Auto Yeild	Yesterday	yield%	Archieve	SQL Query
14	Auto Yeild	Yesterday	Gain/Loss	Archieve	SQL Query
15	Auto Yeild	WTD	Dataseq	Archieve	SQL Query
16	Auto Yeild	WTD	primal	Archieve	SQL Query
17	Auto Yeild	WTD	itemshortname	Archieve	SQL Query
18	Auto Yeild	WTD	itemtype	Archieve	SQL Query
19	Auto Yeild	WTD	Av price	Archieve	SQL Query
20	Auto Yeild	WTD	RM actual	Archieve	SQL Query
21	Auto Yeild	WTD	RM TARGET	Archieve	SQL Query
22	Auto Yeild	WTD	PRODUCTION ACTUAL	Archieve	SQL Query
23	Auto Yeild	WTD	tgtconsumption$	Archieve	SQL Query
24	Auto Yeild	WTD	consumptionRM$	Archieve	SQL Query
25	Auto Yeild	WTD	target %	Archieve	SQL Query
26	Auto Yeild	WTD	yield%	Archieve	SQL Query
27	Auto Yeild	WTD	Gain/Loss	Archieve	SQL Query
28	Auto Yeild	LastWeek	Dataseq	Archieve	SQL Query
29	Auto Yeild	LastWeek	primal	Archieve	SQL Query
30	Auto Yeild	LastWeek	itemshortname	Archieve	SQL Query
31	Auto Yeild	LastWeek	itemtype	Archieve	SQL Query
32	Auto Yeild	LastWeek	Av price	Archieve	SQL Query
33	Auto Yeild	LastWeek	RM actual	Archieve	SQL Query
34	Auto Yeild	LastWeek	RM TARGET	Archieve	SQL Query
35	Auto Yeild	LastWeek	PRODUCTION ACTUAL	Archieve	SQL Query
36	Auto Yeild	LastWeek	tgtconsumption$	Archieve	SQL Query
37	Auto Yeild	LastWeek	consumptionRM$	Archieve	SQL Query
38	Auto Yeild	LastWeek	target %	Archieve	SQL Query
39	Auto Yeild	LastWeek	yield%	Archieve	SQL Query
40	Auto Yeild	LastWeek	Gain/Loss	Archieve	SQL Query

7.4.1.2 Design of Power BI Reports

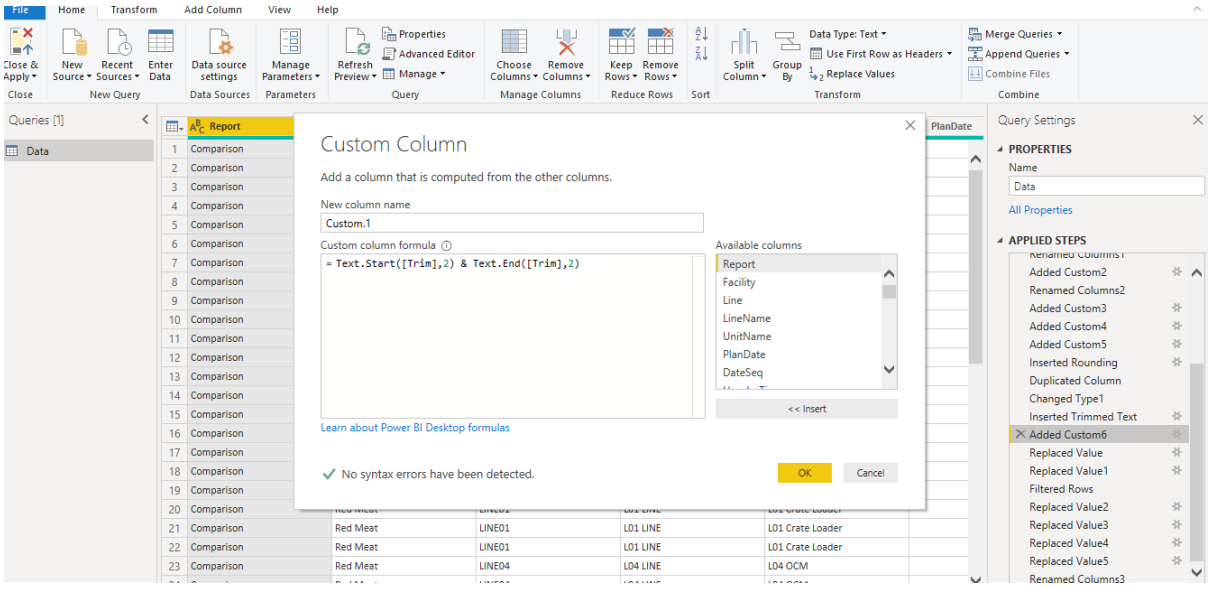


7.4.1.2.1 Data Source

- Data is coming from SQL Script. Power BI allows us to connect directly with SQL Script. Below are the snapshot from existing reports:

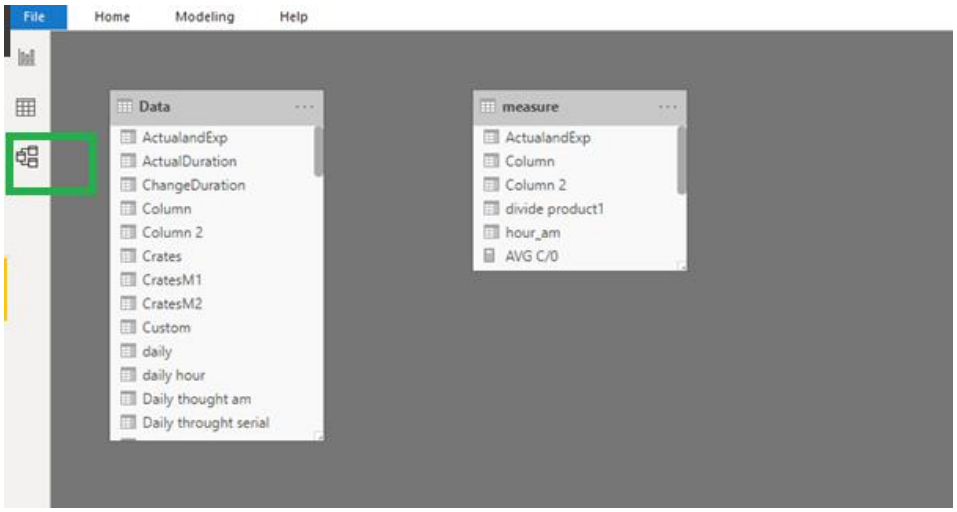


- Server Name: **WPRREPSQL02**
- Database name: **ARC_Swisslog**
- While loading the data we have two options one is direct load (without changing the data) and second one is Transform (Transform the data). Power Query allows us to perform ETL operations on existing data.



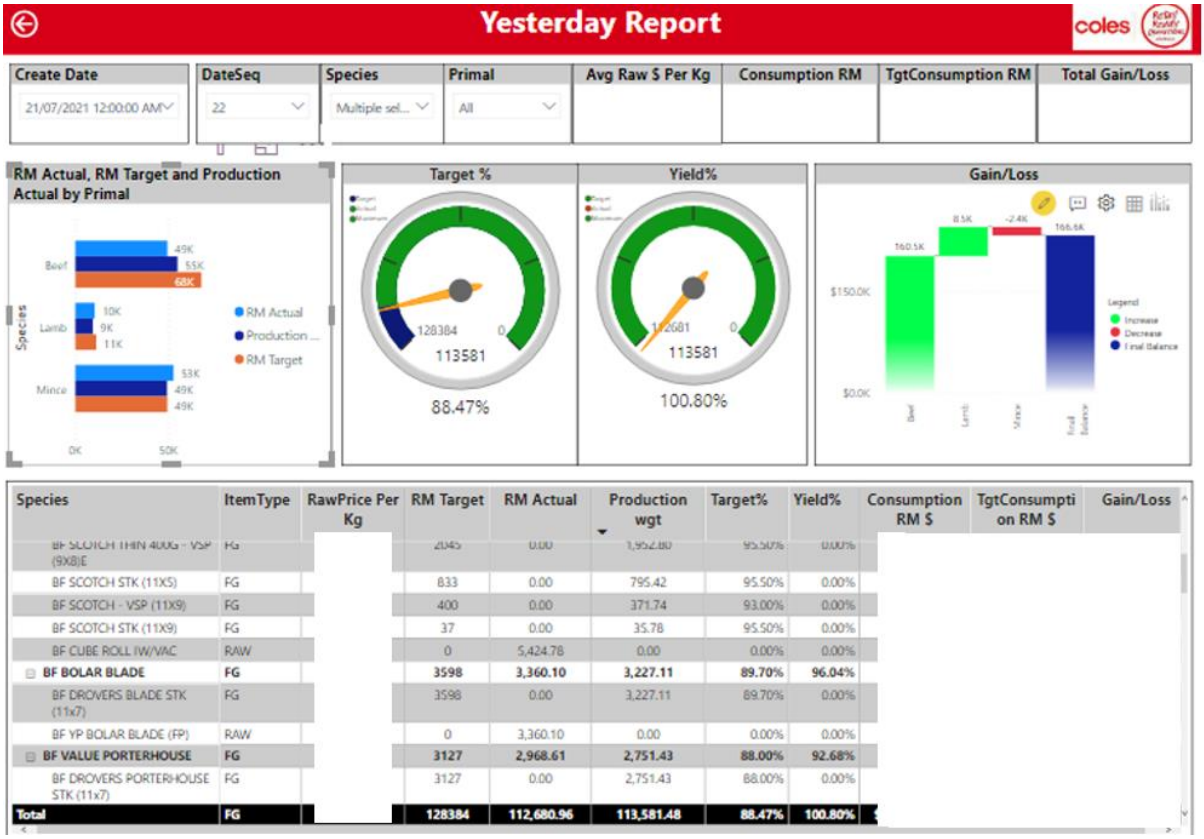
7.4.1.2.2 Data Modelling

- Data Modeling is one of the features used to connect multiple data sources in BI tool using a relationship. A relationship defines how data sources relate to each other and we can create interesting data visualizations on multiple data sources.
- With the modeling feature, we can build custom calculations on the existing tables and these columns can be directly presented into Power BI visualizations. This allows businesses to define new metrics and to perform custom calculations for those metrics.

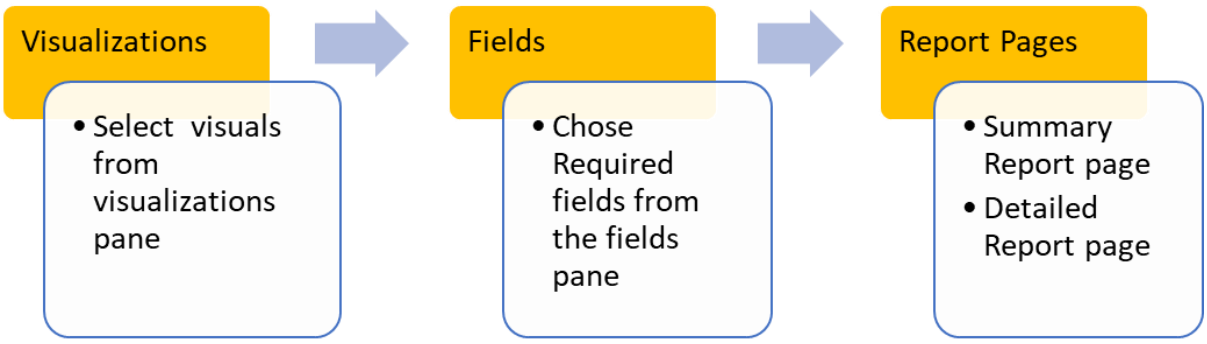


7.4.1.3 Visualize the data

- Power BI has interactive visuals to make report interactive.
- Power BI allows us to import custom visuals as per the requirement.
- We have used few of default visuals like cards, stacked column chart, clustered bar chart and matrix visual.
- For Auto Yield report, we have imported custom visuals from marketplace like dial gauge and water fall charts.
- We have implemented drill down functionality for detailed information of WTD, Yesterday and Last week reports.



7.4.1.4 Report Build



7.4.1.4.1 Fields

- After importing data into power BI desktop, all the tables and respective fields will be available in “data tab “as well “Report tab”.
- Drag and drop required field in selected visuals.
- We can format the report using color, size etc.

7.4.1.4.2 Report Layouts

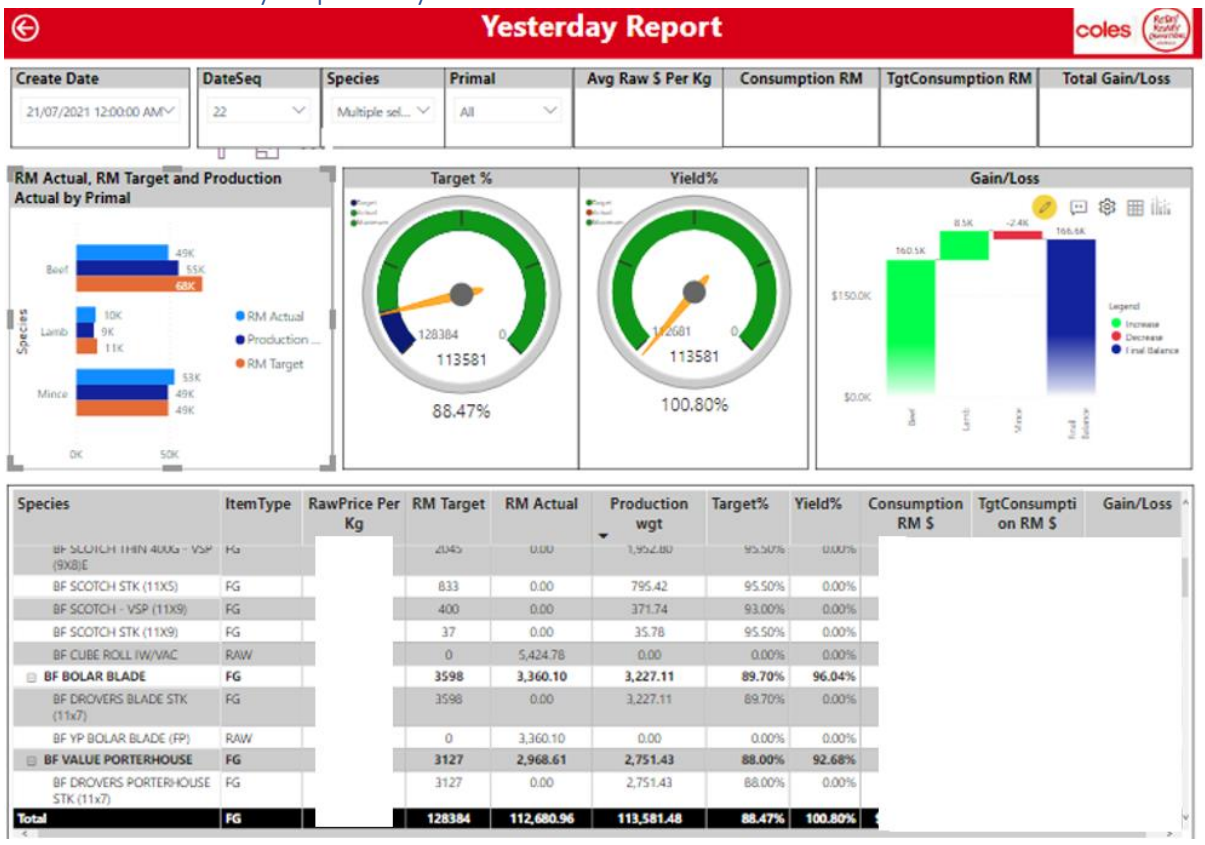
Yesterday Report Layout (Current)

DateSeq 1 **Run All**

				CreateDa	Data							
				21/07/2021								
Species	Primal	ItemTyp	ItemSh	Ave Raw $ Per Kg	RM Actual	RM Target	Production Actual	Target %	Yield %	Consumption RM $	Tgt Consumption RM $	Gain / Loss
Beef	BF BOLAR BLADE			$10.00	3,360	3,598	3,227	89.7%	96.0%	$33,601	$35,977	$2,376
	BF BRISKET	RAW	BF BRISKET	$5.90	0	0	0			$0	$0	$0
	BF BRISKET Total			$5.90	0	0	0			$0	$0	$0
	BF BRISKET (FP)	FG	BF SLOW COOKED BRISK		0	0	0					$0
	BF BRISKET (FP) Total				0	0	0					$0
	BF CASSEROLE			$9.50	1,541	2,243	2,121	94.6%	137.6%	$14,642	$21,305	$6,662
	BF CORNED SILVERSIDI	FG	BF DROVEF	$8.50	0	7,094	5,320	75.0%		$0	$60,296	$60,296
			BF CORNEI	$8.50	0	32,620	24,465	75.0%		$0	$277,272	$277,272
		RAW	BF OUTSIDI	$8.50	22,998	0	0		0.0%	$195,483	$0	-$195,483
	BF CORNED SILVERSIDE Total			$8.50	22,998	39,714	29,785	75.0%	129.5%	$195,483	$337,568	$142,085
	BF CORNED SR	RAW	BF EYE ROU	$12.30	0	0	0			$0	$0	$0
	BF CORNED SR Total			$12.30	0	0	0			$0	$0	$0
	BF GRAVY			$9.50	1,743	1,828	1,711	93.6%	98.2%	$16,555	$17,368	$813
	BF OSSO BUCCO			$7.50	0	0	0			$0	$0	$0
	BF PORTERHOUSE			$23.50	993	1,056	852	80.6%	85.8%	$23,329	$24,825	$1,497
	BF RIB EYE STEAK			$19.00	130	0	0		0.0%	$2,472	$0	-$2,472
	BF ROAST TOPSIDE	FG	BF TOPSIDE ROAST		0	0	0					$0
		RAW	BF TOPSIDE (FP)		0	0	0					$0
	BF ROAST TOPSIDE Total				0	0	0					$0

- It shows the Yesterday data by species level and primal level. The same report was migrated into power BI shown in below snapshot.

Power BI Yesterday Report Layout



Species	ItemType	RawPrice Per Kg	RM Target	RM Actual	Production wgt	Target%	Yield%	Consumption RM $	TgtConsumption RM $	Gain/Loss
BF SCOTCH THIN 400G - VSP (9X8)E	FG		2045	0.00	1,952.80	95.50%	0.00%			
BF SCOTCH STK (11X5)	FG		833	0.00	795.42	95.50%	0.00%			
BF SCOTCH - VSP (11X9)	FG		400	0.00	371.74	93.00%	0.00%			
BF SCOTCH STK (11X9)	FG		37	0.00	35.78	95.50%	0.00%			
BF CUBE ROLL IW/VAC	RAW		0	5,424.78	0.00	0.00%	0.00%			
BF BOLAR BLADE	**FG**		**3598**	**3,360.10**	**3,227.11**	**89.70%**	**96.04%**			
BF DROVERS BLADE STK (11x7)	FG		3598	0.00	3,227.11	89.70%	0.00%			
BF YP BOLAR BLADE (FP)	RAW		0	3,360.10	0.00	0.00%	0.00%			
BF VALUE PORTERHOUSE	**FG**		**3127**	**2,968.61**	**2,751.43**	**88.00%**	**92.68%**			
BF DROVERS PORTERHOUSE STK (11x7)	FG		3127	0.00	2,751.43	88.00%	0.00%			
Total	**FG**		**128384**	**112,680.96**	**113,581.48**	**88.47%**	**100.80%**			

- This Report has Summary page that is showing the species level data like Pork, lamb, BF. From that page to we can see the individual detailed Report by Species level or Primal level. Here are custom visuals imported from Marketplace.
- We have implemented drill through report functionality using bookmark.
- "Water Fall chart has drill down functionality, we can see the detailed primal level data.

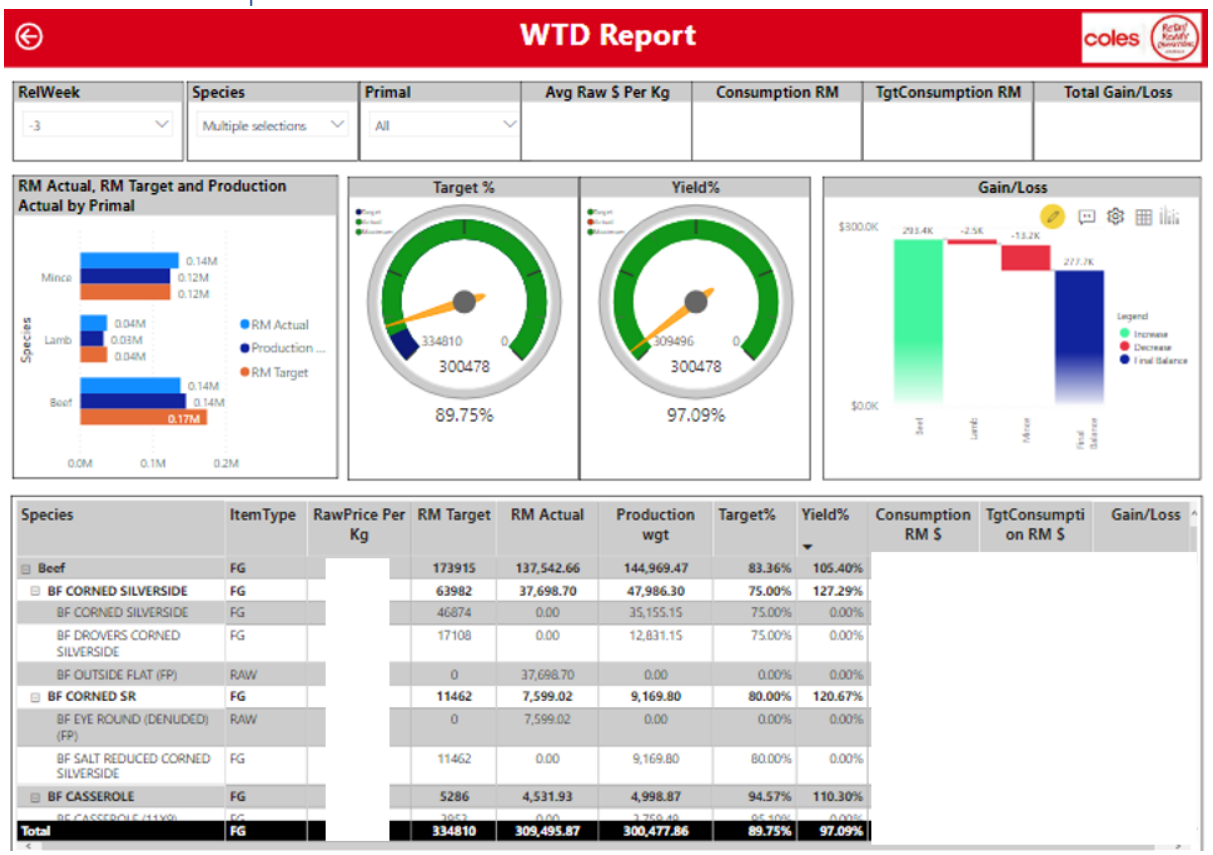
WTD Report (Current)

RelWeek: 0 — Run All

Species	Primal	ItemType	ItemShortName	Data: Ave Raw $ Per Kg	RM Target	RM Actual	Production Actual	Target %	Yield %	Consumption RM $	Tgt Consumption RM $	Gain / Loss
Beef	BF BOLAR BLADE			$10.00	11,843	11,265	10,623	89.7%	94.3%	$112,648	$118,432	$5,784
	BF BRISKET	RAW	BF BRISKET (FP)	$5.90	0	6,144	0		0.0%	$36,248	$0	-$36,248
	BF BRISKET Total			$5.90	0	6,144	0		0.0%	$36,248	$0	-$36,248
	BF BRISKET (FP)	FG	BF SLOW COOKED BRISKET		7,214	0	6,564	91.0%				$0
	BF BRISKET (FP) Total				7,214	0	6,564	91.0%				$0
	BF CASSEROLE			$9.50	5,286	4,532	4,999	94.6%	110.3%	$43,053	$50,216	$7,162
	BF CORNED SILVERSIDE	FG	BF DROVERS CORNE	$8.50	17,108	0	12,831	75.0%		$0	$145,420	$145,420
			BF CORNED SILVERSI	$8.50	46,874	0	35,155	75.0%		$0	$398,425	$398,425
		RAW	BF OUTSIDE FLAT (FP)	$8.50	0	37,699	0		0.0%	$320,439	$0	-$320,439
	BF CORNED SILVERSIDE Total			$8.50	63,982	37,699	47,986	75.0%	127.3%	$320,439	$543,845	$223,406
	BF CORNED SR	FG	BF SALT REDUCED CO	$12.30	11,462	0	9,170	80.0%		$0	$140,986	$140,986
		RAW	BF EYE ROUND (DENI	$12.30	0	7,599	0		0.0%	$93,468	$0	-$93,468
	BF CORNED SR Total			$12.30	11,462	7,599	9,170	80.0%	120.7%	$93,468	$140,986	$47,518
	BF GRAVY			$9.50	2,963	2,890	2,773	93.6%	96.0%	$27,459	$28,149	$691
	BF OSSO BUCCO			$7.50	2,065	1,894	1,549	75.0%	81.8%	$14,202	$15,491	$1,289
	BF PORTERHOUSE			$23.50	5,398	5,023	4,308	79.8%	85.8%	$118,047	$126,858	$8,811
	BF RIB EYE STEAK			$19.00	620	781	560	90.3%	71.6%	$14,846	$11,779	-$3,067
	BF ROAST TOPSIDE	FG	BF TOPSIDE ROAST		10,382	0	9,447	91.0%				$0
		RAW	BF TOPSIDE (FP)		0	9,086	0		0.0%			$0
	BF ROAST TOPSIDE Total				10,382	9,086	9,447	91.0%	104.0%			$0

This Excel Report is the existing one it shows the Current data by species level and primal level. The same report was migrated into power BI shown in below snapshot. Power BI is a SSBI Self-Service business intelligence services and cloud platform. you can visualize your data in good look and feel.

Power BI WTD Report



Species	ItemType	RawPrice Per Kg	RM Target	RM Actual	Production wgt	Target%	Yield%	Consumption RM $	TgtConsumption RM $	Gain/Loss
Beef	FG		173915	137,542.66	144,969.47	83.36%	105.40%			
BF CORNED SILVERSIDE	FG		63982	37,698.70	47,986.30	75.00%	127.29%			
BF CORNED SILVERSIDE	FG		46874	0.00	35,155.15	75.00%	0.00%			
BF DROVERS CORNED SILVERSIDE	FG		17108	0.00	12,831.15	75.00%	0.00%			
BF OUTSIDE FLAT (FP)	RAW		0	37,698.70	0.00	0.00%	0.00%			
BF CORNED SR	FG		11462	7,599.02	9,169.80	80.00%	120.67%			
BF EYE ROUND (DENUDED) (FP)	RAW		0	7,599.02	0.00	0.00%	0.00%			
BF SALT REDUCED CORNED SILVERSIDE	FG		11462	0.00	9,169.80	80.00%	0.00%			
BF CASSEROLE	FG		5286	4,531.93	4,998.87	94.57%	110.30%			
Total	FG		334810	309,495.87	300,477.86	89.75%	97.09%			

- This Report has Summary page that should be shows the species level data like Pork, lamb, BF from that page to we can see the individual detailed Report by Species level or Primal level. Here used custom visuals imported from Marketplace.
- We have implemented drill through report functionality using bookmark.
- Water Fall chart has drill down functionality, we can see the detailed primal level data.

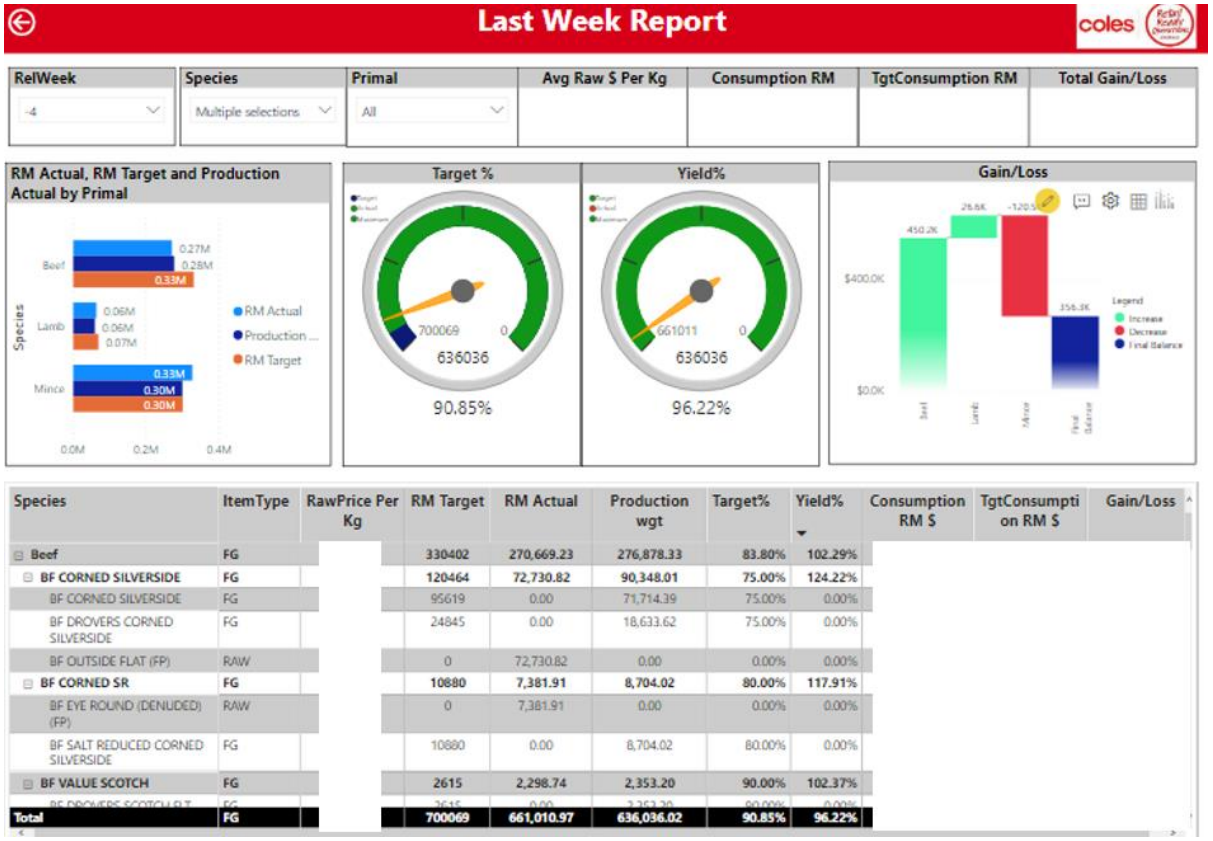
Last Week Report (Current)

Excel Report

RelWeek: -1 — Run All

Species	Primal	ItemType	ItemShortName	Ave Raw $ Per Kg	RM Target	RM Actual	Production Actual	Target %	Yield %	Consumption RM $	Tgt Consumption RM $	Gain / Loss
				Data								
Beef	BF BOLAR BLADE			$10.00	16,757	16,717	15,031	89.7%	89.9%	$167,169	$167,571	$402
	BF BRISKET	RAW	BF BRISKET (FP)	$5.90	0	12,745	0		0.0%	$75,197	$0	-$75,197
	BF BRISKET Total			$5.90	0	12,745	0		0.0%	$75,197	$0	-$75,197
	BF BRISKET (FP)	FG	BF SLOW COOKED BRISKET		14,765	0	13,436	91.0%				$0
	BF BRISKET (FP) Total				14,765	0	13,436	91.0%				$0
	BF CASSEROLE			$9.50	15,656	15,634	14,875	95.0%	95.1%	$148,527	$148,735	$207
	BF CORNED SILVERSIDE	FG	BF DROVERS CORNED S	$8.50	24,845	0	18,634	75.0%		$0	$211,181	$211,181
			BF CORNED SILVERSIDE	$8.50	95,619	0	71,714	75.0%		$0	$812,763	$812,763
		RAW	BF OUTSIDE FLAT (FP)	$8.50	0	72,731	0		0.0%	$618,212	$0	-$618,212
	BF CORNED SILVERSIDE Total			$8.50	120,464	72,731	90,348	75.0%	124.2%	$618,212	$1,023,944	$405,732
	BF CORNED SR	FG	BF SALT REDUCED COR	$12.30	10,880	0	8,704	80.0%		$0	$133,824	$133,824
		RAW	BF EYE ROUND (DENUD	$12.30	0	7,382	0		0.0%	$90,797	$0	-$90,797
	BF CORNED SR Total			$12.30	10,880	7,382	8,704	80.0%	117.9%	$90,797	$133,824	$43,027
	BF GRAVY			$9.50	6,872	6,645	6,415	93.3%	96.5%	$63,126	$65,283	$2,157
	BF OSSO BUCCO			$7.50	4,568	4,059	3,426	75.0%	84.4%	$30,443	$34,259	$3,816
	BF PORTERHOUSE			$23.50	13,756	12,922	10,922	79.4%	84.5%	$303,671	$323,266	$19,595
	BF RIB EYE STEAK			$19.00	1,434	1,481	1,295	90.3%	87.5%	$28,131	$27,251	-$880
	BF ROAST TOPSIDE	FG	BF TOPSIDE ROAST		18,743	0	17,056	91.0%				$0
		RAW	BF TOPSIDE (FP)		0	16,932	0		0.0%			$0
	BF ROAST TOPSIDE Total				18,743	16,932	17,056	91.0%	100.7%			$0

- This Excel Report is the existing one it shows the last week data by species level and primal level. The same report was migrated into power BI shown in below snapshot.



Species	ItemType	RawPrice Per Kg	RM Target	RM Actual	Production wgt	Target%	Yield%	Consumption RM $	TgtConsumption RM $	Gain/Loss
Beef	FG		330402	270,669.23	276,878.33	83.80%	102.29%			
BF CORNED SILVERSIDE	FG		120464	72,730.82	90,348.01	75.00%	124.22%			
BF CORNED SILVERSIDE	FG		95619	0.00	71,714.39	75.00%	0.00%			
BF DROVERS CORNED SILVERSIDE	FG		24845	0.00	18,633.62	75.00%	0.00%			
BF OUTSIDE FLAT (FP)	RAW		0	72,730.82	0.00	0.00%	0.00%			
BF CORNED SR	FG		10880	7,381.91	8,704.02	80.00%	117.91%			
BF EYE ROUND (DENUDED) (FP)	RAW		0	7,381.91	0.00	0.00%	0.00%			
BF SALT REDUCED CORNED SILVERSIDE	FG		10880	0.00	8,704.02	80.00%	0.00%			
BF VALUE SCOTCH	FG		2615	2,298.74	2,353.20	90.00%	102.37%			
Total	FG		700069	661,010.97	636,036.02	90.85%	96.22%			

Power BI Last Week Report

- This Report has Summary page that should be shows the species level data like Pork, lamb, BF from that page to we can see the individual detailed Report by Species level or Primal level. Here used custom visuals imported from Marketplace.
- We have implemented drill through report functionality using bookmark.
- Water Fall chart has drill down functionality, we can see the detailed primal level data.

1. First step is to load the data from data sources. Data sources could be heterogenous.
2. We need to analyze data and then clean data (remove impurities, remove outliers) using Power Query feature of Power BI.
3. Join tables using data modeling feature of Power BI (If Required- If data is coming from various sources or from multiple tables).
4. Identify critical KPIs and measures.
5. Create visualizations/ reports from the data.
6. Publish reports onto Power BI Service and share with users.

7.4.1.5 Sharing of dashboards

1. We can share dashboards with users using Power BI Service. We can assign roles in Power BI Service.
2. If reports need to be refreshed frequently, we can schedule refresh using Power BI service. By this way, data will be refreshed automatically.
3. When any KPI value on visualization reaches to threshold, we can use subscription feature of Power BI to send an alert mail.

7.5 Application of business decision tools

Now that the Power BI Reporting tool has been selected, the next phase will be to implement reports using the tool and use the tool to generate business decision.

7.6 Skills development

MLA Networking meeting on Collaboration skills training.

MLA/Coles Strategy Day meetings to prepare for the next 3 year plan.

7.7 Participation in digital networks

InfoSys and Nukon training sessions. InfoSys have provided practical instructions on how to develop the reports as a baseline to create knowledge if Coles were to continue down the path of power BI.

8 Milestone 9

8.1 Introduction

In milestone 9, efforts have been focused on further developments of the Master Data Management Solution with a design for the Pick and Pack Integration TilliT module. The development of the module will be conducted as part of a larger project for which a MLA Project Application is being submitted in Dec 2021.

RROA is expected to transition to a new ordering method in October 2021. This ordering process will enable a number of benefits for the Coles business and RROA including:

- Accuracy improvement of store orders by improving certainty in inventory and risk period by one day
- System capabilities to shape demand between suppliers using the POSST system
- Enable ordering efficiencies of pallet and layer rounding; expected to improve outbound efficiency and reduce transport cost

The solution will be developed / implemented in two parts:

a. October 2021 – a tactical solution where interim functionality will be developed based on the principle of not incurring significant redevelopment and enabling the Poultry category to adopt the new channel by October 2021
b. March 2022 – the end state solution accounting for business objectives for delivering a consistent platform across Retail Ready Meat processers (Coles Network) and addressing any solution gaps to the FFF BRD to deliver a fully automated solution

8.2 Details of data analysis

The current system which utilises excel spreadsheets for order handling, was analysed with the following main functions identified.

a. DC Orders – Receive Customer Demand
b. DC Order Plan – Receive Customer Demand
c. Roster Calculation
d. Independent Demand Aggregation

8.2.1 Business Processes

The following business processes have been identified as being impacted by this project:

- Store / DC Order Flow from Coles to RROA
- Adjusted Store Order Process → 'Purchase Order Adjustment'
- RROA Order and Data Validation Processes

  - RROA Planning to Move Files from Email to Filestage until End State Solution Derived
  - Order and Roster validations to be Extended to New Channels
  - Purchase Order Adjustments will be used to manage any excess inventory, significant shorts where resupply is possible on the next order date will have a POA performed by the RROA Planning Team

8.2.2 Business Volumetrics - Files

File	Files Per Day	Average Row Count	Receipt on Filestage	Process Frequency
Store Order (Existing)	>1,000 to ~ 100	60	0300-0400 1000-1030 LMOR	15 Minutes + Wait for 2nd Batch to complete load
Order Plan (Existing)	1	1,000,000	0400-0430	15 Minutes
Purchase Order	~4 (+ ~100 SRX)	60	0530-0600 (0730 SLA)	15 Minutes
DC Order Plan	1	~45,000	0600-0630 (No SLA)	15 Minutes

Note: Based on non-daylight savings time

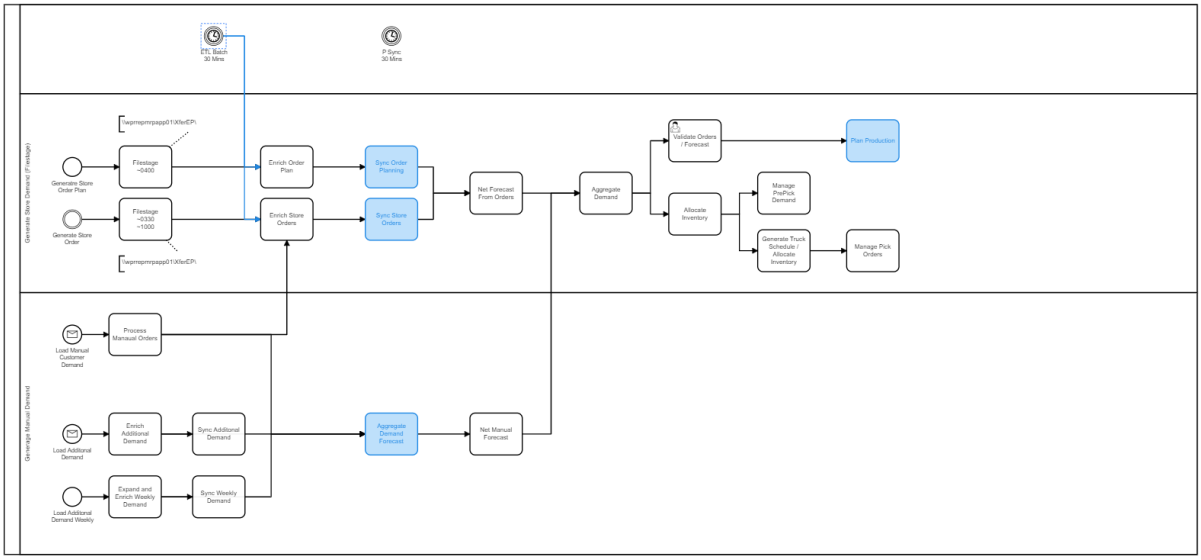
8.3 Development of new digital and data approaches

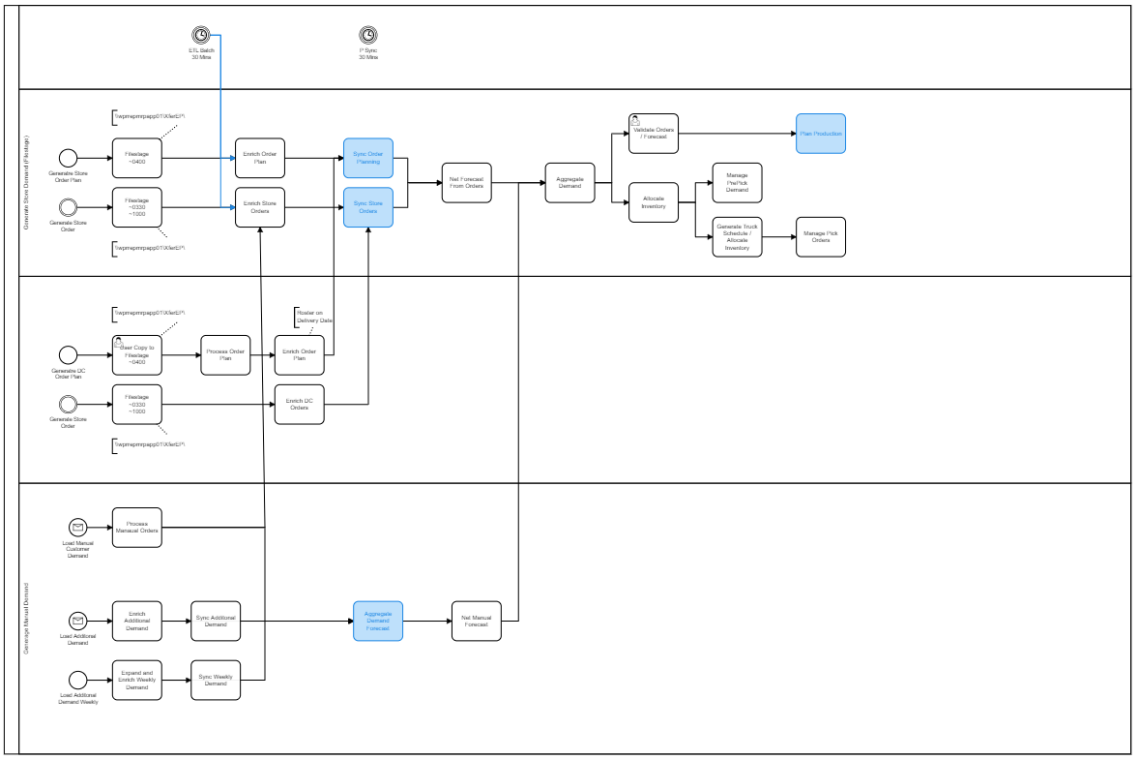
The following descriptions detail the current design of order management.

8.3.1 Current State – Receive Customer Demand

Process Description	Receive Customer Demand
Process Owner	Jordan McIntyre
Roles Involved	Production Planner, Warehouse Operator, RROA IT

Systems Involved	MRP (TilliT), Control-M, SSIS





Existing PnP Order Plan and Orders are Managed via Email uploaded into MRP via VBA code.

8.3.2 Critical Assumptions / Decisions

Assumption	Impact	Owner	Date Confirmed
Supplier ID will not be imported into any new files. RROA will supply both Fixed Weight and Catch Weight Products	RROA will not be able to supply under a separate fixed and catch weight vendor code	Travis	Confirmed. @srinath to confirm from IT that fixed weight and catchweight items can be on the one PO
Any PnP or FFF orders will be filtered from SRX Order Plan	Data volumes transitioned will be reduced. Update to **excludeDCFromETLProcess** for RROA	Coles IT	Will be incorporated into end state – interim state will require filter on RROA
Rosters will need to be based on DC Delivery Date to enable functionality to generate multiple orders per day (used currently for other RRM facilities) Any new roster/order plan extracts should be built with both "order date" and "DC delivery date" so that RROA has the full info	Approval Date Time timestamp logic in files can remain unchanged Additional functionality will need to be developed to handle this roster scenario	Travis	06/08
If multiple DC Order Plans are received on the same day, previous data will be deleted for the that order plan type * Generally only one file will be received	Logic defined to prevent duplicate data	Travis	06/08
If multiple Purchase Orders are loaded on the same day these files will be appended to the order table. If there is a duplicate in the primary key this data is expected to be merged (i.e. quantities updated) * Note that version "A" **IS** part of destination table of PO detail Logic for deletes have not been created	May create duplicate demand if orders are not managed	Travis	06/08
WRP (DC Receipt Order Plan) will contain "Forecast" Values for Orders already received by RROA This depends on IT solution for order plan - depending on solution, orders already released may be included or excluded	Forecast for the current day's orders are used in validation processes.	Travis	06/08
DC Number contained in order plan / purchase orders will have different purchase orders. The Purchase order will have two alpha characters after the 4 digit logical DC (Eg '9521GR'). The Order Plan will have the 4 digit logical DC followed by a id eg ('952101')	Logic in MRP is based on a single value	Travis	The PO's and order files will have different formats.
The Prefix Value contained in the purchase order will be retained (eg R-34741743A).	ASN may fail is PO format is not aligned	Srinath	R needs to be retained, with the suffix.

8.3.3 Target State Filetypes

DC Order	DC Order Plan	Data Definitions
EIDC_PO_XMLformat1 .txt	<NOT CONFIRMED>	Data Definitions.xlsx

Purchase Orders UAT – \\wurrepmrpapp01\XferData\EP\uat\PurchaseOrders
Purchase Orders PROD - \\wprrepmrpapp01\XferData\EP\PurchaseOrders
DC Receipt Plan UAT – \\wurrepmrpapp01\XferData\EP\uat\DCReceiptPlan
DC Receipt Plan PROD - \\wprrepmrpapp01\XferData\EP\DCReceiptPlan

8.4 Analytical tools

Tillit, the open-source application being developed by Nukon for Coles RROA's order management solution, will continue to be utilised to perform the desired order management functions for the Pick and Place integration.

8.4.1 Design Features

8.4.1.1 File Processing

- DC Orders
  - Filestage locations to be setup as "\\wprrepmrpapp01\XferEP\ "
  - Staging Tables to be created
  - Control-M, SSIS Job to be created to import file
- DC Order Plan
  - Filestage locations to be setup as "\\wprrepmrpapp01\XferEP\ "
  - Staging Tables to be created
  - Control-M, SSIS Job to be created to import file
  - Temporary access to be created for All Planning Users to Access this location (List to be specified by Jordan)
  - Development of Macro to Process File to Filestage from Email
- Alerting and Troubleshooting – all capabilities related to alerting and troubleshooting will be applied to the new tables

8.4.1.2 ETL

- Roster calculation will need to be changed:
  - AS-IS (Store) – Rosters will be determined by Order Type Link
  - TO-BE (DC) – Rosters will be joined on CAST('Delivery Date')
    - Shipping Roster – DC Roster Weekly will need to be joined by 'DELIVERY WEEK DAY' rather than 'ORDER WEEK DAY'
    - Will need a days offset for Order DATE
    - Will need a DUE IN OFFSET for Deadline Delivery window
  - 'Price Offset Days' will need to be continued for Price Determination

- Import Order Plan
    - Load and Delete on Filetype separately - i.e. not truncate and load full table
- Archiving – confirm no impacts to current functionality
- Independent Demand Aggregation – Rules and Forecast netting to be assessed

8.5 Application of business decision tools

Once the Pick and Place integration is complete the following outcomes are expected;

- Accuracy improvement of store orders by improving certainty in inventory and risk period by one day
- System capabilities to shape demand between suppliers using the POSST system
- Enable ordering efficiencies of pallet and layer rounding; expected to improve outbound efficiency and reduce transport cost

8.6 Skills development

MLA Networking meeting on Communication styles and empathy skills training.

8.7 Participation in digital networks

Nukon training and design sessions with RROA Production Planner, Warehouse Operations and RROA IT.

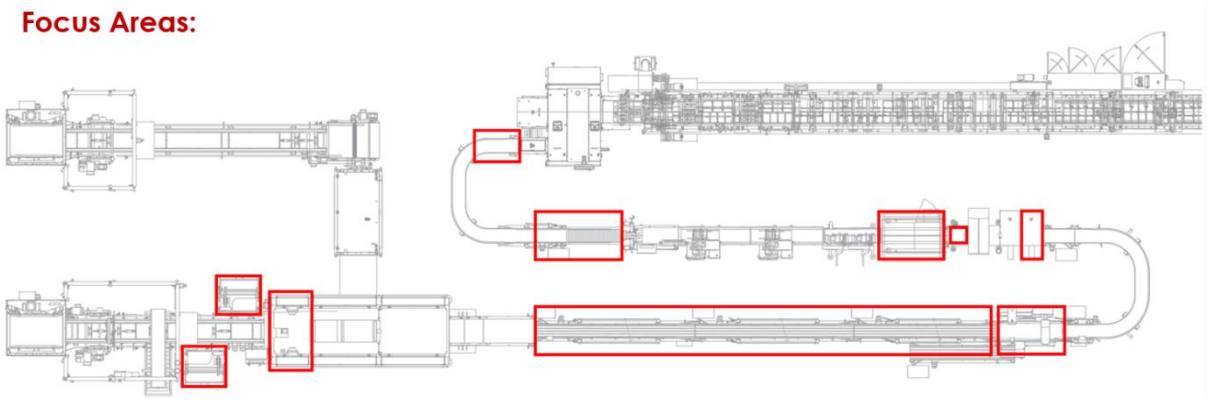
9 Milestone 10

9.1 Introduction

The work of design for the Order Enhancement system, which was conducted in Milestone 9, will be continued in a separate project. An MDC was submitted and approved for the Order Enhancement project.

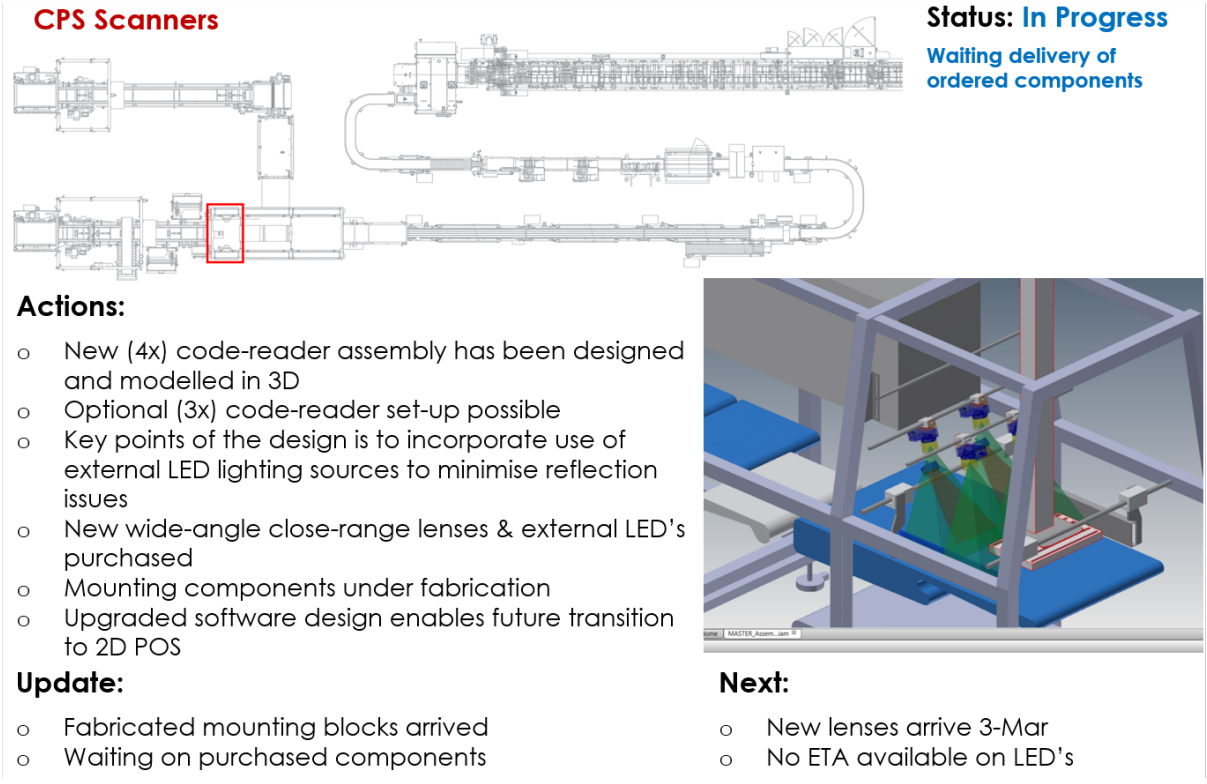
In Milestone 10 the focus was on Line 1 end of line reliability improvements.

- Increased OEE and line performance
- No ‘good packs’ rejected for ‘bad reasons’
- Automate optimal ‘line flow’ conditions between different products
- Controlled line stops and unmanned restart ability
- Remove the practice of ‘uncontrolled’ human interference
- Reduction of labour costs



9.2 Details of data analysis

9.2.1 CPS Scanners



Data analysis of codes read from the CPS case packers showed a high percentage of good packs being rejected due to poorly read barcodes – 8% bad reads.

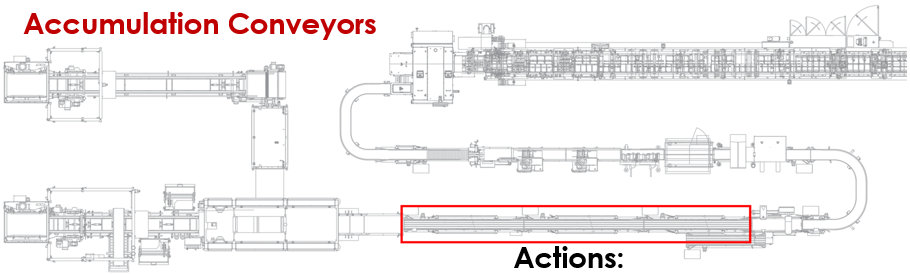
Top film on MAP packs is sometimes curved due to the MAP gas pillowing the pack. This curved, shiny surface causes reflections in the image seen by the cameras which obscures the code and creates reject packs.

Camera trial data showed that use of a wide-angled, close range lens coupled with external lighting to even out the light field, will minimise or eliminate these false rejects.

Waiting on delivery of the new camera hardware to rollout into all the CPS Scanners to run in production.

9.2.2 CPS Infeed Accumulation Conveyors & WPL Infeed

CPS Infeed Accumulation Conveyors



Status: Complete

100 % Functional performance

Possible opportunity for minor fine-tuning

Actions:

- Run cabling and wire new CPS 'Ready to Receive' Signal into PLC
- Update PLC logix automation code
- Adjust conveyor speeds and VSD ramp-up / ramp down times
- Remove sensors and re-weld to new positions
- Execute new accumulation-full control sequence for unmanned restarts

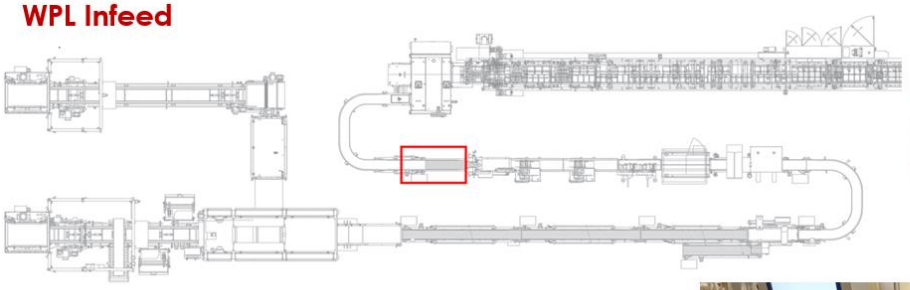
Update:

- No automation changes required over the last week
- Demonstrated control sync with WPL speeds
- Scoped cabling requirements for deployment across other lines and gone out for pricing

Next:

- Update electrical documentation and drawing set
- Undertake cable / core labelling

WPL Infeed



Status: Complete

100 % functional performance

Full control now executed from Innova per SKU

Actions:

- Introduced alternative 'manual' WPL infeed pack spacing and speed control method
- Added new PEC sensor to the WPL infeed
- Defined Innova master settings for default pack length and preset WPL run speeds
- This method achieves precise control of WPL throughput line matched to CPS rate
- Allows for faster line speeds and reduces the number of packs in transit
- The functionality works in-sync with overall line flow

Update:

- The WPL now been running under the new Line control method for a week
- This has proven immediately successful

Next:

- Tuning of master data default preset speeds across full SKU range
- Eligible for controlled roll-out across other lines

The Insights to Innovation manager developed a strategy to reduce the effects of micro-stoppages on the OEE. The strategy directs operators to pack off during a downstream stoppage which another operator rectifies the issue, and then the packs are packed back onto the line. In this way the entire upstream set of machines is kept running, and minor stoppages cause minimal impact to the OEE.

However one issue which was detected when reviewing the throughput data, was if the operator put too many packs back onto the line when packing on after a downstream stoppage was resolved, the machines downstream would suffer issues due to insufficient pack gaps. The WPL, label checkers and case packer would all have issues if the pack gaps are too small.

The solution required must maintain throughput, allow the operator to pack on without having to think, pull adequate gaps between packs and ensure a continuous flow of packs with minimum or no stoppages.

Various timing data from the PLC and CCTV video footage were analysed to trial conveyor speeds and ramp up/ramp down timings. New conveyor sensor positions were required to provide pack data presence information at the critical bottleneck points.

Once optimum settings were determine for each individual SKU, master data was update and integrated with the line control to allow settings to be fed to the control system for each selected SKU.

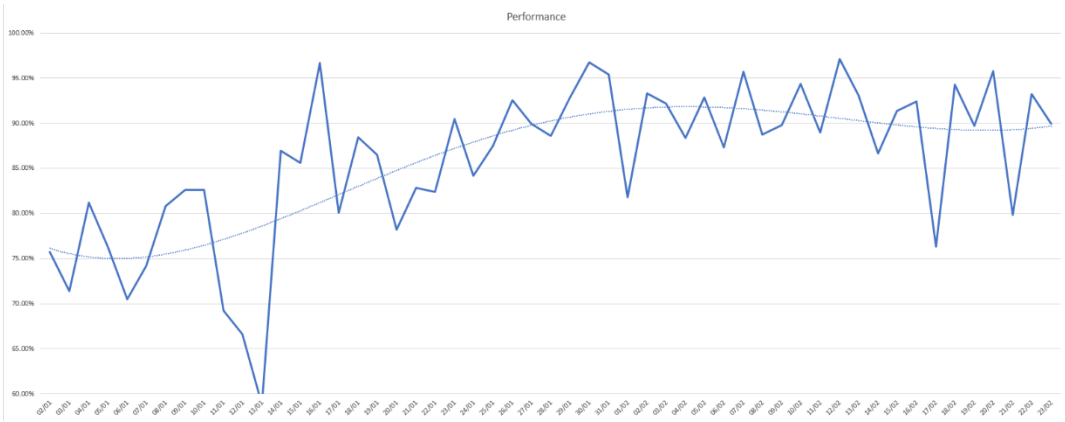
The final solution developed allows for totally unmanned restarts of the line or continuation of line running with a full accumulation conveyor, which is where the operators pack off and pack on from.

The result is a continuously running line which balances all the packs with appropriate gaps regardless of whether the accumulation conveyor is loaded up with packs or not. In this way no micro-stoppages occur, throughput is maintained through the machines which are still running on a line independent of machines downstream which may stop, and packing off and back on does not impede proper flow downstream.

Line 1 2021 average performance was 81.84%.

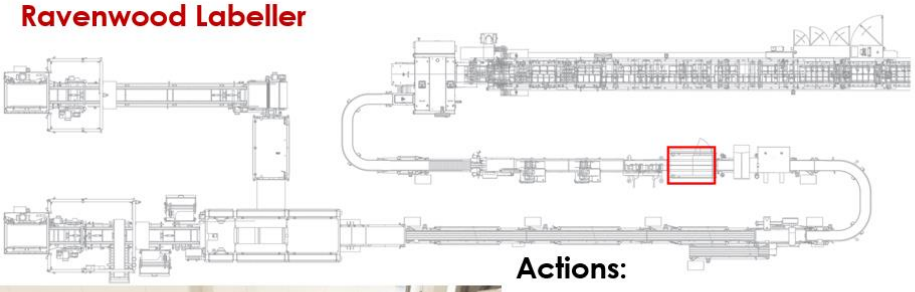
Line 1 improvements conducted through Jan 2022.

January performance was degraded due to COVID absenteeism and the ongoing trials. However as can be seen in the chart below, a step change from 75% to 90%+ was seen from Jan to Feb 2022.



9.2.3 Ravenwood Labeller

Ravenwood Labeller



Status: In Progress

Engineering and senior leadership team

Actions:

- C-wrap linerless is now the primary labelling media type for Coles meat
- Continued and guaranteed operation of Ravenwood labellers is critical for maintaining end line performance
- It is essential to establish proactive preventative maintenance control measures to ensure machine reliability
- Execute stable arrangement for vendor support

Update:

- Discussion point:
  - Metric for measuring acceptable performance

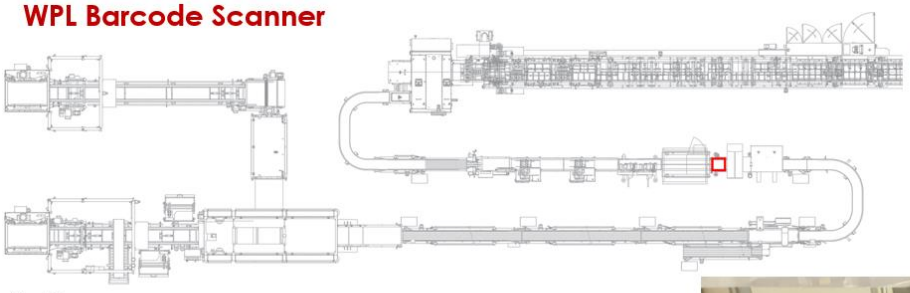
Next:

- Vendor support arrangement?

Data analysis is ongoing to determine key performance metrics from the labeller to measure acceptable performance. If these metrics show performance is waning, this will assist maintenance personnel to schedule preventative maintenance to keep the labeller performing at optimum levels.

9.2.4 WPL Barcode Scanner

WPL Barcode Scanner

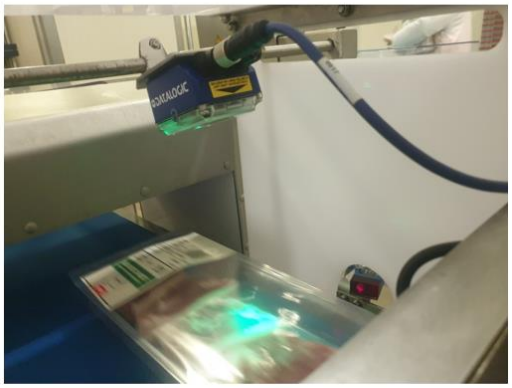


Status: Complete

Production trials finalised
Reporting 100% success

Actions:

- The original 2x code readers have been removed from the WPL
- These have been replaced with a single 'new generation' DLCode-reader
- The new code-reader specifically tuned to look for 2D codes only and allow transition to future 2D POS
- 'Good-Read' outputs are fed back to the WPL for pack confirmation
- 'No-Read' outputs are passed on to the PLC for reject control



Update:

- Trial period completed - No changes required
- Scoped cabling requirements for deployment across other lines and gone out for pricing

Next:

- Update electrical documentation and drawing set
- Undertake cable / core labelling

2D QR codes are much more efficient at storing product data. Items such as the best before dates can be embedded in the code and allow integration with the Point of Sale (POS) system at retail checkouts to flag products which are out of date or have had a product recall.

Data analysis of the 'good read' vs 'no-read' signals from the readers was analysed to fine-tune the imaging system to ensure minimum false rejects, and feedback to the label printers to ensure optimum print clarity was being produced. Bad reads are down to 1.5-2.2%.

9.3 Development of new digital and data approaches

Across all the data analysis projects described in section 10.2, the approach of analysing the "long tail" of data ie the small stoppage reasons, and focusing on eliminating their root causes, has resulted in large gains in OEE to 75-85%.

The large stoppage reasons tend to be machine breakdown related, and don't often occur. Preventative maintenance scheduling to keep machines running at optimum levels is an adequate strategy to minimise those large downtime events.

A continued focus on eliminating the micro-stoppages through analysis of downtime reasons through the tools developed will ensure the business will be able to keep on making incremental improvements to overall machine, line and plant efficiencies.

9.4 Analytical tools

9.4.1 Digital Dashboard

- Important tool for recording metrics, providing insight and measure of line performance
- Initial concept dev done under trial license - New tag licensing required for deployment
- Opportunities for installing additional sensors and display alternative performance metrics

Work from previous milestones allowed many disparate machine data sources to be pooled into a common database and then reported using license free Grafana dashboard software.

This dashboard allows a live view of each line's key performance metrics and highlights trends which indicate potential issues eg actual throughput falling well under target for sustained periods of time. Operators can adjust operations if metrics indicate lagging performance.

9.5 Application of business decision tools

Observation of human behaviour when these dashboard results were made available to the operators on adjacent lines, suggests a gamification outcome whereby teams on each line start to compete against each other to achieve higher throughputs, reduced downtime, and higher quality metrics which of course results in higher OEE for all lines.

The next phase will be to take this proof of concept dashboard and implement it in production at the end of each line.

9.6 Skills development

MLA Networking meeting on Principles of Project Management. Developed and presented a showcase presentation on RROA's top 3 projects from FY20 with a focus on the Coles' project management methodologies employed.

9.7 Participation in digital networks

Various supplier training sessions to learn how to implement data mining and reporting using the Wonderware, Grafana and code reader data tools.

10 Milestone 11

10.1 Introduction

The Coles Chef Fresh business in Banksmeadow, formally Jewel Fine Foods, is nearing 2 years under Coles ownership. The business is undergoing many transformative changes to standardise processes and implement systems that are sustainable from a human resources perspective.

One of the transformations that has been implemented is within the Planning Department.

Previously the Planning Department consisted of 3 Planners who ran several excel spreadsheets, for the area of the plant that they managed, to forecast orders, receive store orders, plan inventory procurement orders and generate production/cook schedules.

These spreadsheets were manual in nature requiring lots of interventions, cut and pasting between spreadsheets and unique knowledge only understood by a particular planner.

This resulted in high time demands each week from the planners, in order to manage inventory, store and production orders, while also incurring inaccuracies due to the many manual operations.

These processes were unique to each planner so when a planner left the business, information was lost, and training new staff was extremely difficult. Furthermore there was no clearly defined system to manage these processes efficiently or accurately. The result was raw material right offs due to expired stock issues.

The business required a standard and systematised approach to inventory and order planning. The business could not wait for the several months of design and implementation required to migrate to an off-the-shelf application, delivered by Coles IT, or a contractor led custom application solution.

Instead the business decided the use the considerable in-house talent within the Coles RROA Planning team to develop a quick solution to the problem using open-source solutions.

The solution focused on consolidating the many individual planner's spreadsheets into one master spreadsheet which used automation coding to define the rules and exception handling for each process that the planners executed.

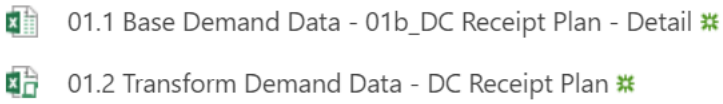
The result was a single interface and tool, that all planners use, which automates all their tasks dramatically reducing errors and effort. This tool encapsulates all the business rules and exception handling so that if new staff have to be trained, it is a much faster and simpler process.

This solution was

10.2 Details of data analysis

The manual spreadsheets previously used were analysed by the RROA developer in conjunction with meetings with each planner to determine the tasks each spreadsheet managed, as well as all the exception handling tasks and rules required. This process took approximately 2 weeks

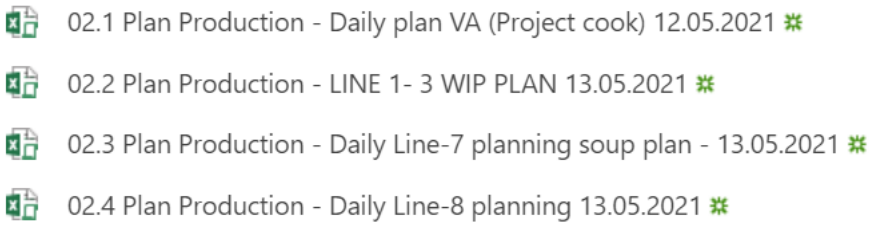
The first set of manual spreadsheets shown below numbered 01.1 and 01.2 managed stored orders received from Coles or forecasted orders if no Coles order was available.



01.1 Base demand data – Sourced from Coles via an extraction process from the Coles website to create a store orders file which contains a few day's demand – DC Receipt Plan. If orders are not available a forecast consumption file is used to fill in the missing data as per 01.2 Transform Demand Data shown next.

01.2 Transform Demand Data – Actual store order data is fed into the DC Receipt Plan, but if the DC order is not available, a forecast consumption file by date and Distribution Centre, is used to complete the missing data and thus the order. Typically store orders are received each morning and despatched in the afternoon.

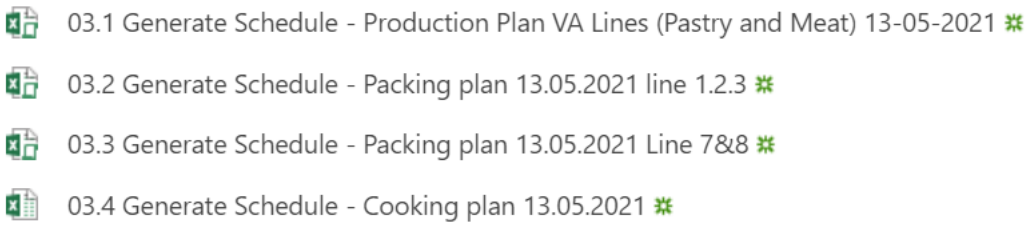
The next set of spreadsheets ***02.1 to 02.4 Plan Production,*** contained the production plan data for areas Line1-4, Line 7, Line 8 and VA. The spreadsheets calculated the daily production quantities for a 4-6 week schedule in order to determine inventory procurement quantities of raw materials. These quantities were manually calculated.



The new master spreadsheet had to contain rules to accurately calculate the daily production per product based on the actual weekly production pattern. Some products were produced daily, while others were only produced every 2nd or 3rd day, so each day an accurate quantity calculation was required to account for the varying production cycles of each product.

This fixed cycle of manufacture had to be coupled with the varying daily, weekly, monthly and seasonal demands and dynamic inputs such as weather, to accurately procure raw material quantities.

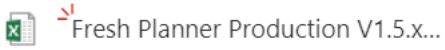
The next set of manual spreadsheets ***03.1-03.4 Generate Schedule*** were used to forecast and plan the next 2-3 days of production schedule. The schedule detailed the sequence and quantities of each product to be produced on each line. This schedule is generated 1 day prior to production, or in the case of Mondays, the schedule is generated on Friday. One file also contained the cooking schedule.



10.3 Development of new digital and data approaches

The tool used to deliver the functionality of the old manual spreadsheets, was one master spreadsheet which contained specialised code that encapsulated the rules and exception handling of the old spreadsheets and planner's specialised knowledge. This development took only 2 months.

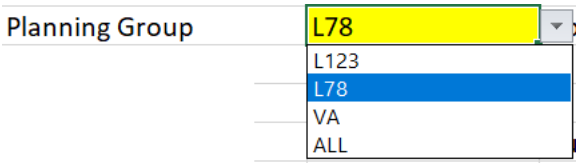
Using the understanding gained from the Data Analysis phase detailed in 11.2 above, the developer was able to codify all the rules and exception handling contained in the 11 old spreadsheets and consolidate them into one master spreadsheet shown below.



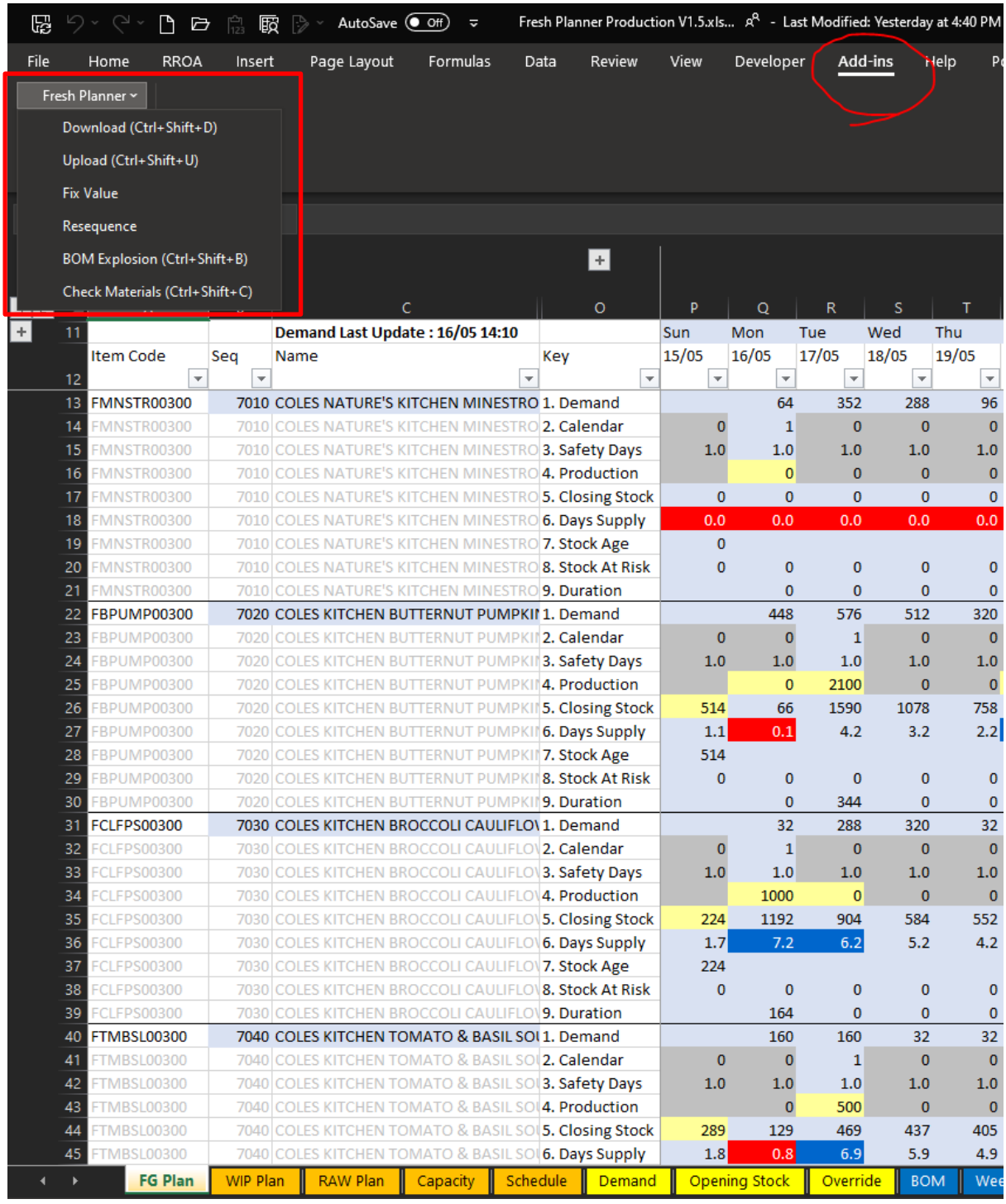
Using VBA code which is an open coding language embedded within Microsoft Excel, all the rules and exception handling routines could be built into the master file.

Using simple drop down selections and buttons each planned could simply select their desired area and then initiate each of their tasks to automatically generate the outputs for store orders, raw material orders or production schedules.

Planner selects the Planning Group (Plant Area)

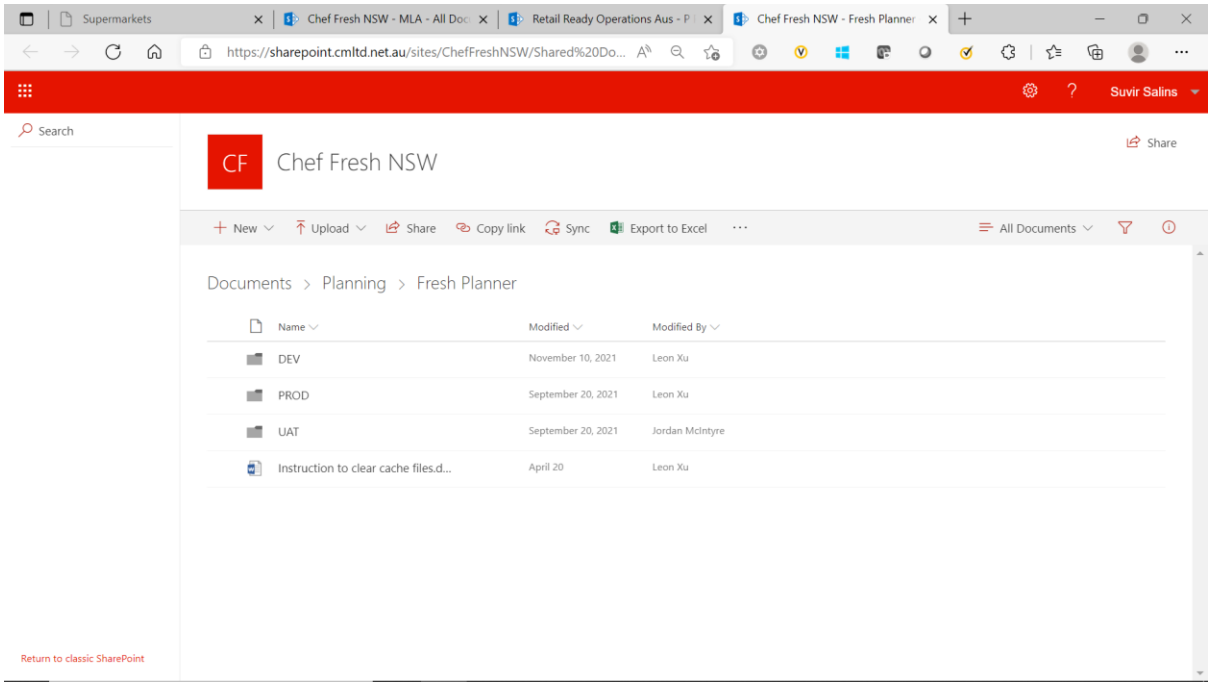


Planner Initiates the Desired Function

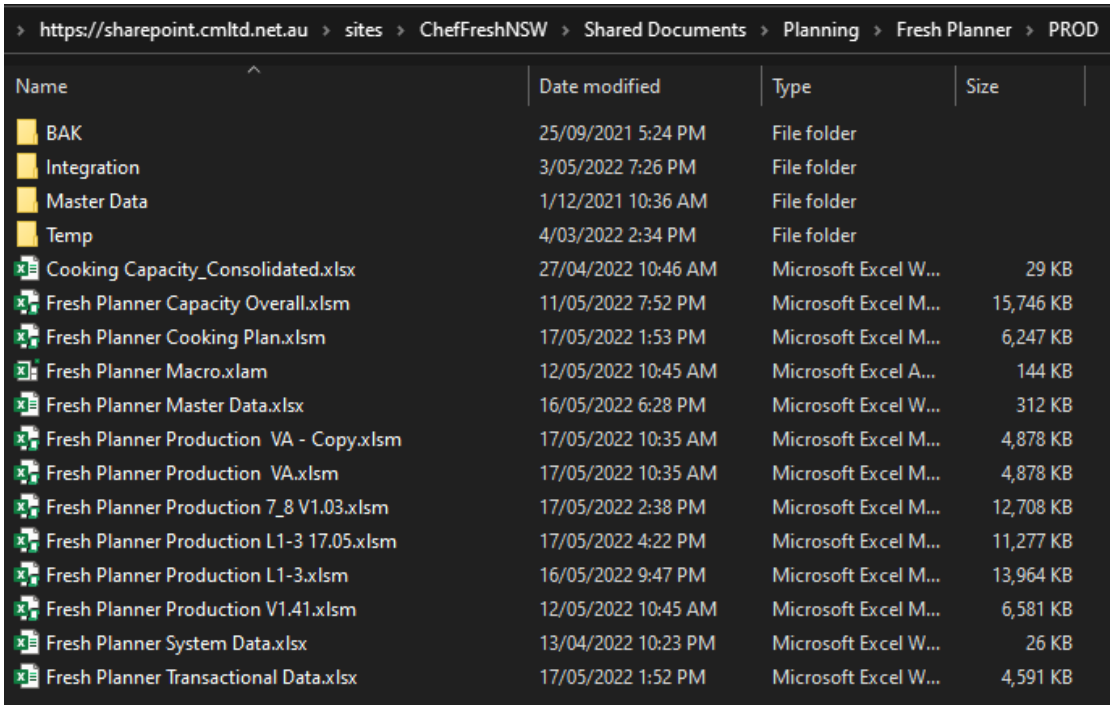


10.4 Analytical tools

The tool, the master spreadsheet with automated code, enables the user, typically each planner, to make a critical selection, which is the environment they want to work within. There are 3 environments, Production (PROD) which is the live environment, User Acceptance Testing (UAT) which is similar to the production environment and is used to test changes before they are deployed to PROD, and finally Development (DEV) which is an environment where changes are developed.



The current solution does not utilise a database. As such master data is stored in several master data spreadsheets.



The environments are simply separate folder structures each containing their own sets of master spreadsheets so that output files generated from the master spreadsheet only appear in its own folder/environment, and don't interfere with other environments ie don't mix DEV generated data in the PROD environment.

In this way changes can be developed safely and tested without interfering with live production activities.

10.5 Application of business decision tools

The design of this unique and custom tailored solution within 2 weeks and implementation in 2 months, with a full rollout of the final version within 6 months, shows that this sort of agile software development can be very light weight and still deliver huge gains.

Raw material write-offs are down by a 75% reduction, with more work being done to reduce this to zero.

Planner efficiency improvements are in the order of 75%-83%, with specific tasks previously taking 4-6hrs being reduced to under 1hr to finalise.

10.6 Skills development

Training on the principles of Project Management at the MLA Networking Meeting:

- Process
- People
- Principles
- Practices

10.7 Participation in digital networks

Various networking meetings with Coles IT and contractor software developers were conducted to determine various options for off-the-shelf and custom applications that would be suitable to solve the Chef Fresh planning requirements. Suggestions from all parties with internal RROA software teams led to the final solution design and implementation.

11 Milestone 12

11.1 Introduction

RROA is growth constrained by logistics constraints – specifically picking throughput and finished goods storage. RROA has additional production capacity to produce 100T mince (or equivalent) per week with the ability to fractionalise 10% of RROA's overheads.

RROA has invested in a $1.2m project to deliver picking equipment, currently utilised at 20% of expected project capability.

RROA has implemented an end of line palletising solution in early 2021. The solution consisted of three elements:

1. The "hardware" (electromechanical solution) consisting of Robotic Palletisation, Pallet wrapping and Conveyors.
2. The "software" consisting of an integration solution between the various RROA applications including TilliT, Swisslog and Innova; including the enabling of new processes to divert inventory from the "normal" process flow and pick/ship inventory from an alternate location.
3. An end-user handover to ensure ongoing supportability of the function.

The current solution only delivers approximately 20% of the expected benefit and has several vulnerabilities relating to supportability, availability, and write-off.

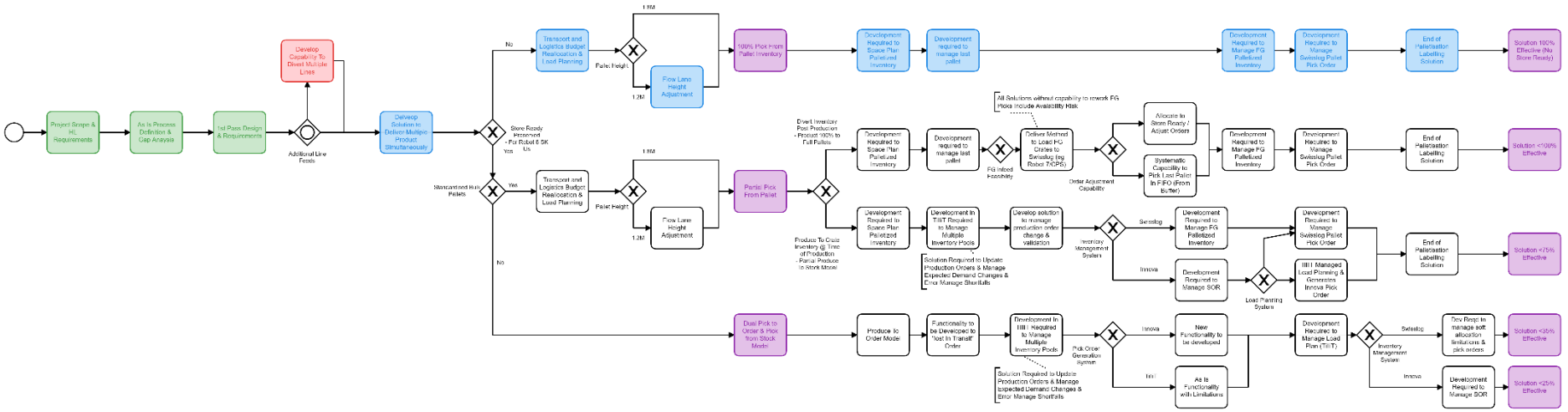
The Robot 8 Project optimisation will deliver an end-to-end solution which will:

- divert over 4,000 crates from the buffer chiller to the Robot 8 infrastructure (peak day, point in time holding)
- continue to enable store ready picking, including system capabilities to account for / plan for dual demand sources without supply risk
- systematically account for all inventory and segment inventory in pick-to-order scenarios where inventory can only be consumed by specific channels
- continue to enable picking from buffer chiller solution for BCP scenarios, and manage inventory existing in all states and picking functions
- account for expected changes in demand and production quantities - managed without the introduction of supply risk or excessive administration
- ensure that the following capabilities are preserved
    - all transactional systems of record (despatch, production receipt)
    - despatch processes, load planning and scan-to-trailer functions
    - production efficiency - not increased by diverting orders to Robot 8

11.2 Development of new digital and data approaches

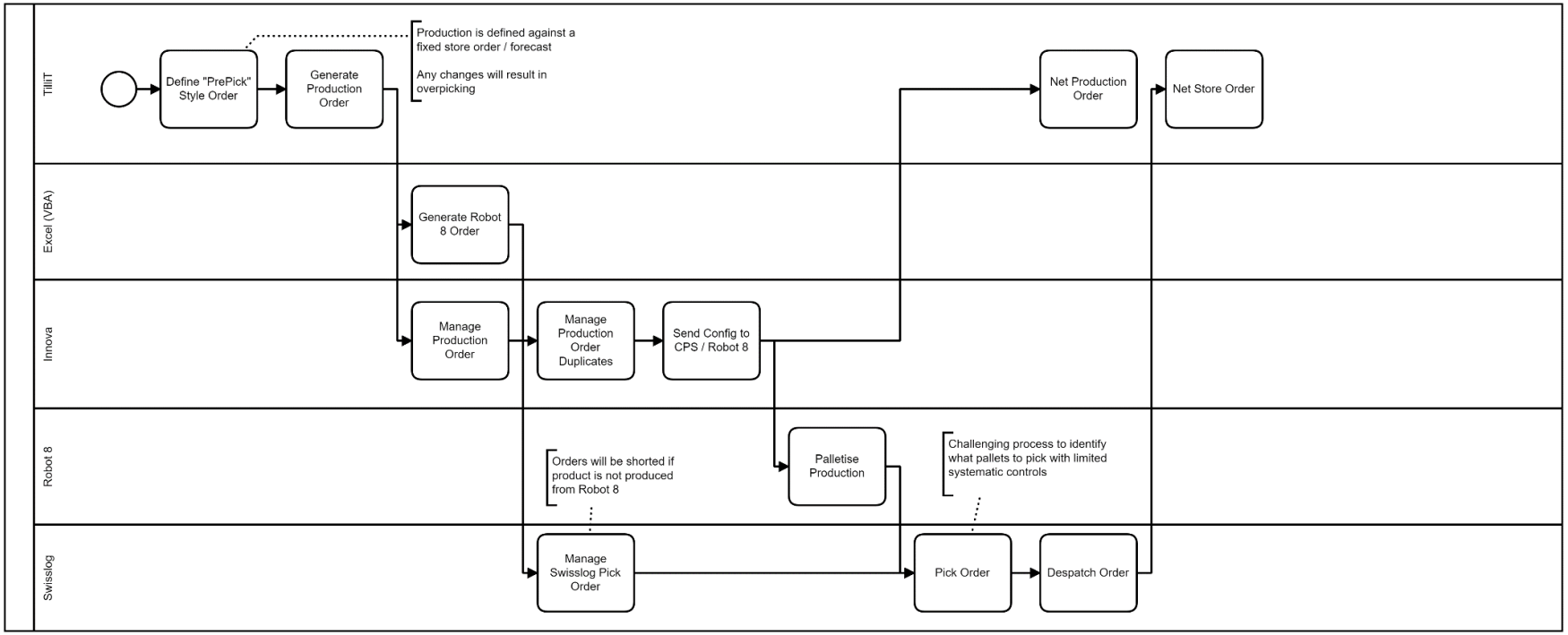
A gap analysis was performed in-house, to identify the shortfalls of the current Robot 8 implementation.

The “Blue” Path shown below, has been identified as the optimum choice from the design roadmap options, outlined as a result of the gap analysis. The blue path will significantly improve asset utilisation compared with other options and will reduce overall solution cost/complexity.


Project Scope & HL Requirements
As Is Process Definition & Gap Analysis
1st Pass Design & Requirements
Develop Capability To Divert Multiple Lines
Additional Line Feeds
Delveop Solution to Deliver Multiple Product Simultaneously
Store Ready Reserved - For Robot & SK Us
No
Yes
Transport and Logistics Budget Reallocation & Load Planning
Pallet Height
1.8M
1.2M
Flow Lane Height Adjustment
100% Pick From Pallet Inventory
Development Required to Space Plan Palletized Inventory
Development required to manage last pallet
Development Required to Manage FG Palletized Inventory
Development Required to Manage Swisslog Pallet Pick Order
End of Palletisation Labelling Solution
Solution 100% Effective (No Store Ready)
Standardised Build Pallets
Partial Pick From Pallet
Direct Inventory Post Production - Prospot 100% to Full Pallets
Produce To Child Inventory @ Time of Production - Partial Produce to Work Model
All Solutions without capability to rework FG Picks include Availability Risk
FG Infeed Feasibility
Deliver Method to Load FG Crates to Swisslog (eg Robot ?/OPS)
Order Adjustment Capability
Allocate to Store Ready / Adjust Orders
Systematic Capability to Pick Last Pallet In F-I-O (From Buffer)
Solution <100% Effective
Development Required to Manage Inventory Pools
Development In TiMT Required to Manage Multiple Inventory Pools
Solution Required to Update Production Orders & Manage Expected Demand Changes & Error Manage Shortfalls
Develop solution to manage production order change & validation
Inventory Management System
Swisslog
Innova
Development Required to Manage SOR
Development Required to Manage Swisslog Pallet Pick Order
IIM I Managed Load Planning & Generates Innova Pick Order
Load Planning System
Solution <75% Effective
Dual Pick to Order & Pick from Stock Mode
Produce to Order Mode
Functionality to be Developed to "lost In Transit" Order
Development In IIM I Required to Manage Multiple Inventory Pools
Pick Order Generation System
New Functionality to be developed
As Is Functionality with Limitations
Development Required to Manage Load Plan (TiMT)
Inventory Management System
Dev Reqd to manage soft allocation limitations & pick orders
Solution <50% Effective
Solution <25% Effective

Current State – Manage Bulk Pick Order

Process Description	Manage Robot 8 Production Order
Process Owner	TBD
Roles Involved	Production Planner, Control Room Operator, Production Operator, Warehouse Controller, Forklift Operator
Systems Involved	Swisslog WMS, TilliT, Excel ("Leon" Integration), Innova

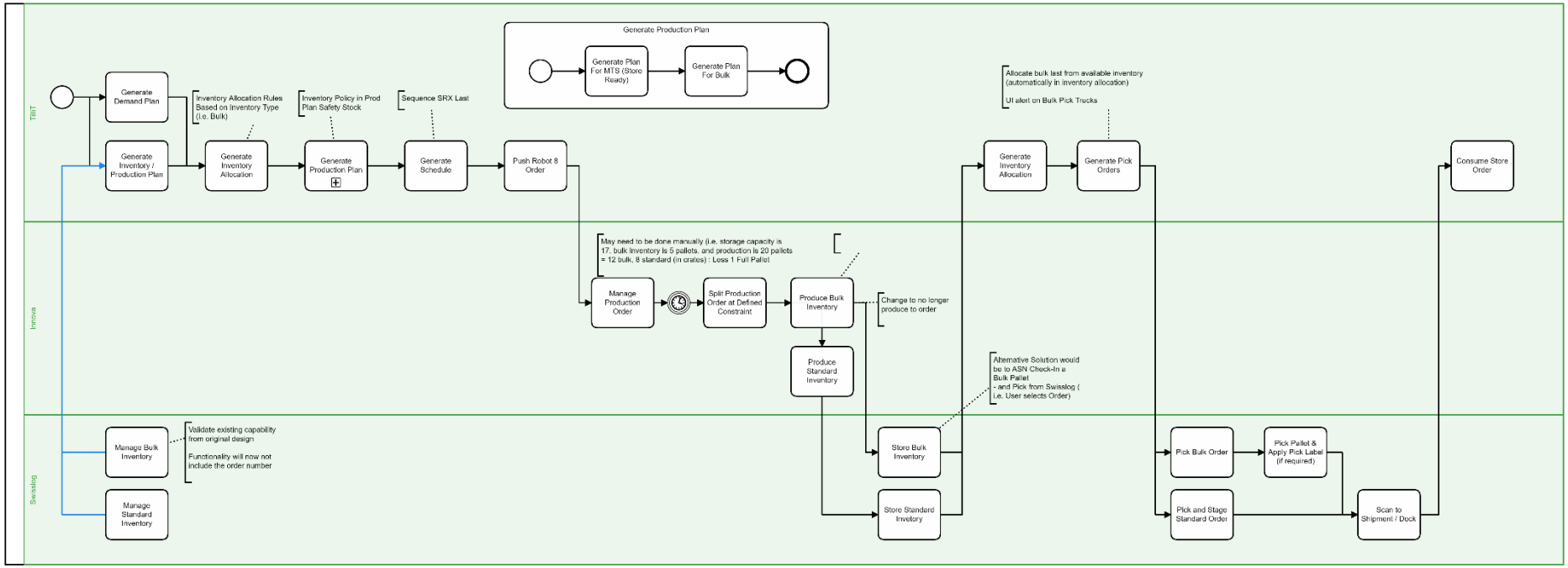


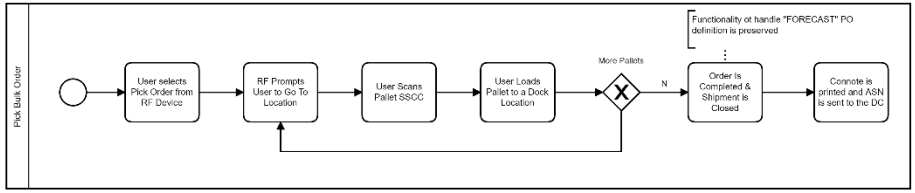
Adjusting purchase orders does not take place automatically, failure to adjust will directly result in a shortage of pick/production, and controls/validations are limited in this process and are generally reliant on teams actioning email instructions.

There are several vulnerabilities in the process where unsupported decisions can lead to shortfalls in supply, due to: picking out if sequence and inventory being allocated a bulk channel, and demand changes against a specific DC/Item/Date.

Target State – Manage Bulk Pick Order

Process Description	Manage Robot 8 Production Order
Process Owner	TBD
Roles Involved	Production Planner, Control Room Operator, Production Operator, Warehouse Controller, Forklift Operator
Systems Involved	Swisslog WMS, TilliT, Innova


TRIIT
Innova
Swisslog
Generate Production Plan
Generate Plan For MTS (Store Ready)
Generate Plan For Bulk
Generate Demand Plan
Inventory Allocation Rules Based on Inventory Type (i.e. Bulk)
Inventory Policy in Prod Plan Safety Stock
Sequence SRX Last
Generate Inventory / Production Plan
Generate Inventory Allocation
Generate Production Plan
Generate Schedule
Push Robot 8 Order
Allocate bulk last from available inventory (automatically in inventory allocation)
UI alert on Bulk Pick Trucks
Generate Inventory Allocation
Generate Pick Orders
Consume Store Order
May need to be done manually (i.e. storage capacity is 17, bulk inventory is 5 pallets, and production is 20 pallets = 12 bulk, 8 standard (in crates) : Less 1 Full Pallet
Manage Production Order
Split Production Order at Defined Constraint
Produce Bulk Inventory
Change to no longer produce to order
Produce Standard Inventory
Alternative Solution would be to ASN Check-In a Bulk Pallet - and Pick from Swisslog (i.e. User selects Order)
Manage Bulk Inventory
Validate existing capability from original design
Functionality will now not include the order number
Manage Standard Inventory
Store Bulk Inventory
Store Standard Inventory
Pick Bulk Order
Pick Pallet & Apply Pick Label (if required)
Pick and Stage Standard Order
Scan to Shipment / Dock


Pick Bulk Order
Functionality ot handle "FORECAST" PO definition is preserved
User selects Pick Order from RF Device
RF Prompts User to Go To Location
User Scans Pallet SSCC
User Loads Pallet to a Dock Location
More Pallets
N
Order Is Completed & Shipment is Closed
Connote is printed and ASN is sent to the DC

Business Volumetrics

This section outlines the expected volumes of activities that are relevant to the change being requested and will be used for specifying non-functional requirements.

Target of 4,000 crates diverted from buffer chiller per day: up from max 864

ITEM CODE	ITEM DESCRIPTION	SRX	ECDC	RROA	BFG	Total BULK	CPP 1.2	CPP 1.8	Additional Bulk Pallets	Pallets Per Week	Average Day	Allocated Space
8850814	COLES BEEF 3 STAR REGULAR MINCE RR 9x7 :1 KG	1,613	3,258	5,497	-	5,497	30	42	31	183	37	2
8850654	COLES BEEF 5 STAR EXTRA TRIM MINCE RR 9x7 :500 GRAM	558	2,687	3,195	1,002	4,197	30	42	26	140	28	1
8850188	COLES BEEF 3 STAR REGULAR MINCE RR 9x7 :500 GRAM	702	2,145	2,145	1,615	3,760	30	42	20	125	25	1
8850450	COLES BEEF 4 STAR LEAN MINCE RR 9x7 :500 GRAM	671	2,217	2,739	1,010	3,749	30	42	21	125	25	1
3449773	COLES BEEF 4 STAR LEAN MINCE RR 9X7 :800 GRAM	658	2,096	3,399	-	3,399	30	42	20	113	23	1
8782725	COLES PORK & BEEF 3 STAR MINCE BOLOGNESE RR 9X7:500 GRAM	659	2,522	3,942	-	3,942	48	72	18	82	16	1
4256629	BEEF MINCE TABLELAND FOODS BULK PACKS:PER KG	-	-	-	2,423	2,423	30	42	-	81	16	1
8850053	COLES BRAND RR 9X7 LAMB MINCE:500 GRAM	329	1,303	2,162	-	2,162	48	72	9	45	9	
2024280	COLES GRAZE GRASS FED BEEF MINCE 500G:500 GRAM	2	490	499	351	850	48	72	3	18	4	
3697709	COLES GRAZE LAMB MINCE 500G:500 GRAM	-	-	-	517	517	48	72	-	11	2	

Racking Layout

AS IS	1.8m High Racking	3 Levels, 2 Wide	17 Spaces Per Rack	102 Pallets
TO BE	1.2m High Racking	4 Levels, 2 Wide	17 Spaces Per Rack	136 Pallets

Business Requirements

Ref	Type	I want	So that
BR.001	TilliT	Functionality of the production plan to separately plan demand against an inventory policy of “Bulk” as a separate order type – demand for these DCs will influence processes impacting the” Production Plan Pivot, Production Schedule, Inventory Allocation, Truck Scheduling and Truck Allocation * “Bulk” should be pre-defined via an Inventory Policy (item level) and in the event that Inventory is detected (unplanned) in a “Bulk” location, this inventory should not be assigned to demand in the “Store_Ready” order type.	Functionality will exist to support decisions where inventory/production stored as “Bulk” cannot be systematically assigned to demand fulfilled by Swisslog automation
BR.002	Configuration Swisslog	Define a location cluster and associated locations to store and manage “Bulk” inventory.	
BR.003	TilliT	Extracts and Tables relating to inventory to include the Location Cluster defined in Swisslog – configuration defined to identify the location clusters which will support “Bulk” only inventory Associated inventory feed of “Bulk” inventory will need to be integrated into opening stock and physical inventory with a concept of inventory type.	
BR.004	Innova / TilliT	Extract of Innova Order Status to include relevant flagging to systematically identify “Bulk” production orders – used in Inventory Allocation of production orders	
BR.005	TilliT	Inventory allocation in TilliT to restrict supply of channels to location groups – specifically Store Ready and Bulk can access “Standard” (buffer chiller) Inventory, where “Bulk” orders can only access “Bulk” storage All other behaviours such as FIFO, MLOR and price should be maintained. * Inventory Allocation refers to all processes which assign inventory to demand ** This process should also apply the same constraints to the allocation of “production” records where the Innova order is flagged as Robot 8 *** Additional logic to consume “production” in the inventory allocation plan may be required to prioritise consumption of the BULK inventory type over MLOR as there is a foreseeable scenario of over consuming standard inventory	The TilliT production plan will allocate inventory specific to the “inventory Policy” – systematically, new stock will be picked for Store Ready, and excesses will be shown for the relevant channel
BR.006	TilliT	Functional and technical support to monitor inventory allocation at launch, including a user interface to show the inventory allocation plan and ability to influence the plan through the configuration value to use/not use the criteria of 'Inventory Availability' < 'Inventory Cut Off' * Configuration should allow the ‘Opening Stock’ run of Inventory Allocation to overconsume ‘Bulk’ to drive worst case plan	High risk implementation as there is a foreseeable scenario where “Standard” inventory could be over consumed leaving excess “Bulk” inventory

Ref	Type	I want	So that
BR.007	TilliT	In the schedule, a constraint table can be referenced to set a maximum number of "Bulk" pallets which can be set per day; the schedule will combine / reallocate the remainder to a new schedule line record - Bulk pallets will only be rounded to a full pallet and that the last bulk quantity i.e. Bulk = (int('Total Bulk'/CPP)-1) x CPP | where min(BULK, CONSTRAINT) * "-1" should be a configuration value - Bulk production should be sequenced to standard inventory - Constraint table should be configurable by item, by day of week, date * use MLOR override without DC as template e.g. **Raw Planned Qty** Item Price Inventory Policy Quantity A 1 BULK 7 A 2 BULK 11 A 1 BULK 13 A 1 STD 17 A 2 STD 19 B 1 BULK 23 B 1 STD 29 C 1 BULK 3.5 Bulk Restricted Qty 17 **Scheduled Value** Item Price Inventory Policy Quantity A 1 BULK 7 A 2 BULK 10 A 2 STD 1 A 1 STD 13 A 1 STD 17 A 2 STD 19 B 1 BULK 17 B 1 STD 6 B 1 STD 29 C 1 BULK 2 C 1 STD 1.5	Business can set days where Robot 8 will not be used or to temporarily increase/decrease storage constraints To enable FIFO to be preserved so that any unallocated standard inventory can be combined with Fresh Stock to complete the remainder of the order Store Ready Orders cannot be fulfilled by Bulk inventory where bulk orders can be fulfilled by Swisslog inventory – sequencing will also assure that any overproduction will go to "Standard" inventory Finished goods bulk storage capacity is not breached. Innova preferred to TilliT to reduce the time between decision and order definition – if this is possible in detailed design review
BR.007	Swisslog	System directed putaway for each item to a dedicated location (storage cluster) – each location should be defined in the same way as flow racking in inbound where capacity is controlled by Transport_Unit (Pallet). The behaviour of price should be included where each price will be directed to an alternate location. An Overflow location should be defined and included in the system behaviour if capacity is reached and "Bulk" inventory cannot be allocated	Users can be guided to an available putaway location when retrieving a "Bulk" pallet from Robot 8. The destination directed should ensure that FIFO behaviours are preserved and that behaviours of one product per lane are preserved
BR.008	TilliT	An ability to configure a specific crates per pallet (height value) per product per DC. This value should be referenced as the Crate Per Pallet and used in determining the number of pallet spaces in Truck Allocation logic	Only 7 products need to be height restricted to ECDC saving a significant cost of putaway and receiving activities. * Confirm functionality already existing in Swisslog (Add item to config value)
BR.007	Financial / Supply Chain	DC approval to send additional 150 pallets per week of 7 mince SKUs	Racking can be standardised for the same pallet height for bulk mince production to all DCs
BR.008	Equipment	Racking to be adjusted to mince/bulk flow lanes to 1.2m Pallets – including one additional layer	Increase the capacity of storage by 33% and the number of distinct products which can be allocated to a dedicated space * Racking height was originally defined as 1.2m but reviewed where 90% of the Robot 8 volume was to a destination for a 1.8m pallet; the destination mix is expected to change for RROA
BR.008	TilliT	Define an additional item field where a value of "Disallow Promotional Price" to be set. This value if true will influence the pricing logic where only the regular sell price is applied.	Will reduce complexity in managing multiple sell prices for Bulk inventory, this method is preferred to managing price overrides which may result I the application of the incorrect price – and may improve the solution where items such as corned beef have business rules to not apply a promotional price.

Ref	Type	I want	So that
BR.009	Innova / Swisslog / Crossmuller	A completed Bulk product can be "check in" to Swisslog using a production ASN. The ASN should include all practical validations to identify likely issues which would result in a failed pallet. The pallet should be able to be represented in Swisslog as a Transport Unit linked to the SSCC label printed on the pallet; containing the physical crates as Load_Units each with their specific and corresponding details Processes should be defined and systematically supported to resolve a "failed" pallet	
BR.010	Equipment	Suitable hardware to manage the scanning and directed putaway and pick activities associated with the management of "Bulk" order management	Review to ensure that current hardware is sufficient and compatible to continue (increased) operation
BR.011	Swisslog	Bulk inventory cannot be allocated / accessed from the Swisslog Automation	Standard inventory is allocated to the correct pick orders
BR.012	TilliT (Swisslog integration)	"Bulk" order types to access inventory in "Bulk"; this would be achieved by - TilliT to populate Auto Allocation False for Bulk Order Type – will not default from automation as a pick order line; unless a user manually allocates the order - TilliT to pre-fix the Prefix orders with "Bulk_"	Swisslog has necessary details to ensure "Bulk" orders are not allocated to the automated picking solution
BR.013	Swisslog	System directed picking for each item to a dedicated location (storage cluster) - RF Device to include a function for Bulk picking * should be existing with MDM Picking - Function should be enhanced to include sorting / filtering capability (i.e. Finished Goods Bulk, Finished Goods BCP) Pick orders should direct retrieval of the product from the correct location as defined in the inventory solution, and to the relevant dock location in the similar process to the standard picking workflow User interfaces for RF picking should define remaining work of a production order. Efforts should be taken to replate functionality of picking to existing processes and safeguards in ram material order selection.	Some products may be stored across multiple locations, to preserve FIFO the retriever (picker) must be directed to the correct location with the minimum BBD RF functionality should easily direct users to easily identify the appropriate pick order. Solution validation should be based on review of current functionality to replenish production lines with material order requests to flow lanes.
BR.014	Swisslog	Pallet labelling should comply with Coles supply standards see page 57 on the Coles Standards weblink	The solution complies with Coles packaging and logistics specifications; and any user validations which include pallet SSCC information are preserved.
BR.015	Swisslog	Connotes, ASN details and "FORECASTED" (prepick) functions should not be compatible with the Bulk picking solution	Existing business functions are not impacted
BR.016	Swisslog	Existing reporting to be reviewed as part of the detailed solution, creation of any new Operation IDs, Transaction Types, Adjust Reasons etc	Inventory needs to be tracked for financial and operational reasons – specific values recorded in inventory transactions will impact the accuracy and completeness of reporting

Ref	Type	I want	So that
BR.017	TilliT	Decommission workflow of allocating an DC order to a production order and truck order	Workflows are very manual (involve many unnecessary decisions) and have few safeguards for processes which performed incorrectly will result in a shortfall in supply.
BR.018	Innova	Decommission processes which "Store" bulk manufactured products in a sales order and picking Sales orders to Innova must be able to pick Robot 8 Orders without the assignment of an order number	Workflows are very manual (involve many unnecessary decisions) and have few safeguards for processes which performed incorrectly will result in a shortfall in supply.
BR.019	Swisslog / Innova	Validations for ASN Check-in should be preformed at a bulk pallet level. Checking processes should be developed to resolve >99% of defects (target < 1 pallet per day). Validations performed on bulk should not impact the performance of Innova/Swisslog and should not have a meaningful impact to robot throughput (< 1 Second)	

Design Dependencies / Assumptions

- TilliT P2 will deliver Safety Stock by inventory policy (resolve defect)
- Finished Good SSCC Label will not have the destination or order type
  If an alternate label is required, additional functionality and hardware will be required
- Staging lanes reserved for the storage of empty crates will not be impacted by this change
- The production process for mince, sequencing or planning rules will not change for mince
- Staffing and equipment requirements (PPE, forklifts etc) will be reviewed with increased volumes, a training plan would be in place as part of standard recruitment processes
- Pallet label requirements can be changed from current state, as long as they are compliant with Coles supplier standards
- Traffic management plans will be updated if there are any layout changes as a result of an updated risk assessment
- Processes associated with manual palletisation are included in any costing processes – bulk palletisation is a method of reducing constraints of a site asset and therefore costing processes should be applied across all finished goods utilising Swisslog automation
- Variable weight production should not have an impact to the solution design

11.3 Analytical tools

This is the design phase. The tool will be developed in upcoming milestones.

11.4 Application of business decision tools

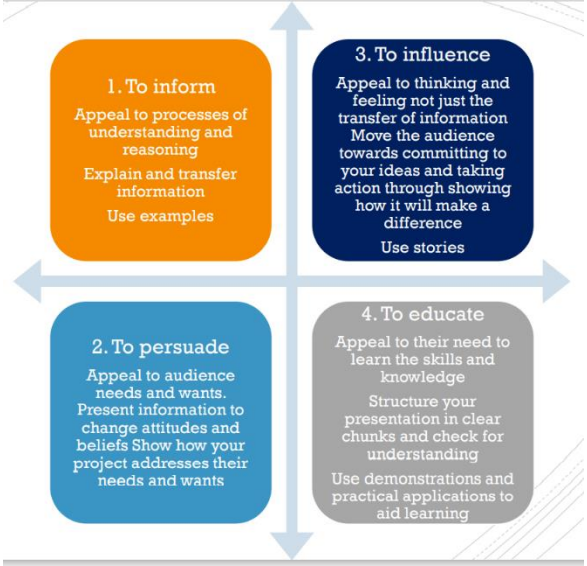
This is the design phase. The benefits of the application of the tool will be realised in upcoming milestones.

11.5 Skills development

Participated in the MLA Networking Meeting at the Kilcoy Innovation Hub on “Pitching to Win” run by the Hargraves Institute.

Present to:

- Inform
- Persuade
- Influence
- Educate



11.6 Participation in digital networks

Participated in Coles internal sessions to learn about the exclusive partnership with Ocado and its unparalleled technology, world leading grocery website, automated fulfilment and home delivery solution.

Ocado will partner with Coles to launch an end-to-end online grocery shopping solution, which includes:

- A significantly enhanced customer experience, supported by Ocado’s proprietary online and mobile grocery ordering applications, known as the Ocado Smart Platform (OSP);
- Two state-of-the-art automated customer fulfilment centres (CFCs), one located each in Melbourne and Sydney; and
- Last-mile routing management technology to optimise delivery efficiency and customer service.

The key benefits of the partnership include an enhanced website that will be available to our customers Australia-wide, a seamless digital customer experience, greater range, improved product

availability and freshness, more regular delivery windows, and increased network capacity at a lower cost to serve. The introduction of the CFCs will also provide a safer working environment for our Coles' team members.

Ocado is a global leader in online grocery retailing and has partnerships in place with some of the world's leading grocery retailers, including Sobey's (Canada), Groupe Casino (France), Kroger (USA) and more recently Marks & Spencer (UK).

Migration to Ocado's website and the development and construction of the CFCs is expected to be completed by the end of the 2023 financial year. To ensure successful implementation, Coles will be supported by a dedicated Ocado team permanently based in Australia.

12 Milestone 13

12.1 Introduction

This is the final report for the Digital Officer role. This milestone will report on the major achievements this role has provided to the Coles RROA business, the lessons learnt on innovation approaches used to identify digital high growth opportunities and successes, failures, and surprises discovered.

12.2 Development of new digital and data approaches

12.2.1OEE Pilot study

- Proved data could be accessed directly from plant equipment without additional hardware
- New insights derived from the data eg operator initiated micro machine pauses were a big contributor to downtime and thus OEE
- Development of a digital dashboard using the same licence free technology that TilliT utilises ie Grafana
- IT firewall rules and enterprise provided hardware created unnecessary roadblocks to the data being able to get to different levels of devices ie office laptops, phones, tablets, offsite computing devices or even office smart screens.
- Testing light-weight OEE solutions with simple 4G connected embedded computing devices with IN/OUT sensors strategically located on the line to provide real-time product counts, quality and downtime data that can easily be shared via a cloud server to any internet connected device including tablets, phones and computers. Simple downtime reason allocation via tablets

12.2.2Puradigm pilot study

- CSIRO study proved the effectiveness of this technology within lab conditions against SARS-CoV-2, DELTA variant
- Led to the development of a stand-alone project investigating the effectiveness of this technology within production environments
- The stand-alone project has been achieving impressive results of 4-5 log reductions of highly aged product bringing them back to a fresh state

- Further studies on surface decontamination for packaging and mould reduction in the HVAC are ongoing
- Additional shelf life enhancing technology is being investigated in conjunction with Puradigm to produce world-first shelf life extension capabilities

12.2.3Vision system

- Proof of concept camera and code for OCR to read pack labels
- Led to an in-house implementation to replace a paper-based system with the vision system to scan and record InBound carton codes

12.2.4TilliT

- Allowed RROA to investigate and develop early versions of the TilliT modules that have now been used for the Faster Fresher Flows and integrations with the RROS Planning, Production and Warehouse systems
- Removed 1 day out of the order, produce, despatch, transfer, in-store cycle which results in fresher produce to customers
- Proved that an open-source, licence free, custom red meat ERP application could be developed for the industry
- Next steps are to roll this out to our partners, such as Coles, SRS, and others, that will then allow the FFF initiate to go national

12.2.5End of Line Optimisations

- Enabled the end of line equipment performance data to be analysed and insights gained which led to direct operational changes that optimised line performance and led to better operator utilisation

12.3 Analytical tools

The following analytical tools have been developed through this role which are currently in use:

- OEE Dashboard
- TilliT Order Planning and Scheduling tools
- RAND Integration and warehouse optimisation tools

12.4 Application of business decision tools

12.4.1OEE Dashboards

- The OEE Dashboard tools have allowed the business to understand the complexity of the enterprise IT environment and how to navigate this to produce a light-weight but useful OEE system

- Insights on operator initiated micro-pauses have allowed the business to focus line speed optimisations, new operator behaviours to keep the line running consistently, inter-machine signals to better coordinate machine stops and starts that have all helped increase OEE by 10-20%

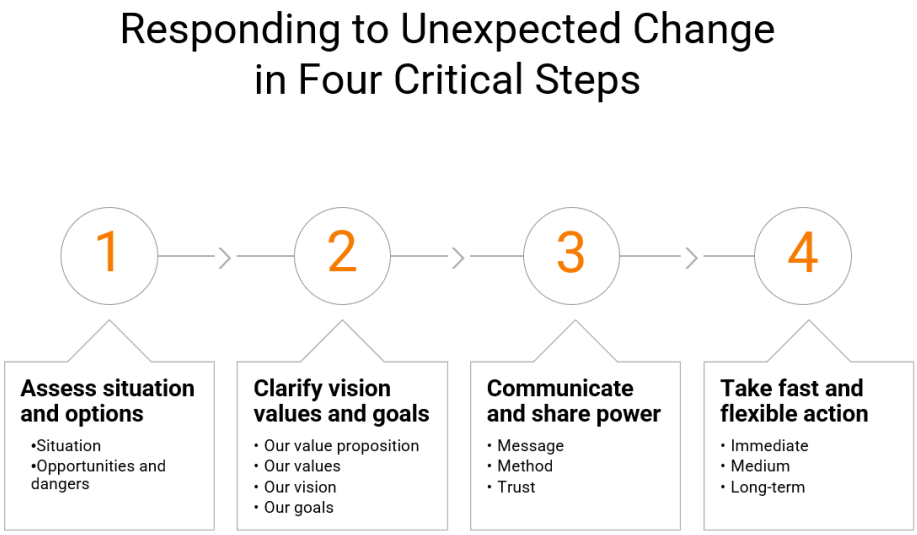
12.4.2TilliT & RAND Integration

The development of the TilliT modules has resulted in the following:

- The removal of 1 day out of the order cycle resulting in fresher food to the consumer
- Visibility of the live production schedule for RROA and Coles
- Optimisation of production, storage and picking resulting in:
    - Less product holding
    - Less capacity breaches
    - Faster flows of product
    - More capacity for future volume growth
- Optimised warehousing at RROA and our 3rd party storage providers
    - Less capacity breaches
    - Lower storage costs
    - More capacity for future growth
- Ability to have a national rollout of the Faster Fresher Flows initiative achieved at RROA, with our contract manufacturers and Coles customer
- Proving that an open-source, license free set of applications can be used to develop a relatively low-cost ERP solution specifically tailored to the Red Meat industry.

12.5 Skills development

Participated in the MLA Networking Meeting to workshop how to respond to unexpected change. Broke up into teams to work through a real-world challenge of Australian red meat being banned due to unsubstantiated foot & mouth disease claims by our export markets.



12.6 Participation in digital networks

Workshop sessions with Nukon, the TilliT developer, Swisslog, the WMS developer and Innova, the MES developers for Tillit, Robot 8 and RAND integrations.

13 Conclusion & recommendations

13.1 Conclusion

The following stages of the project, Milestones 1, 2, 3,4,5,6,7, 8, 9,10,11, 12 & 13 were successfully completed with the following deliverables being achieved:

- Finalise position description & commence recruitment.
- Company / MLA steering committee formed
- Draft RROA Co-Innovation Strategy including RROA's draft digital strategy and collaborative priorities – To be approved by the project steering group.
- Digital program development and implementation.
- Data analysis and insights.
- Development of new digital and data capture approaches.
- Development of analytical tools.
- Application of business decision tools.
- Skills development.
- Participate in digital networks.
  GO/NO GO DECISION
  Progress to demonstrate
- Use of digital insights in innovation portfolio
- Suite of activities commenced that demonstrate future increased red meat demand for RROA's operations and customer channels.
- Quarterly Reports to be submitted to RROA / MLA Steering committee for review and approval.
- Final Report to be submitted to RROA / MLA Steering committee for review and approval.

The current suite of innovation projects have significantly contributed by generating timely and useable information and insights from the significant amounts of data that RROA collects.

The MLA's funding of the Digital Officer role has allowed many projects to be implemented, which otherwise would not have been given support. Coles RROA fully supports the continued support by the MLA for roles such as this, to enable more projects to be scoped, proofs of concepts to the explored and projects to be delivered.

13.2 Recommendations

The project has now been concluded with Milestone 13 having completed the public final report that will be approved by MLA & RROA for industry release. Lessons learnt on innovation approaches used to identify digital high growth opportunities and successes, failures, surprises to be presented.

RROA to deliver one industry workshop and update to RROA & MLA senior management.

14 Appendices

14.1 Coles RROA Collaborative Innovation Strategy

14.2 Coles RROA Digital Transformation Strategy

Coles RROA / MLA Partnership Strategy (2021-2024)

Aspiration: By 2024 Coles will increase red meat consumption across local and export markets by 10%

Expected Values: (1) Export Sales Values doubled by FY24 (2) New Formats: 5% increase by 2024, 10% increase by 2030. (3) Meat Network Productivity: 10% reduction in controllable costs by 2024

HOW

Quality products | **Drive continuous improvement initiatives** | **Data driven insights** | **Deliver cutting edge quality initiatives** | **Consumer focus** | **Industry leading collaboration**

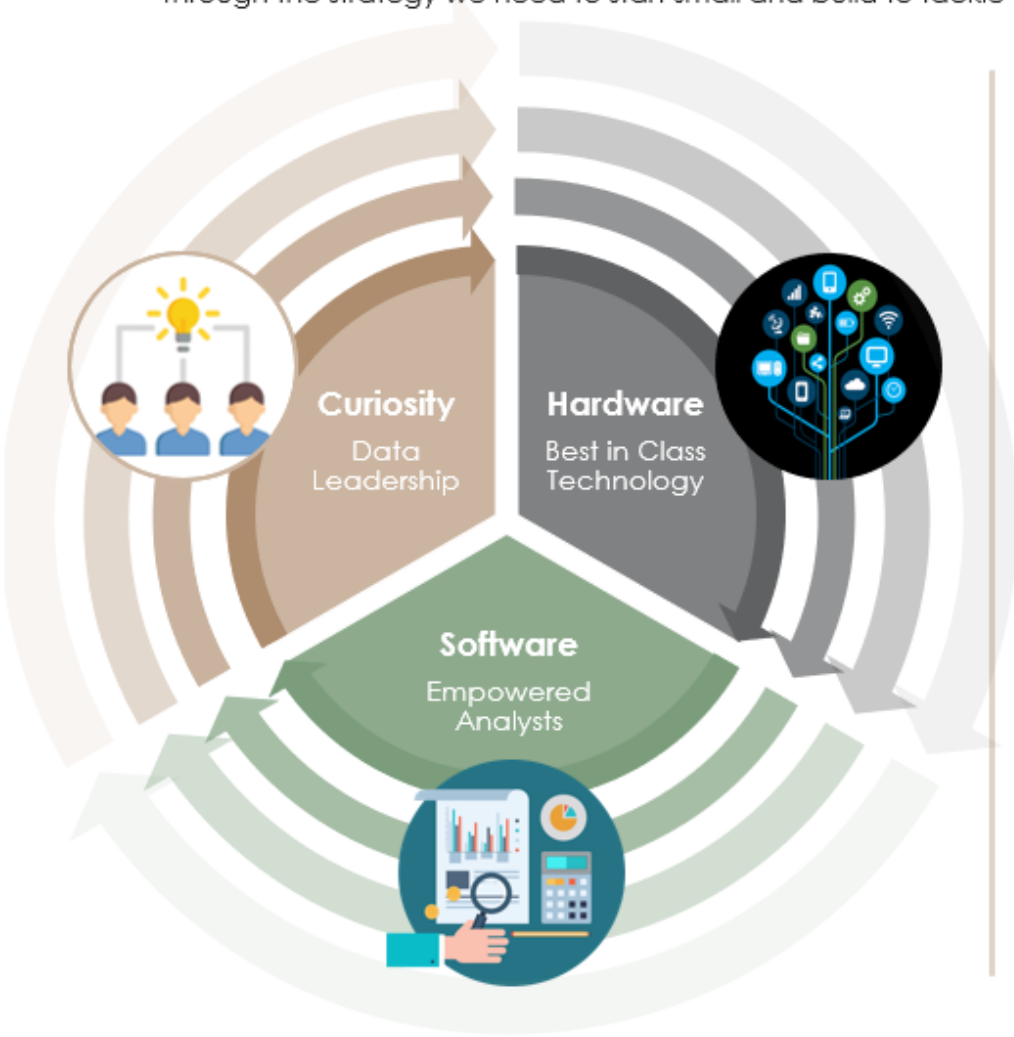
Priorities and Projects by Area

RRM Operational Excellence	Digital Solutions	Supply Chain & Sector Opportunities	Product Innovation	Sustainability – (Coles Internal)
Automation • Line 1 automation to eliminate remedial task around meat handling /transfers • Cobotics, Vision and AI applications • Vision OCR inspection systems • Introduction of Augmented maintenance systems	**Data Driven Decision Making** • Capture and use essential data to inform decisions and operations • New platforms & technologies • Enhanced data visualisation • Develop a data model specific to packaged meat production	**Shelf-life** • Work with suppliers to improve shelf-life • Sustainable or new packaging formats/materials/easy-open • Packaging cold-chain compliance traceability • Develop raw material shelf-life modelling for retail ready meat	**Improve Quality & Compliance** • Continuous sanitising technology • Dynamic, equipment processing flow based shelf-life calculations	**Increase Recyclability** • Transform all meat packaging to fully recyclable by 2025 • Soaker pad elimination • Use of Bio-degradable inks • Increase recycled content of raw materials • Promote recycling of packaging materials using ARL format
Production Metrics • Automated online quality attribute measurement, i.e. fat levels, visual lean, grading, yield, finished pack inspections • Yield Optimisation program	**Data Collaboration** • Enhance data through employee insights • Implement data sharing via cloud, blockchain and other data streaming technologies • Business to business data exchange for meat attributes	**Business Models** • Feedback integration to suppliers and producers – Muddy Boots	**Yield Optimisation** • Development of new technology for fixed-weight on portioning – TVI1600 trials • Portion control – portion number and weight – improving online customer experience	**Minimise Material Usage** • Equipment capable of using recyclable materials • Minimise packaging and waste • Low/no waste Equipment options • Replacement of cardboard shippers with reusable crates for raw material • Lower Gauge packaging films • Printed top film for fewer labels
Lean Implementation • Rapid implementation and scaling of new ideas • Maximise employee engagement of new technologies • Leverage best in class FMCG Lean program implementation • Training programs, RCM programs	**Business Optimisation** • Meat-centric enterprise application development through open-source platforms • Introduction of a BI platform / dashboard and predictive modelling to manage KPI's • Technology to manage animal welfare and maximise yield	**Sector Relationships** • Build sector relationships to improve innovation – Lumachain traceability • Collaboration projects with suppliers and producers – raw materials, packaging and transport	**Market Insight Access** • Adopting product solutions from external sources • Market analysis – economy meat cuts eg end-cuts • Portion optimisation: budget/premium – DSI fat acceptance levels	**Reduce Food Waste** • Packaging to extend freshness and shelf life by using alternate MAP technologies and Vacuum formats • Sales of un-used cuts • Surplus donated to Food Bank/Second Bite
Supply Chain Efficiency • Faster, Fresher Flows • Transport optimisation-double stacking/pallet standardisation • End-to-end optimisation • Robotic truck loading • Improved factory Density Model	**Production Data Analytics** • Inventory optimisation / Analytics / Order shaping / Constraint management • Automate OEE measurement and reporting • Live KPI dashboards in factory • Data mining using deep learning and AI to guide initiatives • Automated workflows for production efficiency improvements • Leverage Industry 4.0	**Guarantee Quality** • Foreign matter/ plastic detection in meat • Paddock to Plate traceability processes (DNA traceback/AI) • Extend shelf life and freshness • Product origin information • MSA Eating Quality index • High speed in line seal integrity checks • Temp sensitive/Shelf-life sensitive embedded devices	**New Product Development** • Value adding products to meet customer needs • Discovering different cuts and uses for the whole animal • Frozen meal solutions • Product life - ageing in bag, optimise / extend shelf life • Ease of use - information on pack/ online • Value add meats that deliver convenience i.e. tenderize etc	**Efficient Use of Utility Resources** • Greenhouse gas reductions • Minimise Refrigeration load by management of room isolations • Rainwater use in building utilities • Building management systems to monitor and control energy use • Solar power/Battery storage

Data Transformation Strategy

Delivering a data transformation strategy relies on building three distinct capabilities by targeted projects aimed at improving technological capability (the hardware), creating a user base to propel us forward (the software) and the leadership to support a data driven approach (the curiosity).

Through the strategy we need to start small and build to tackle the greatest of industry challenges.



Hardware - Build a Strong Foundation

Focused programs on delivering technological capability

- Generate clean and structured data
- Provide visibility and accessibility to data with the right tools
- Implement BPM* capability to manage events

* Business Process Management

Software - Build an Analytical Capability

Supplement new capabilities by embedding a user capability and positive experience

- Upskill team on data visualization and analytics concepts
- Provide bandwidth to team members to deliver "new" projects
- Form working groups to encourage knowledge sharing

Curiosity - Foster a Data Driven Culture

Deliver business outcomes by asking the right questions and act on the right information

- Capture business questions that could be answered with the right data
- Develop a data governance model to encourage the organisation's, creation of data
- Recognise the role of data in improving performance