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DYNAMIC SCHEDULING MODEL FOR A MULTI-SITE SNACK FOOD MANUFACTURER: A SIMIO DIGITAL TWIN IMPLEMENTATION

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ABSTRACT

This case study examines the implementation of a Simio-based digital twin scheduling model for a major Australian snack food manufacturer. The company faced significant scheduling challenges due to complex production constraints, including shared assets, intricate product routing, and the transition between multiple manufacturing sites. The previous Excel-based system could not adequately handle these complexities, resulting in suboptimal resource utilization. The Simio model incorporated flow-based modeling techniques to represent fryer outputs and bagger draws, enabling dynamic scheduling that respected all production constraints while optimizing resource utilization. The implementation resulted in improved planning efficiency, better departmental alignment, enhanced capacity understanding, and successful commissioning of a new manufacturing facility.

INTRODUCTION

The Australian snack food industry is characterized by high product variety, rapid innovation cycles, and complex manufacturing processes. The subject of this case study is a major producer in the Australian market with multiple product types including potato chips, corn chips, and extruded snacks. Products are manufactured in both large sharing bags and smaller multipacks.

The manufacturer operated two Sydney sites and recently completed a new factory to replace the original facilities. This transition presented additional scheduling challenges beyond the complex day-to-day operations.

Prior to this project, scheduling was performed using Excel spreadsheets, creating numerous challenges. The site's complexity, with multiple shared assets, made it difficult to create optimal schedules. The previous tool lacked integration with business systems, making adjustments slow and manual, while true site capacity remained poorly understood.

1 PROBLEM STATEMENT

The manufacturer's scheduling challenges stemmed from several key factors:

- **Complex Asset Sharing:** Products shared critical resources like fryers, seasoning drums, and case packers.
- **Production Balance:** Small and large bags needed careful balancing as fryers must run at constant rates.
- **Innovation Requirements:** Frequent schedule adjustments were needed due to new products and flavors.
- **Multi-Site Coordination:** Transition between facilities required coordinated scheduling.
- **Departmental Silos:** Independent teams complicated scheduling efforts.

The Excel-based approach resulted in suboptimal resource utilization, limited scenario planning, and poor organizational visibility.

2 METHODOLOGY

A comprehensive scheduling model was developed using Simio simulation software to:

- **Integrate with Enterprise Systems:** Connected to the ERP system for automated data inputs.
- **Model Complex Constraints:** Incorporated production constraints including product sequences, flavor sequencing, fryer-bagger balancing, and resource allocation.
- **Enable Dynamic Scheduling:** Allowed schedule manipulation through an intuitive interface.
- **Support Multi-Site Planning:** Included all factories, supporting transition planning.
- **Provide Visibility:** Output tables fed into dashboards throughout the factory.

The model architecture used Simio's flow capabilities to represent the continuous production of chips from fryers to baggers. Orders were released from a demand table and queued until resources became available. Each bagger was modeled as a server linked to flow regulators that calculated the draw from fryers. Selection expressions ensured orders were assigned to appropriate baggers based on product type, flavor sequence, and resource availability.

3 RESULTS AND BENEFITS

The implementation of the Simio scheduling model delivered significant benefits:

- **Improved Planning Efficiency**: Quick schedule adjustments freed time for strategic decisions.
- **Enhanced Capacity Understanding:** Provided clear visibility of factory capacity under different scenarios.
- **Optimized Resource Utilization:** Balanced bag production ensured optimal fryer operation.
- **Scenario Testing:** Supported "what-if" analysis for equipment, maintenance, and volume changes.
- **Successful Site Transition:** Supported volume transition and new facility commissioning.
- **Cross-Functional Alignment:** Shared scheduling view improved team coordination.
- **Enhanced Visibility:** Factory-wide schedule access supported operational reviews.

4 CONCLUSION

This case study demonstrates how simulation-based scheduling addresses complex manufacturing environments with multiple interdependent constraints. The Simio model replaced a manual approach with a dynamic solution that improved planning efficiency, enhanced capacity understanding, and supported a major site transition.

Key success factors included the model's ability to handle complex constraints, enterprise system integration, and user-friendly interface. The visual nature of the Simio model provided insights not possible with the previous approach.