Case Study

Plan, Pasta, and Pandemic

Plans, Pasta, and Pandemics[1]

How to utilize resources in the supply network to rapidly respond to disruptions? There are fluctuating demand and perishable goods to consider.

"I'll take 'Use Your Noodle' for $400."

"This delicate strand is best paired with light sauces and is a favorite of cherubs."

Ravi Khullar looked up from his room service meal to shout, "What is angel hair pasta?" at the TV. Before the game show host could reveal the correct answer, Ravi turned the television off. He was spending a lot of time thinking about pasta these days.

As a senior consultant with the Mitchell & Guthrie Consulting Group, Ravi had become accustomed to immersing himself in his client's business. Shouting answers to random trivia questions in his empty hotel room as a result of that knowledge was a first. He chuckled to himself as he reflected on his latest project and how pasta had come to the forefront of his mind.

Three weeks earlier, Ravi had arrived at the headquarters of Premium Foods, a global Consumer Packaged Goods (CPG) company specializing in cereal, sauce, frozen food, and instant noodles. They had wanted to expand their noodle product line to increase market share in that space. Rather than invest in creating new products on their own, Premium Foods had just announced their intent to acquire Perfect Pasta as it had a solid range of products and an already established customer base. Premium Foods had hired Mitchell & Guthrie Consulting Group, a firm that specializes in supply chain consulting, to assist in assessing Perfect Pasta's supply chain management practices.

Given the importance of supply chain performance to overall company performance, Ravi and his team were initially tasked with analyzing the scope of work necessary to integrate the two supply chains in an optimal way. Now, only weeks into the project, Premium Foods was feeling the impact of a pandemic that had begun earlier that year in Asia and was now quickly reaching a global scale.

That same evening, Andrea De Meo, Premium Foods' Chief Financial Officer, stopped at a big brand retailer on her way home from the office and saw empty shelves where her instant noodles should be. At that moment, the reality of panic buying and the resulting stock outs confronted her – the potential disruptions the leadership team had been discussing were no longer hypothetical.

The next morning, Andrea and the executive team at Premium Foods met with Ravi and his team. A decision was made to shift the focus of the project from longer-term integration goals to how to best manage their supply chains through the current disruption. They wanted the team from Mitchell & Guthrie Consulting Group to assess the agility of both Premium Foods and Perfect Pasta supply chains to

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determine how responsive they would be to the disruption of the pandemic and to identify the strengths and weaknesses of the risk management strategies that were in place.

Grocery Supply Chains

The North American food industry caters to two sectors: the grocery sector and food services (such as restaurants and schools). The two sectors have very different supply chains. A food product starts its journey with ingredients from farms and can involve several subsequent refining and packaging processes. Consumer packaged goods suppliers typically run synchronized and stable supply chains with a steady flow of orders coming in from upstream and going out to the downstream customers. Suppliers hold a limited number of products in inventory, with much of their incoming quantities getting distributed within a short time. Their profits are dependent on the smooth flow of products, as margins are typically small. Consumer food companies are generally challenged by the limited shelf life of their products. Just-in-time manufacturing and delivery has been adopted by many companies to manage this challenge. Food products are usually transported by three modes, depending on the kind of product to be shipped: bulk (ships, barges), containers (rail, trucks) and air freight.

Grocery supply chains sell mostly through "direct store delivery" to retail locations, though the market for home delivery from local distribution warehouses (as well as retail stores) is growing. Distributors are varied in size and product range. For example, small grocery distributors tend to focus on items such as cheese and dairy. However, some products, such as baked goods and beverages, are handled via direct store delivery. These products are not stored in grocery retailer distribution centers.

Some of the biggest manufacturers and distributors of pasta and related products include FreshCourt, al dente, and Barilla. These manufacturers sometimes produce private label goods for large grocery chains (e.g., Kroger, WalMart) as well. In addition to low prices and high quality, distributors offer their grocery chain customers flexibility in packaging and shipping options, Just-in-Time replenishments (the average grocery store replenishes its entire inventory more than 13 times per year). There is also growing pressure for distributors to offer complete traceability (farm to store) for items, especially for protein and produce products. Traceability requirements include not only the provenance (source locations and steps along the supply chain) but quality information (temperature, age, quality checks) all along the way.

The pandemic stimulated increases in demand for many dry and produce items of more than 200% in the space of just a few months. Many grocery supply chains have struggled to keep up with these soaring demands.

Premium Foods

Premium Foods headquarters are in East Hanover, New Jersey (Exhibit 1 provides financial statements for the firm). Their products are sold through their own distribution centers and through 3rd party distributors to both supermarket chains and boutique food shops across North America. Their main product categories are cereal, sauce, frozen food and instant noodles (see Exhibits 2). They operate manufacturing plants and central distribution centers in Montreal, Chicago, East Hanover, and Dallas. Each distribution center planned to hold approximately 1 week of inventory on average throughout the year.

Just two years ago, Premium Foods made the decision to reshore some of its major sources of supply to North America in the hopes that they could respond faster to changing customer demands. Average lead times from North American suppliers were 3 to 5 days, where deliveries from offshore suppliers typically required 3 to 5 weeks. In addition, domestic suppliers enabled a transition to a just-in-time inventory strategy. Supply managers sourced from a limited number of suppliers for each product category in the hope of getting lower prices from vendors.

Ravi interviewed a variety of Premium Foods supply chain planners and learned that they used planning software that enables them to do "concurrent planning." This means that whenever a planner decides to make changes in her area of management, the system automatically mapped that change across all other planning areas in the supply chain. The effect of that change was calculated for every data point that might be affected, and the planner initiating the change was alerted if a variable was impacted beyond a certain threshold (Exhibit 3).

The concurrent planning system provided real-time planning updates, with no delays in the process. Planners from various functional areas could collaborate within the same environment and instantly see the impact of their changes. In contrast, conventional planning approaches often required one planner to edit a spreadsheet and then pass it to the next planner who then made his changes and passed it along to the next planner, etc. The real-time nature of concurrent planning enabled planners to assess multiple what-if scenarios to determine the best plan for a given situation. For example, if Premium Foods were to forecast a significant increase in demand for their instant noodles they could model different methods of meeting that demand and determine which option would deliver the best outcome. This system enabled "event-driven" replanning processes in addition to Premium Foods' normal weekly planning cycle.

Ravi also looked at the processes in place between Premium Foods and their suppliers and distributors. He observed there was a profit-sharing contract in place between Premium Foods and its suppliers, which led to a high degree of cooperation within these partnerships. This collaboration increased Premium Foods planners' visibility into what was happening. For example, a planner could quickly assess current supply against changing demands (both forecasts and actual emerging orders) to identify late orders at risk. Then, she could drill into the order information to assess how much revenue those late orders represented. Using this data, planners could make adjustments to purchasing and production plans in order to avoid unhappy customers and lost revenue (Exhibit 4).

Premium Foods expected to pay $4 billion to acquire Perfect Pasta, an expense that would surely impact their cash reserves and increase their debt.

Perfect Pasta

Perfect Pasta is an owner-operated business headquartered in Toronto, Ontario (financials given in Exhibit 1). Their pasta products are sold through distribution centers to both supermarket chains and boutique food shops across Canada and the Northeastern United States. They have four categories of pasta: two premium pasta lines and two budget friendly lines (Exhibit 2). Their pasta manufacturing plants and central distribution centers are in Toronto, Calgary and Hoboken.

The company distinguished their premium pasta noodles by using flour imported from Verona, Italy. The imported flour presented a higher cost to the company, but it allowed them to stand out from other

products on the shelf and to charge a premium price. Shipping the flour from Italy to Canada and the US usually took about 14 days. The rest of their Perfect Pasta's suppliers were spread across North America to serve their regional plants. Perfect Pasta had a wide network of suppliers who required an average lead time of 3 to 5 days.

Perfect Pasta considered safety stock an important aspect of their risk management strategy and carried the costs associated with higher levels of inventory. Many of their competitors carried about 5 to 6 days of inventory whereas Perfect Pasta typically maintained 15 to 18 days of inventory.

Ravi conducted interviews to understand the functioning of Perfect Pasta's supply chain and mapped their supply chain planning processes (Figure 2). Their monthly planning process was managed through a cascaded network of spreadsheets flowing across the organization. Spreadsheets were embedded in multiple emails and it was challenging to know which email contained the most current version of a spreadsheet. The planning process was concentrated within each department. Consequently, it typically required 1-3 days for a planner to gather the data necessary to formulate her plan before sending it to the next planner. This exchange of files slowed down the process at each step of planning, while potentially injecting errors through data translations and a lack of strict version control.

If errors were identified or key variables did not meet certain thresholds, the process had to be repeated. This could produce cycles of planning going back and forth between multiple planners, multiple times. By the time a plan had been approved, the data that formed the basis of that plan could be quite old, bringing the plan's accuracy and relevance into question.

Ravi spent some time with individual planners to understand their forecasting practices. He was surprised to see them using a moving average model (average of the last three periods) to build their initial forecasts, which they then adjusted based on their past experiences. Ravi also examined the processes in place between Perfect Pasta and its suppliers and distributors to understand how orders were handled and what information was exchanged. He observed that information was tightly controlled; suppliers and distributors were not transparent about their own planning processes with Perfect Pasta. They kept much of their operational data to themselves because of the competition among the suppliers.

From a financial perspective, Perfect Pasta had maintained large cash reserves as the owner felt that cash could protect the business from a variety of challenges. There were risk management strategies in place to deal with disruptions at the plant level but nothing that was on a scale to address a disruption caused by a global pandemic.

The Pandemic Challenge

The global Covid-19 pandemic had begun to drive daily changes to the business landscape for both Premium Foods and Perfect Pasta. Leaders like Andrea at Premium Foods were struggling to manage operations in accordance with shifting guidelines and priorities. Suppliers had been affected by different types of disruptions, including plant shutdowns due to Covid infections among workers. For both companies, availability of ingredients had become limited and procurement from countries outside North America became challenging. At the same time, both companies expected rapid demands from the pandemic that would impact stock levels (Exhibit 2). Perfect Pasta was already seeing demand increases that far outstripped their production capacity (Exhibit 5). Similarly, managers at Premium

Foods were considering whether their just-in-time strategy would be viable for the foreseeable future. Sudden spikes in demand had cleared out their inventory.

In addition, Premium Foods faced an immediate crisis. Ravi spoke with a production planner who was dealing with a shortage of flavoring ingredient due to a supplier plant shut down. The planner envisioned four different potential ways to respond to the shortage:

Option 1. Allow Alternate Supplier Premium Foods had the potential to use an alternate offshore supplier for the flavoring ingredient. The alternate supplier had been used previously by Premium Foods, but in the past two years closer regional suppliers with shorter lead times were preferred in order to support the just-in-time inventory strategy. It would likely take time to begin receiving orders from the alternate supplier, depending on the supplier's available finished goods inventory.

Option 2. Equal share supply All Premium Foods' existing inventory could be divided equally into orders; each customer would receive the same amount (e.g., Premium Foods would ship 100K units to each customer).

Option 3. Fair share supply All Premium Foods' inventory would be divided fairly (proportionally) into orders; all customer orders will receive the same % of their order (e.g., Premium Foods will ship 50% of each order).

Option 4: Prioritize key customer All Premium Foods' inventory would allocated first to orders from their key customers; key customers would receive full orders, whereas non-key customers would receive partial orders filled with remaining inventory after all key customer orders were fulfilled.

Using the company's scenario planning tool, the planner had estimated the impacts of each option on important decision criteria (Exhibit 6). In addition, Perfect Pasta was struggling with their Italian supplier. Border closures and various additions to government guidelines were causing delivery delays.

Going Forward

Ravi expected that disruptions of this sort would continue to arise as the pandemic grew. He strongly believed that the best ways that the Mitchell & Guthrie Consulting Group could support their client would be by offering insightful analysis and recommendations to address short term challenges in addition to developing a longer-term supply chain strategy for Premium Foods. He knew that the role Perfect Pasta would play in Premium Foods' future was now an open question.

Exhibit 1: Income and balance sheets for Premium Foods and Perfect Pasta (in millions of dollars)

	Premium Foods				Perfect Pasta			
	2016	2017	2018	2019	2016	2017	2018	2019
Net sales	5,338	5,713	5,690	5,875	2,288	2,290	2,350	2,250
Cost of products sold	2,944	3,077	3,205	3,064	1,262	1,312	1,392	1,364
Marketing, research and administrative expenses	1,518	1,785	1,700	1,835	651	652	645	650
Operating income	876	851	785	976	375	326	313	236
Interest expense	91	103	115	89	39	44	50	40
Other income, net	33	43	98	45	14	17	15	24
Earnings Before Income tax	752	705	572	842	322	265	248	172
Income tax	291	285	246	297	125	122	107	132
Net Earnings	461	420	326	545	197	143	141	40
Balance Sheet	2016	2017	2018	2019	2016	2017	2018	2019
Property, plant and equipment	2035	2200	2200	2250	758	760	765	868
Other fixed assets	1138	1492	1204	1936	488	636	640	873
Total fixed assets	3,173	3,692	3,404	4,186	1,246	1,396	1,405	1,741
Inventory	200	257	217	230	300	298	267	250
Receivables	412	416	738	728	287	312	310	324
Cash and securities	711	525	338	529	400	410	420	400
Total current assets	1,323	1,198	1,293	1,487	987	1,020	997	974
Total assets	4,496	4,890	4,697	5,673	2,233	2,416	2,402	2,715
Owners' equity	1,688	1,757	1,741	2,001	954	1,036	910	1,221
Long-term liabilities	923	1,364	1,420	1,635	500	550	622	650
Other non-current liabilities	378	330	133	211	200	210	240	231
Total non-current liabilities	1,301	1,694	1,553	1,846	700	760	862	881
Short-term liabilities	1,135	1,107	1,071	1,416	404	440	445	420
Trade payables	372	332	332	410	174	180	185	193
Total current liabilities	1,507	1,439	1,403	1,826	578	620	630	613
Total equity and liabilities	4,496	4,890	4,697	5,673	2,232	2,416	2,402	2,715

Exhibit 2: Product SKUs

	Product Group	# of SKUs	% of Total Sales	Forecasted Increase in Demand
Premium Foods	Cereals	20	6%	40%
	Instant Noodles	12	28%	100%
	Sauces	30	18%	60%
	Frozen Food	45	48%	20%
Perfect Pasta	Premium line	20	63%	25%
	Economy line	45	37%	40%

Exhibit 3: Concurrent and sequential planning processes

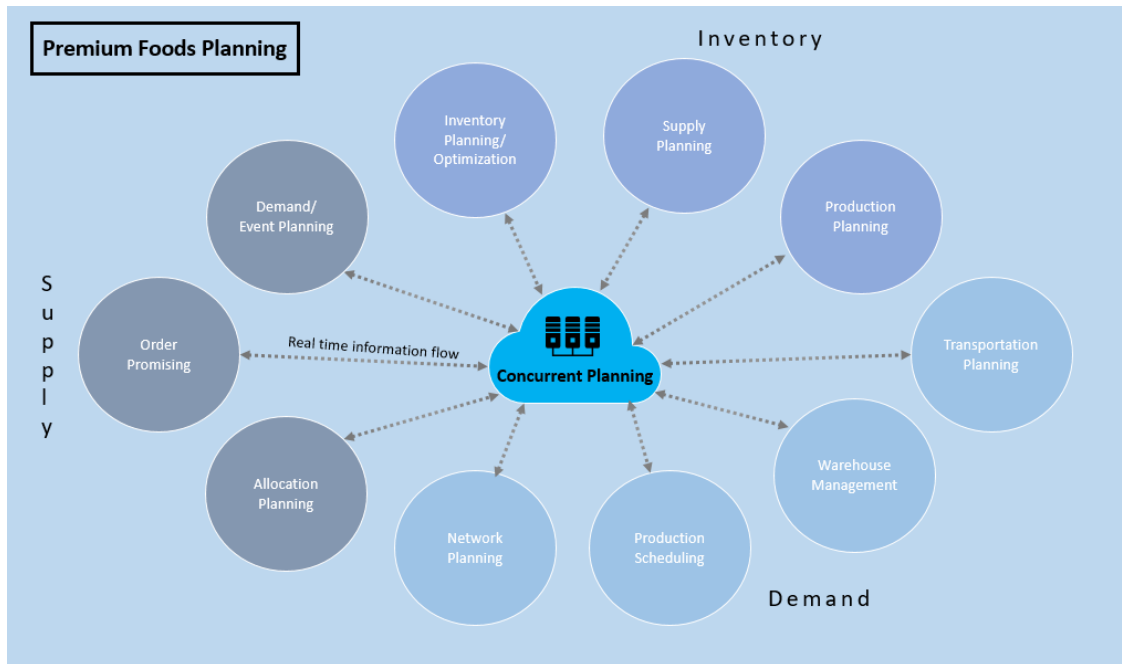**Premium Foods concurrent planning process**

Exhibit 3 (continued): Concurrent and sequential planning processes
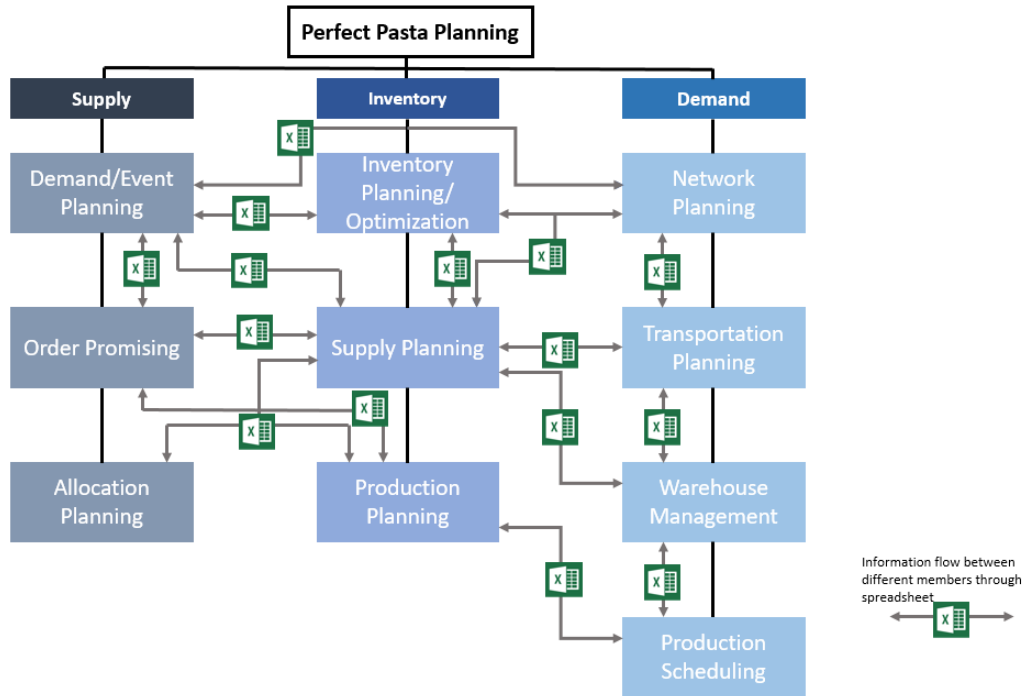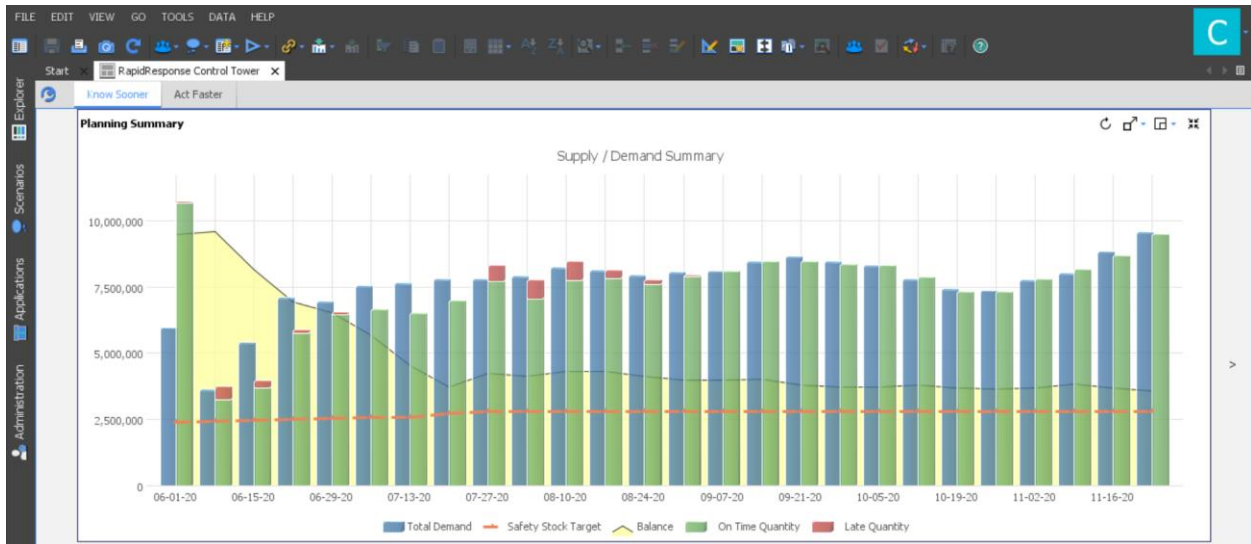
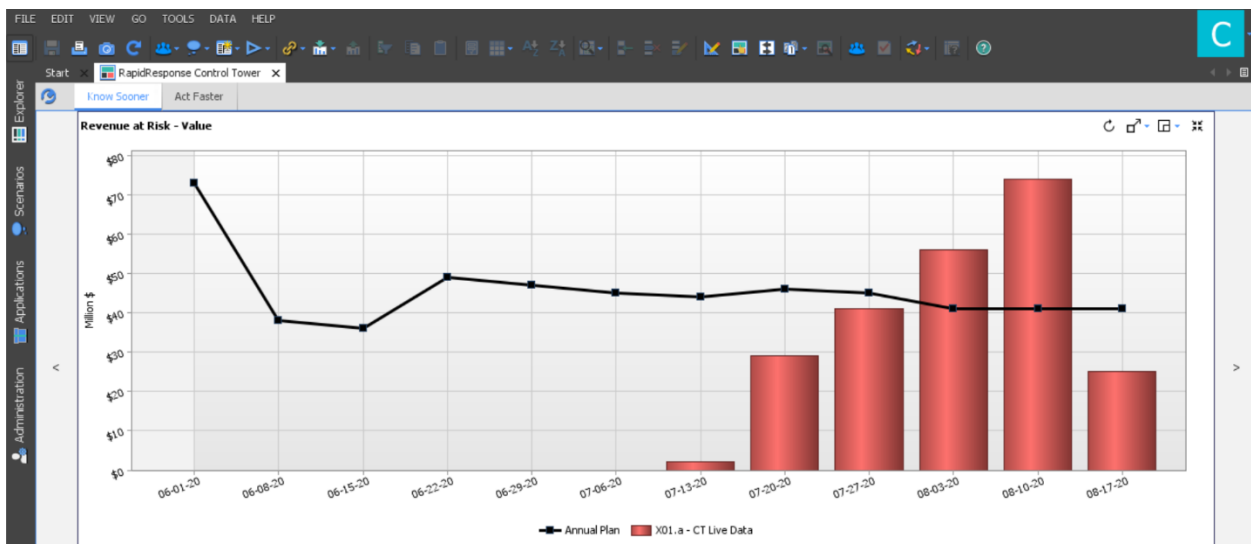**Perfect Pasta sequential planning process**

Exhibit 4: Real-time planning tools at Premium Foods

Current supply and demand planning view

Revenue at risk (revenue from current open orders and forecast at risk of shipping later than the order due date)

Note the constant increase in the nominal value of the revenue at risk. This indicates that the number of forecasted open orders at risk of shipping after the due date is constantly increasing.

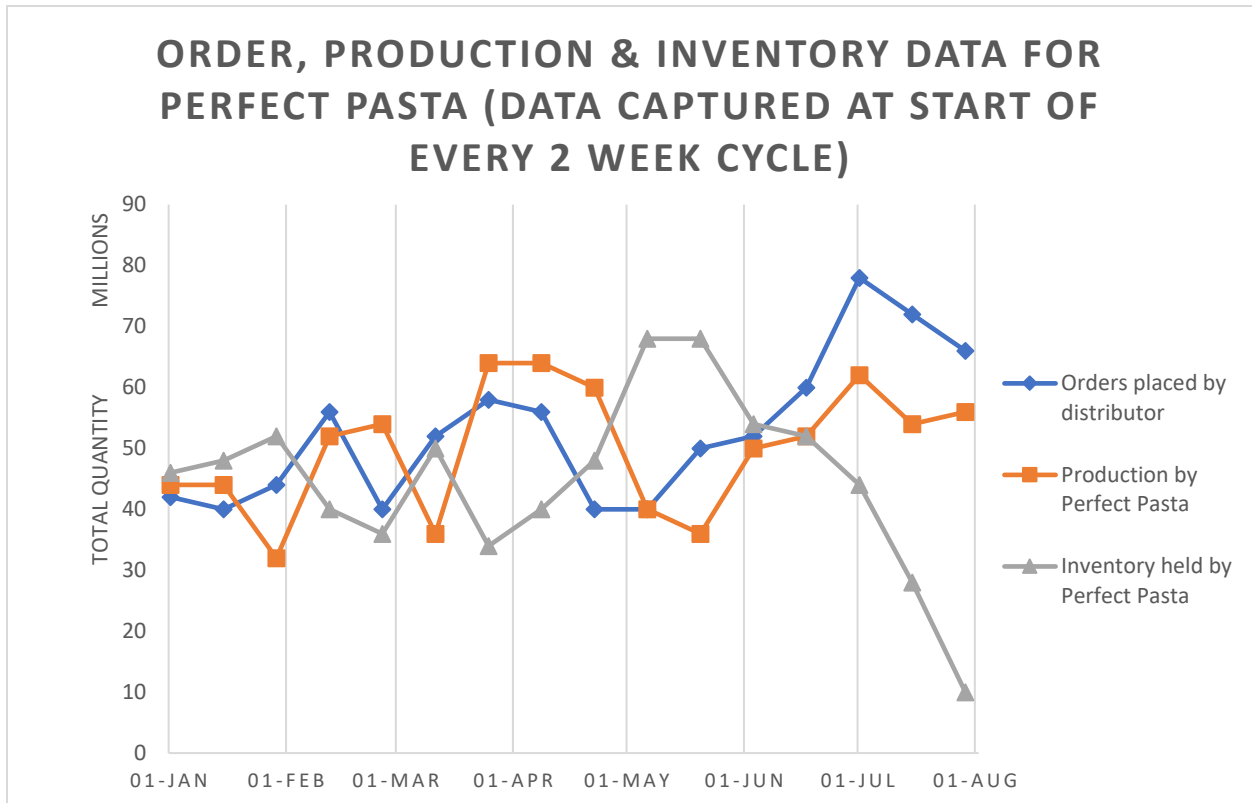**Exhibit 5: Perfect Pasta order, demand, and inventory trends**

ORDER, PRODUCTION & INVENTORY DATA FOR PERFECT PASTA (DATA CAPTURED AT START OF EVERY 2 WEEK CYCLE)

Legend:
- Orders placed by distributor
- Production by Perfect Pasta
- Inventory held by Perfect Pasta

Exhibit 6: Premium Foods planning scorecard

Metric	Weight	Target	Allow Alternate Supplier Expected Result	Equalshare Supply Expected Result	Fairshare Supply Expected Result	Prioritize Key Customers Expected Result
Ontime Revenue	14.3%	$5,850,916,928	$5,865,245,455	$5,755,316,069	$5,712,257,524	$5,831,534,664
Late Revenue	14.3%	$245,743,651	$175,266,455	$341,344,510	$384,403,055	$265,125,915
Gross Margin	28.6%	44.17%	40.49%	44.10%	47.39%	44.51%
Cost of Goods Sold	14.3%	$3,403,480,661	$3,594,695,276	$3,407,787,205	$3,207,699,174	$3,383,066,051
Late Order Count	14.3%	500	120	543	1000	548
CO2 Consumption	7.1%	7,098,113,400	8,235,622,355	6,526,584,855	6,985,245,551	7,375,804,200
Plastics Consumption	7.1%	55,086,132	63,264,265	54,075,623	54,075,623	57,795,750

"Weight" represents the relative priority placed on each metric.

Metric Definitions:

Ontime Revenue: Estimated total revenue generated from customer orders delivered on time

Late Revenue: Estimated total revenue generated from customer orders delivered late, also accounting for lost sales

Gross Margin Percentage: Standard gross margin percentage (1 – COGS/SALES) for all independent demands

Cost of Goods Sold: Planned Cost of Goods Sold for all independent demands, including forecasts, available within the planning horizon

Late Order Count: Estimated number of customers who will receive orders delivered late

CO2 Consumption: Estimated kilograms of CO_2 that will be emitted in operations

Plastics Consumption: Estimated kilograms of plastic that will be used in operations

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