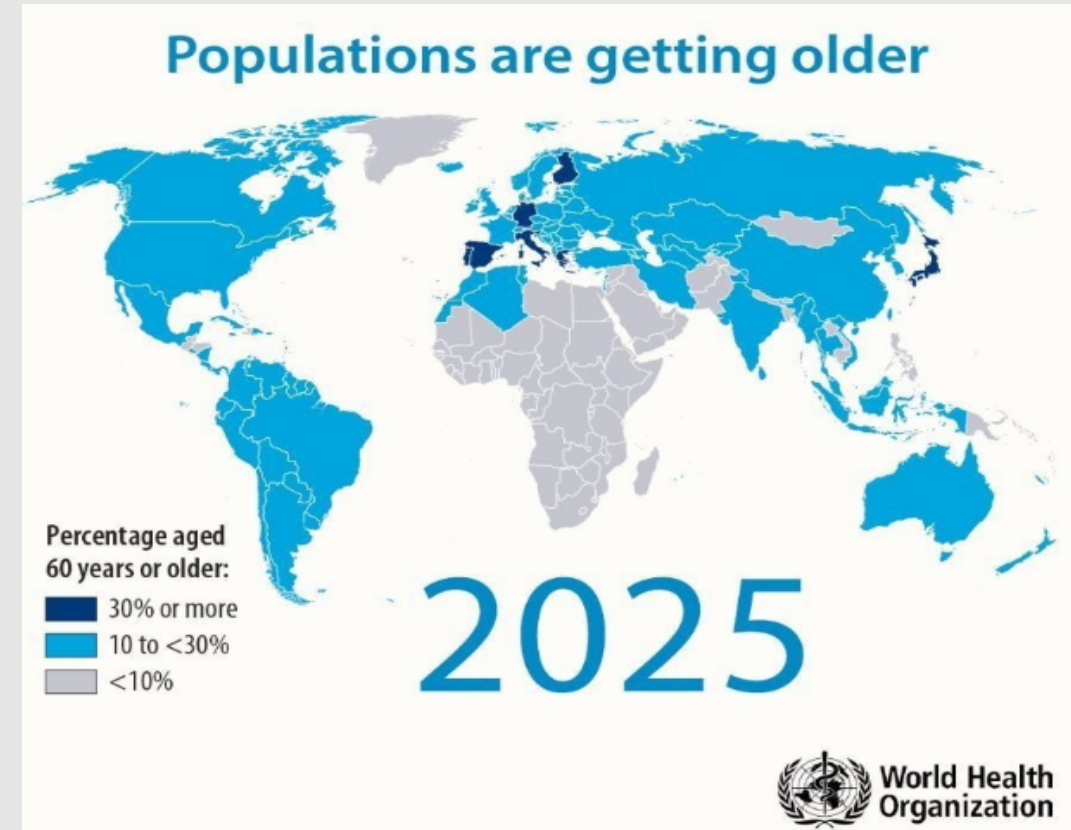# Optimal Supply Chain Operating Strategies by Replenishment Stream

Mary Kate Agnes Gorman

The Aging Population

- In 2011, Unicharm, the largest provider of sanitary products in Japan, reported selling more adult diapers than baby diapers for the first time in history, the CEO reporting that *"the elderly would become the company's target of consumption"* (Alpher, Yamaguchi).

- Dr. Joseph Coughlin at the MIT AgeLab predicts that by 2026, the same will have taken place in the United States.

- The MIT AgeLab predicts that more than one in every four Americans will be over age 65 by 2030.

- The Boston Consulting group estimates that less than 15% of global companies have established business strategies to meet the needs of this older population (Grey Market).

Populations are getting older

Percentage aged 60 years or older:
- 30% or more
- 10 to <30%
- <10%

2025

World Health Organization

The Aging Population – Is Female

- Retailers must recognize that this age demographic is disproportionately female.

- In the United States, for those aged 65 – 69, there are 96 men to every 100 women, with this number dropping to 60 men to every 100 women for those aged 85 and over.

- Women provide a disproportionate share of elder care in the United States (66% of the informal caregiver market).

- To properly evaluate the purchasing patterns of a sensitive product targeted at treating incontinence, it is necessary to understand the purchasing patterns and consumer behavior of those doing the majority of the purchasing: Women.
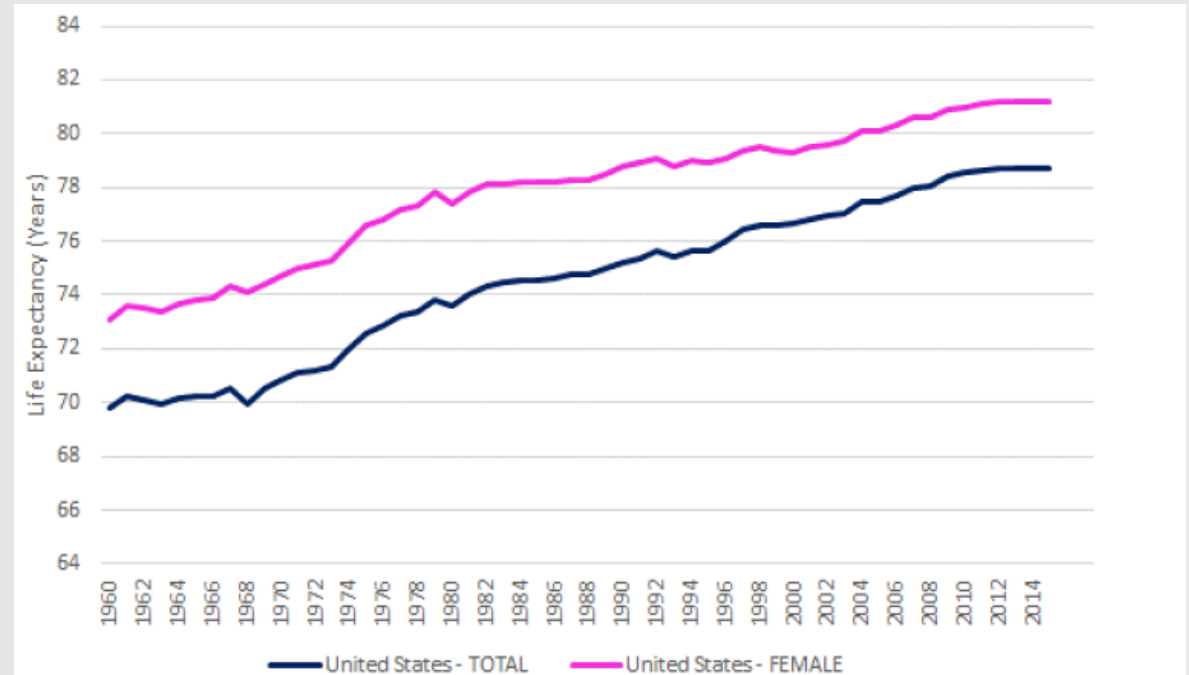

Figure 1.1.1 United States Life Expectancy From Birth (Source: US Census).

Why Incontinence?

- The CDC recently reported that more than half of adults aged 65 and older suffer from the disease of incontinence, with nearly 50 percent of women and 25 percent of men suffering from bladder incontinence (Gorina, 2004).

- The CDC estimates that the average cost for bowel incontinence related personal expenses totals $4,100 annually, valuing the total addressable market in the United States at $19.5 billion.

- CNBC estimates that, in the United States, the average monthly take home pay for a 65+ year old woman is $3,200, making incontinence spend roughly 11% of total monthly pay.

- It is estimated that the average elderly person spends 34 percent of their take home pay on medical expenses, making that spent on incontinence roughly one-third of an elderly female's annual medical budget.
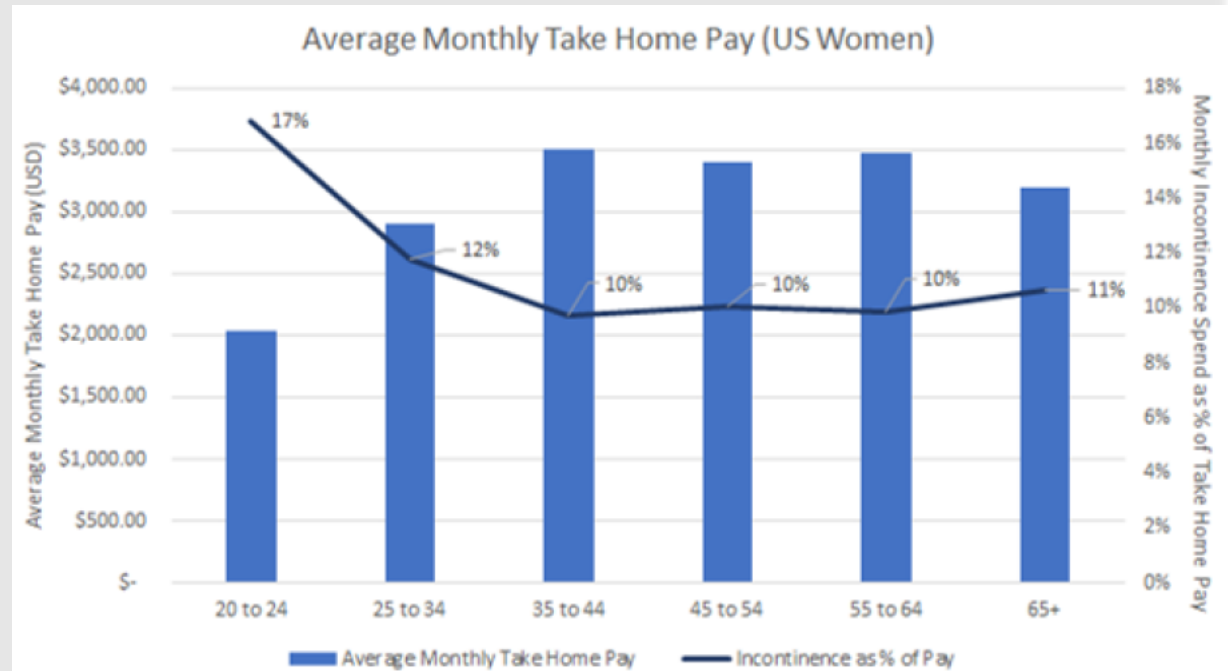

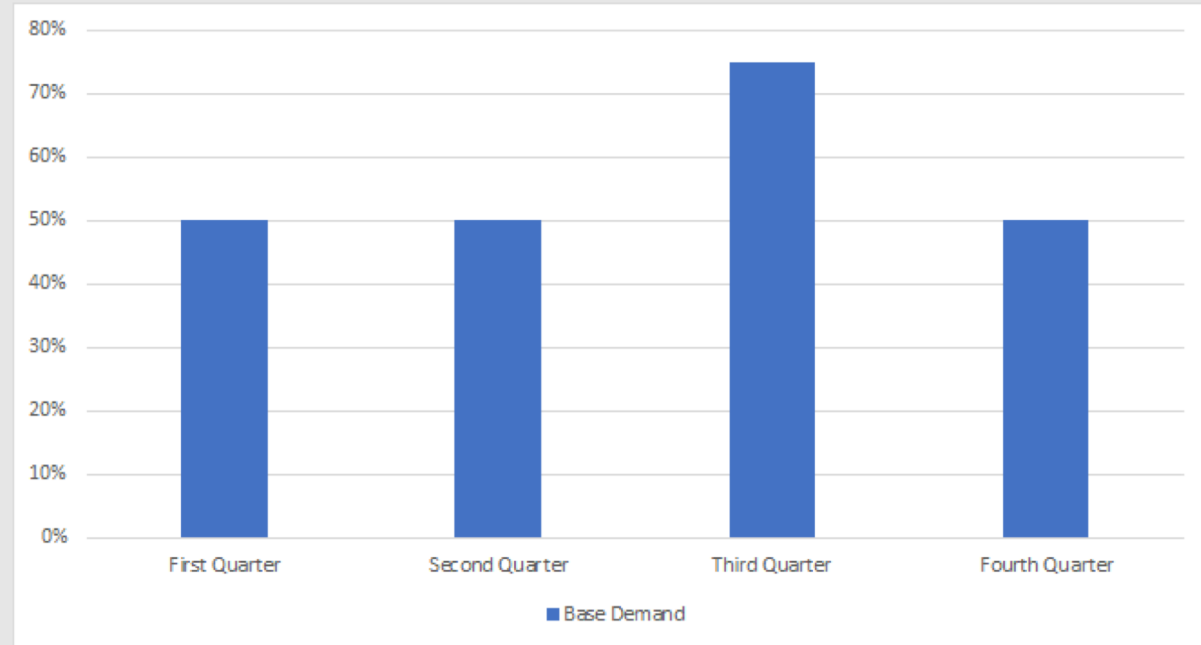**Figure 1.2.1** Average Monthly Take Home Pay – US Women. (Source: CNBC).

A consumer packaged goods company (the "Company") manufactures and distributes consumer packaged goods including products for feminine care and incontinence.

The Company has identified five unique replenishment streams:

A Consumer Packaged Goods Company ("CPG") has identified the following replenishment streams:

1. **Base Demand** – Everyday movement of product, characterized by a very stable demand signal (typically ~80% of product movement is characterized by this profile).

Note: Image does not represent actual company data or trends, for demonstrative purposes only.
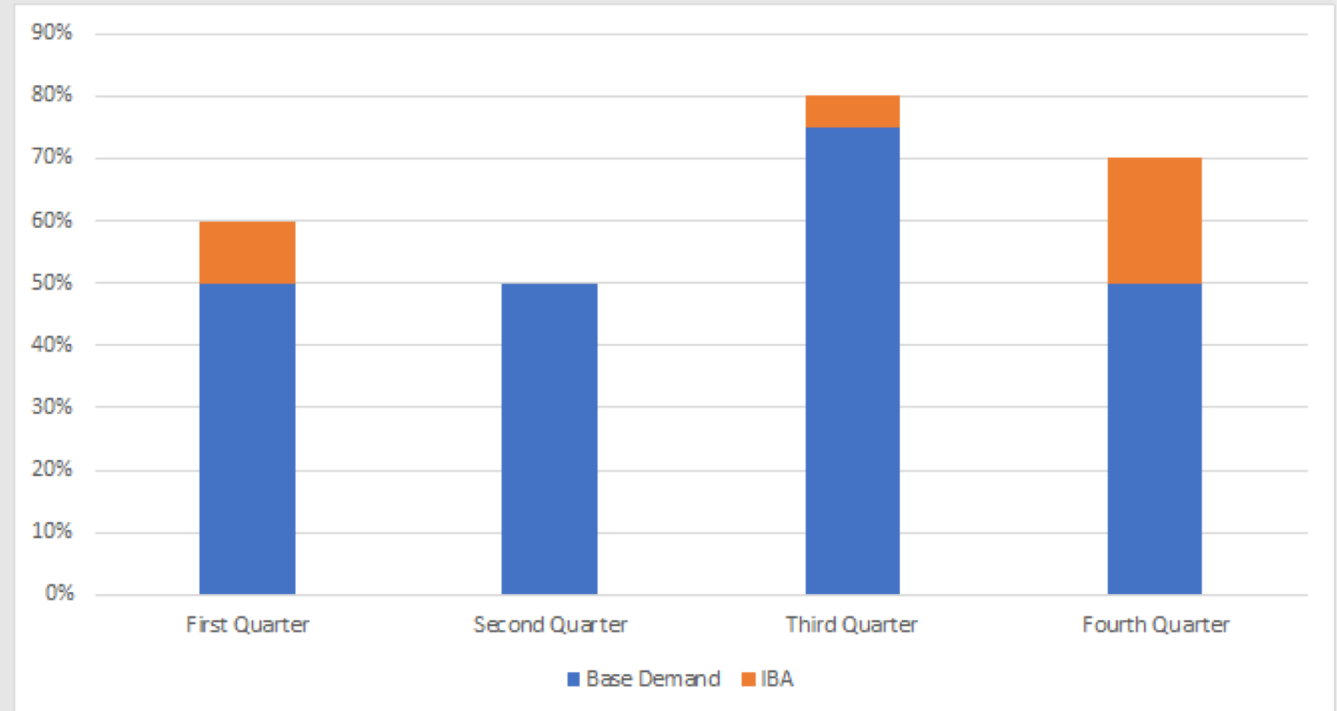
A Consumer Packaged Goods Company ("CPG") has identified the following replenishment streams:

2. Incremental Business Activities – Incremental Business Activities ("IBAs") are characterized by unplanned demand spikes and occur with very little notice.

These activities are caused by events in the broader market and the actions of competitors.

There is typically no early warning signal for this replenishment stream; however, the Company is typically able to respond to this demand signal within two to four weeks.
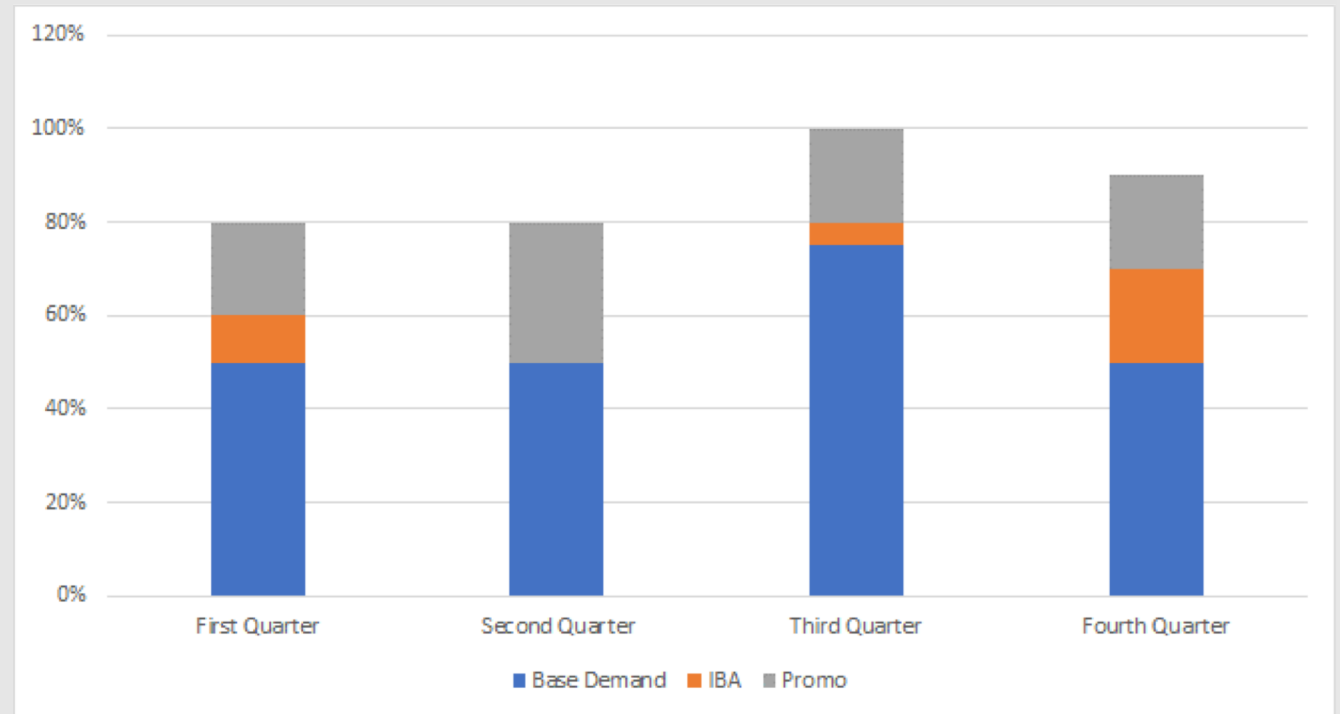

Note: Image does not represent actual company data or trends, for demonstrative purposes only.

A Consumer Packaged Goods Company ("CPG") has identified the following replenishment streams:

3. Promotional Activity – Planned promotional activities, such as advertisements in retail stores, drive demand spikes in both shipments and sales.

The Company coordinates with customers to gather demand planning information four to six weeks in advance.

Note: Image does not represent actual company data or trends, for demonstrative purposes only.
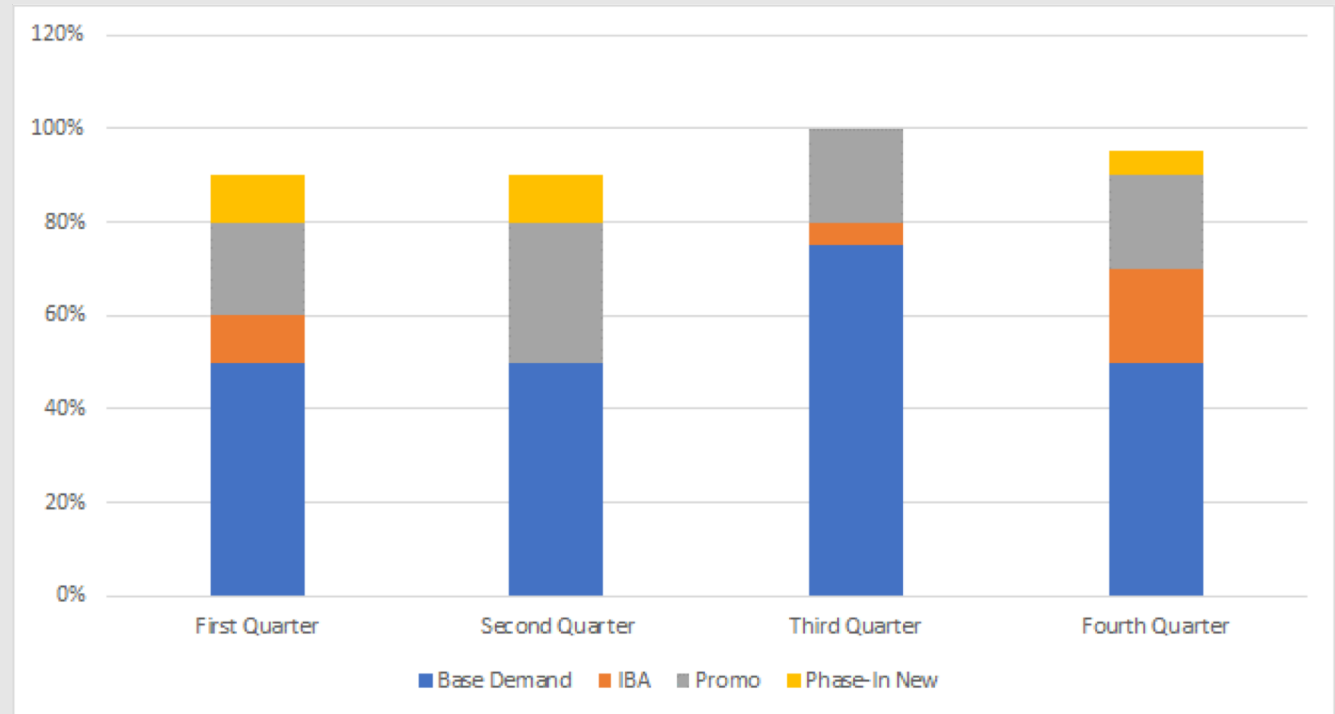
A Consumer Packaged Goods Company ("CPG") has identified the following replenishment streams:

4. New Initiatives – Phase in New – New stock keeping units ("SKUs") brought to market for the first time.

The Company defines a new SKU as either an entirely new product or as an iteration of an existing product but with improved features.

There are very specific demand signals (i.e. the customer launch plan) for this replenishment stream.

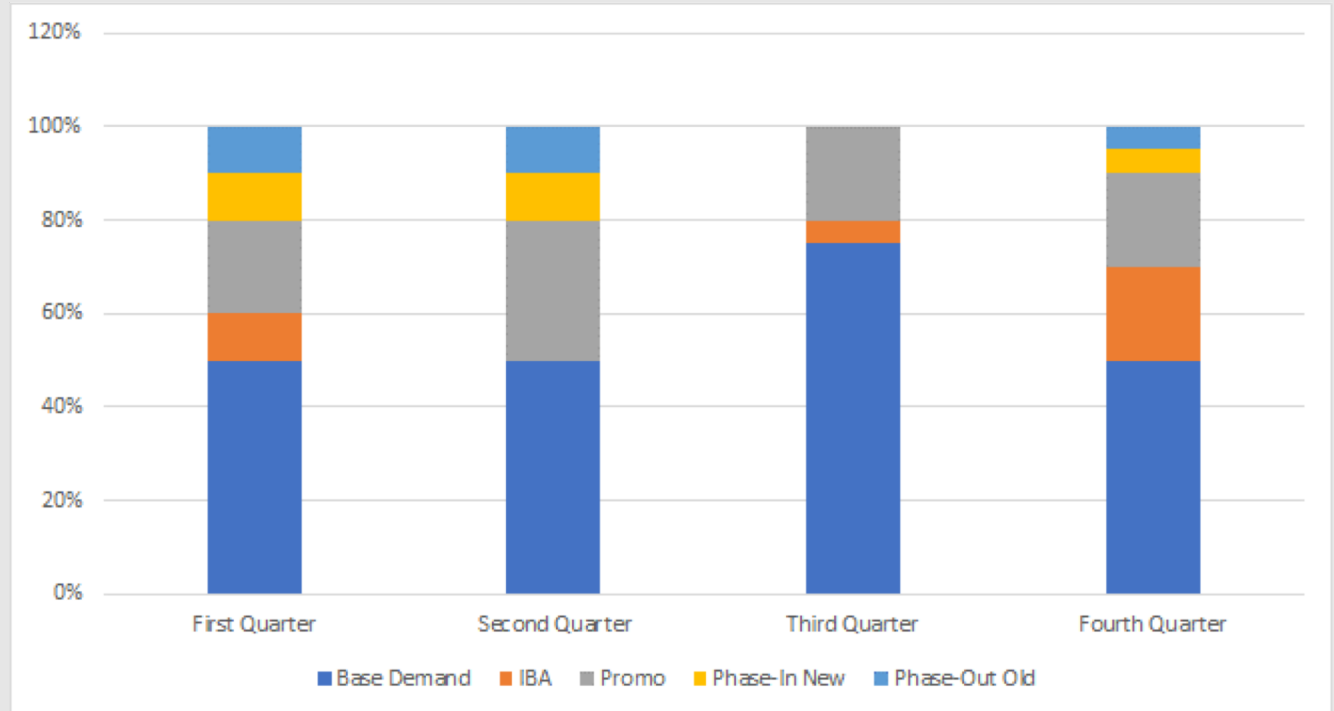Phase-In of New Initiatives typically last for three months and then this demand transitions to Base.

Note: Image does not represent actual company data or trends, for demonstrative purposes only.

A Consumer Packaged Goods Company ("CPG") has identified the following replenishment streams:

5. New Initiatives – Phase out Old – For Phase-Out Old Initiatives, the Company is typically working to replace a historic product (Phase Out demand is characterized by heavy discounting activity of the product being phased out).

Phase Out typically occurs two months prior to the end of scheduled ship date in the calendar.

Note: Image does not represent actual company data or trends, for demonstrative purposes only.
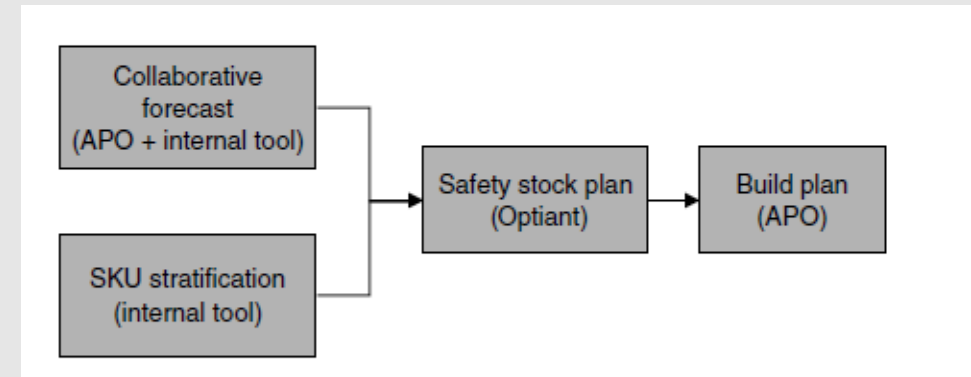
For each of these replenishment streams, the Company wishes to confirm whether or not there is an operational and/or financial benefit to differentiate the supply chain by the five replenishment streams identified or by some hybrid.

For this project, the rationale to analyze feminine care data to inform demand patterns for incontinence products is to understand and analyze the buying patterns of the female consumer (i.e. frequency of purchase and purchase channel preference) the anticipated purchaser.

Literature Review

- Several Fortune 500 companies have identified similar demand replenishment streams and have leveraged Optiant PowerChain Software to improve planning processes across these demand profiles.

- Base Demand, Phase In/Out, and Promotional replenishment streams are similar in nature whilst IBAs are often the result of unrelated, competitive events.

- It may not be a cost-effective solution to offer each customer and product the same level of service.

- SKU and product segmentation are powerful tools that can be leveraged to determine which customers and products should receive which levels of service as a means to increase cash flow and reduce operating costs.

Optiant PowerChain software is a tool used by many Fortune 500 companies for demand planning purposes across different replenishment streams.

Data and Methodology:

Data - The Company provided four million records of data for years 2016 and 2017 for the North American market (United States and Canada). This data is broken up by SKU by customer, shipment date, ship from location, amount ordered, and amount shipped.

Data Manipulation. The customer demand data file contained orders and shipments broken out by SKU, customer, replenishment stream, and day for 2016 and 2017. At the Company, all relevant inventory and planning analysis at the execution level is done using internal metrics for ease of comparison across business units. By having a standardized unit of comparison across business units, the Company can compare metrics like profitability across seemingly dissimilar product categories.

Customer Service level. The Company monitors case fill rate, or CFR, as a measure of end customer satisfaction. The Company is targeting CFR levels close to 1 for all SKUs for the top customers. In the customer data file, a new column on CFR was added by dividing shipments by orders. A CFR ratio of less than 1 represents situations where the Company shipped less than what the customer ordered.

Data Analysis & Visualization. To analyze trends and patterns in data, this project leveraged Tableau and Excel to visualize data and present findings in elegant, articulate graphics.

Primary Research. To better inform research, interviews with both industry and Company experts were conducted to better understand how both the Company and similar companies have approached the question of whether or not replenishment streams should be treated differently based on their demand characteristics.

Inventory Strategy – Pareto Analysis

- Adult incontinence is the Company's fastest growing product segment.

- The Company offers incontinence products under three main categories: Segment A, Segment B, and Segment C.

- This segmentation identified which SKUs contributed the most (Power SKUs) and least (Bottom SKUs) to overall incontinence product volume, serving as a roadmap for further analysis.

- From this analysis, three SKUS drive ~70% of sales volume across all incontinence product lines (Segment A, Segment B, and Segment C) in both 2016 and 2017.

- Product sizes in incontinence are trending towards bigger sizes and longer pads given the high incidence of obesity in the US (46 – 67% of obese women are incontinent).
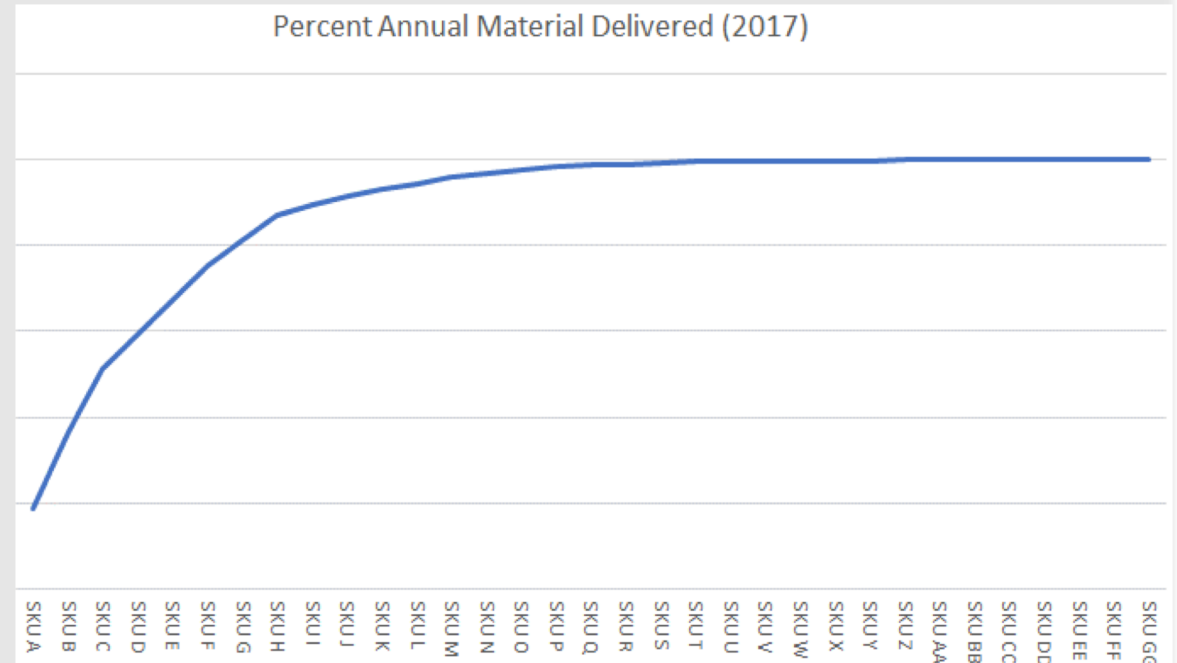

Percent Annual Material Delivered (2017)

Fig 1. *Three SKUs drive ~70% of sales volume across all incontinence product lines. These SKUs represent Segment A sold to top accounts.*

Planning Strategy – IBA & Phase In

- Incontinence has a higher incidence of IBAs than traditional feminine care.

- IBAs present a challenge from a demand forecasting perspective given that there is very little lead time (typically only 2-4 weeks) for this type of business activity.

- Unexpected shipments, the result of an IBA, cause supply chain disruptions that result in CFR values <1.

- Incontinence also has a high incidence of Phase-In.

- Given that Phase-In are typically introduced biannually, from a planning perspective, this high incidence of Phase-In likely contributes to low CFR levels for Customer A.
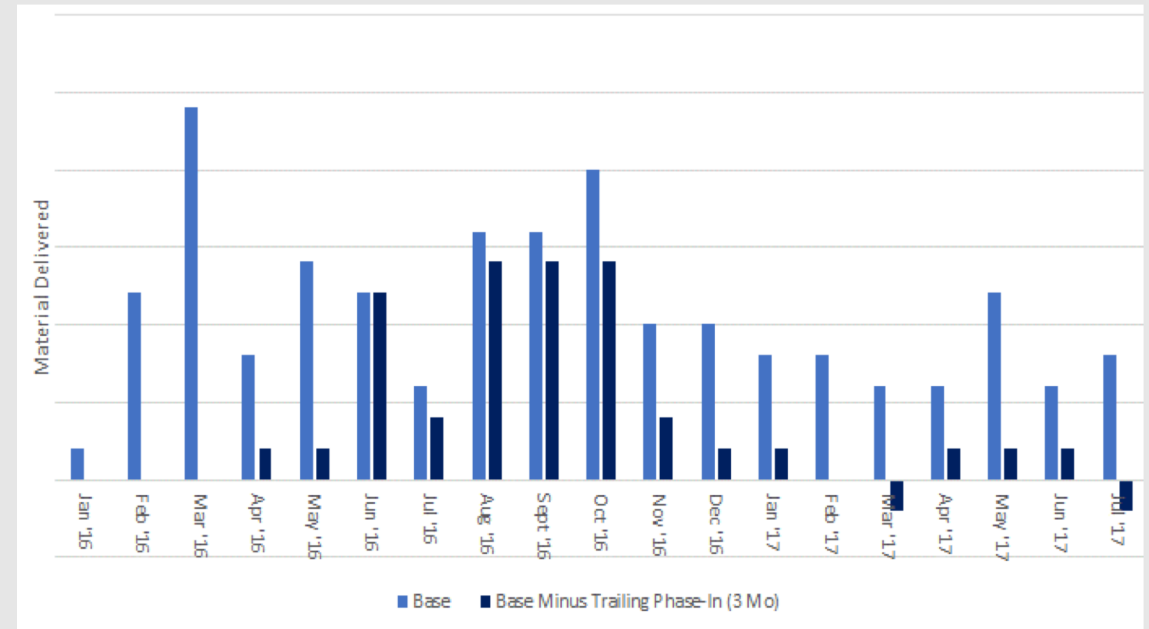

Fig 2. *Phase-In becomes Base Demand after three months and must be accounted for in forward-looking Base Demand forecasts.*

Distribution Strategy

- The Company recently adopted a mixing center strategy to give customers more flexibility when placing orders (i.e. instead of placing orders for a single product type by the truckload that would ship directly from the manufacturing plant, customers now place orders that mix and match commodities to their needs and ship from a centralized mixing center).

- Feminine care and incontinence are typically last on truck for mixed loads because they are the lightest products and, as a result, also the first thing to come off the truck.

- The Company tracks and diagnoses root causes for low CFR on a month-to-month basis.

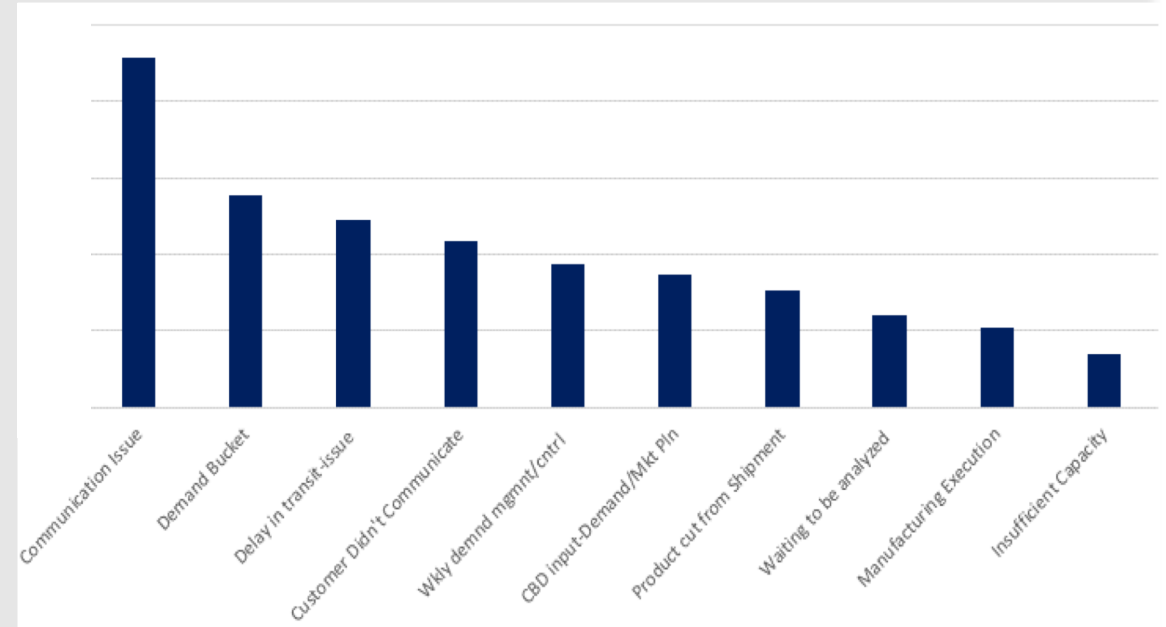- Highest cause of low CFR is either communication or distribution related.

Fig 3. *Root cause analysis for low CFR for the months July 2017 through October 2017.*

Key Insights

- Segmenting inventory by both product category and SKU into high, medium, and low volume categories is more practical from a strategic inventory management perspective than segmenting by replenishment stream.

- Initiative Phase-In activity must be executed in a consistent, organized manner to ensure that this demand is properly incorporated into the forward-looking Base Demand forecast after the product launch phase expires.

- Simple events, such as product being left off the truck in a cube or weigh out event, can disproportionately impact end customer service level for lighter weight CPGs overtime.

Questions

References.

Centers for Disease Control & Prevention, 2014.

Neale and Willems: Managing Inventory in Supply Chains with Nonstationary Demand Interfaces 39(5), pp. 388–399, ©2009 INFORMS

"The Grey Market", The Economist, April 9, 2016.