INVENTORY REDUCTION THROUGH BUSINESS RE-ENGINEERING & INDUSTRY BEST PRACTICE

NUS National University of Singapore

Schlumberger

Industrial & Systems Engineering, IE3100R System Design Project

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Problem Definition & Approach

COMPANY OVERVIEW

Schlumberger World's leading company in Oil & Gas industry

Provide widest range of products & services
95% of oil & gas operations rely on Artificial Lift

Full control of its supply chain
Global presence in 6 regions in the world
Provides 70,000 products across different levels

PROBLEM STATEMENT

High Inventory Level
High Inventory Cost

Poor inventory management:
- No standardized methodology
- Misunderstanding of inventory concepts
- Sub-optimized inventory policies

Manual process -- Inefficient and incur human error

PROJECT OBJECTIVE

Reduce Inventory Level
Reduce Inventory Cost

Holistic inventory management:
- Develop standardized methodology
- Revise inventory concepts
- Re-design inventory polices

Process automation – Improve efficiency and reduce error

Implementation Detail & Result Analysis

01 STEP — DATA PROCESSING

We aim to analyze the raw data. This is to ensure the data can be properly used for further method development and policy design. We focus on dealing with Bullwhip effect and Data aggregation.

24 months → **Last 12 months**

Location level → **Regional level**
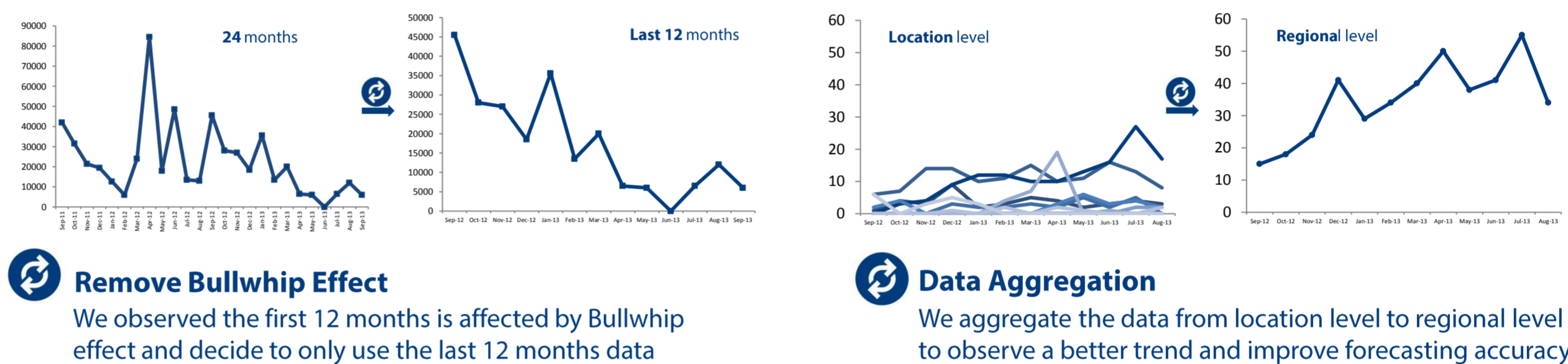
Remove Bullwhip Effect
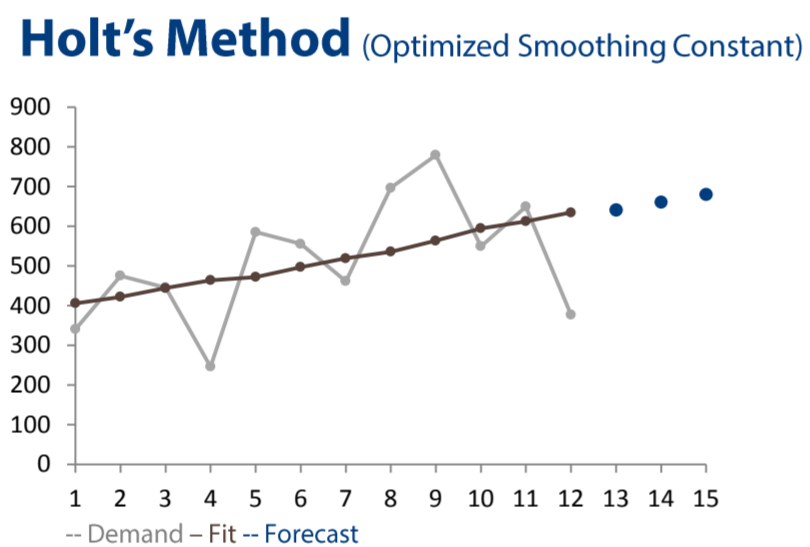We observed the first 12 months is affected by Bullwhip effect and decide to only use the last 12 months data

Data Aggregation
We aggregate the data from location level to regional level to observe a better trend and improve forecasting accuracy

02 STEP — DEMAND FORECASTING

Improvement
- **Suitability:** Correctly capture the **level & trend**
- **Effectiveness:** **26%** Reduction in MAD and **23%** Reduction in $\sqrt{MSE}$

Proposed Approach
Holt's Method (Optimized Smoothing Constant)
— Demand — Fit — Forecast

Tried

Current Approach
Simple Moving Average
— Demand — Fit — Forecast
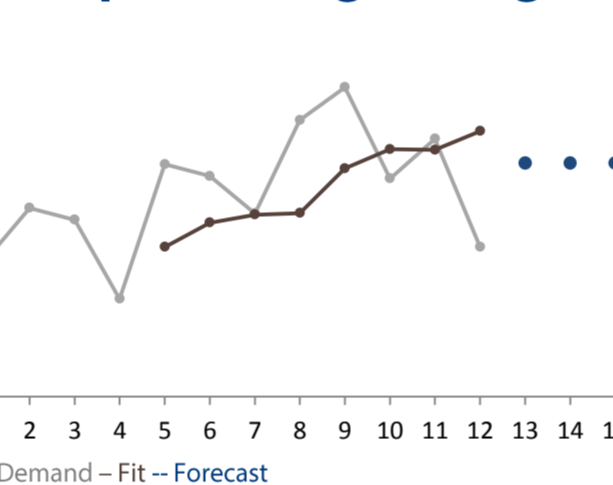
- Linear Regression
- Weighted Moving Average
- Simple Exponential Smoothing
- Holt's Method (fixed smoothing constant)

We aim to find out the most suitable forecasting method. Forecasting is a very important step as its result is crucial for production planning, inventory management and affects the overall supply chain performance. We will filter out he unpredictable random component and focus on estimating the systematic component which include level, trend and seasonality.

03 STEP — PRODUCT CATEGORIZATION

We aim to adapt & improve on Schlumberger's current practice and categorize products into different classes according to demand type and its monetary value to simplify the management process.

Demand Type

We first categorize the products into Runner, Repeater and Stranger according to Coefficient of Variation (COV). COV is calculated as standard deviation of forecasting error over average demand of product.

| Coefficient of Variation	Item Type
COV < 1	Runner
1< COV< 2	Repeater
COV > 2	Stranger

Monetary Value

We then categorize according to monetary value. We adopted ABC analysis in which products were classified according to annual sales values.
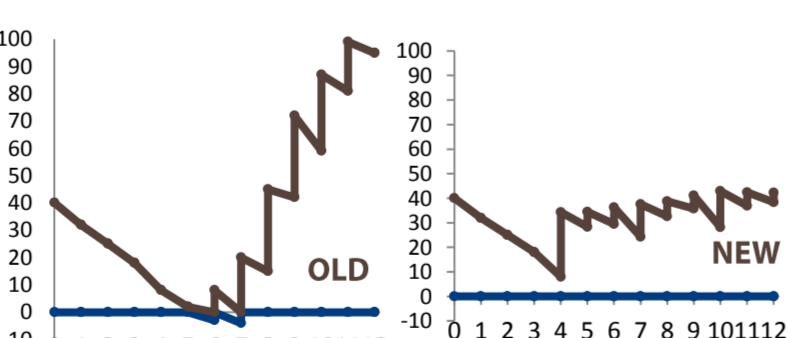
% of Annual Sales Value	Item Type
Top 80%	A
Next 15%	B
Bottom 5%	C

— Stranger — Repeater — Runner --* 80%,95%,100%

04 STEP — INVENTORY REPLENISHMENT
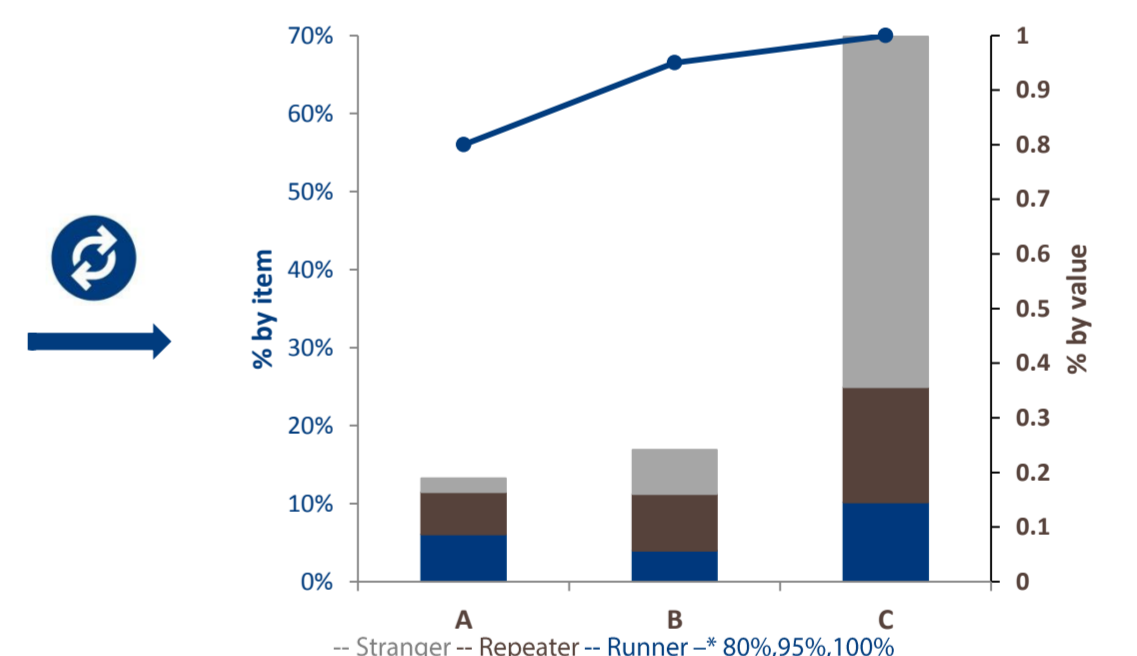
Improvement

Runner/Repeater C
Cost: **43%** Reduction in Total Cost
On-hand Inventory & Shortage
OLD / NEW
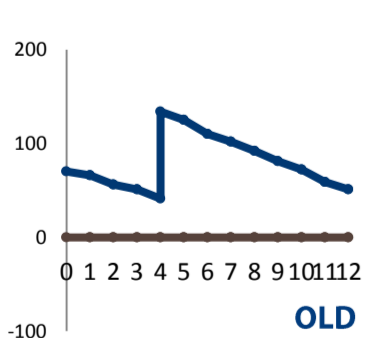
Runner/Repeater A/B
Cost: **38%** Reduction in Total Cost
On-hand Inventory & Shortage
OLD / NEW

Inventory Policies Comparison

	A	B	C
Runner **Repeater**	**OLD:** Monthly Pull system from manufactory with 3 months equivalence safety stock level		**OLD:** 3 month quantity as ROP level with 6 month ordering quantity
	NEW: Period Review with optimized order-up-to level G and safety stock to minimize total cost		**NEW:** Use EOQ as ordering quantity with optimized ROP level
Stranger	PULL System: Design & Made to Order ✓		

We will revise the inventory replenishment polices based on product's category using the improved forecasts as an input. We aim to achieve the same service level but reduce the total inventory cost which includes ordering cost, holding cost and shortage cost. We will demonstrate the saving in total cost and the inventory profile of the product.

Conclusion & Future Development

CONCLUSION

- Developed 4 Steps methodology & Revised various inventory practices ✓
- Automated data processing, forecasting & categorization processes ✓
- Significant reduction in inventory position and inventory cost ✓

FUTURE DEVELOPMENT

Adopt RFID technology & Implement Continuous Review inventory policy
- Further reduce company's inventory level and inventory cost
- Increase product visibility, reduce error and enable better management
- Benefit the supply chain strategy and long run competitiveness of company

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