



Supply Chain  
MANAGEMENT

# Improving Inventory Strategies for Consumable Materials

Capstone Project by Jake Haber  
Spring 2019

Submitted as a Capstone Project Presentation in partial fulfillment of a Master of Applied Science Degree in Supply Chain Management at the Massachusetts Institute of Technology

# Presentation Outline

- Personal Introduction
- Company Background
- Problem Background
- Project Background, Description & Motivation
- Project Methodology & Results
- The Next Steps
- Thanks and Acknowledgements

\*\*Please note the name of the sponsoring company has been altered throughout this presentation to protect intellectual property and potentially proprietary information.

# Personal Introduction – Humble Beginnings



# Personal Introduction – Educational History



This is to certify that

**Jake Haber**

has successfully completed all courses and received passing grades to earn a MicroMasters program certificate in

**Supply Chain Management**

a program offered by Massachusetts Institute of Technology, in collaboration with edX.



Christopher Caplice

Director, SCM MicroMasters Program  
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MICROMASTERS PROGRAM CERTIFICATE  
Issued June 2017

VALID CERTIFICATE ID  
825299dd60084090b5f1594b96bdd30e



# Company Background

- WOB Corporation manufactures components for Global Positioning Systems (GPS)
- Best in class products of the Positioning, Navigation and Timing industry



SpaceX   
@SpaceX

Successful deployment of GPS III SV01 to medium Earth orbit confirmed.



LAUNCH: GPS III SV01

LIFTOFF SECOND STAGE ENGINE CUTOFF SECOND STAGE ENGINE CUTOFF  
MAIN ENGINE CUTOFF SECOND STAGE ENGINE STARTUP DEPLOY

12/23/18, 10:51 AM

SPACEX

The image shows a tweet from SpaceX. The tweet text reads: "Successful deployment of GPS III SV01 to medium Earth orbit confirmed." Below the text is a video frame showing the GPS III SV01 satellite being deployed from the second stage of a Falcon Heavy rocket. The satellite is a small, rectangular object with a circular antenna. The video frame includes a timeline at the bottom with the following labels: LIFTOFF, SECOND STAGE ENGINE CUTOFF, MAIN ENGINE CUTOFF, SECOND STAGE ENGINE STARTUP, SECOND STAGE ENGINE CUTOFF, and DEPLOY. The video frame also shows a timestamp "T+ 01:59:05" in the top right corner and the SpaceX logo in the bottom right corner. The tweet is dated "12/23/18, 10:51 AM".

# Problem Background

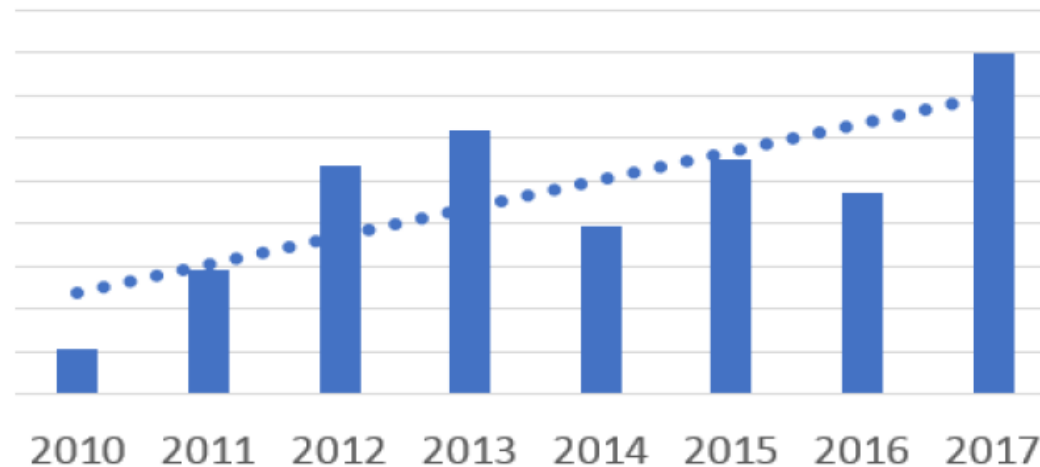
- How can WOB Corp. better manage their consumable materials?
  - What is Consumable / Expendable Material?
  - How do we know what the quantity is for “AR”?
  - How can you plan when you do not know the build requirements?
  - Procurement Unit of Measure (UOM) may not be equivalent to Stocking UOM

FIND #	Qty	PartNumber	Description
1	1		
2	7		
3	6		
4	AR		SOLDER, PASTE
5	AR		SOLDER,
6	1		
7	9		
8	2		
9	1		
10	1		
11	8		
12	8		
13	1		
14	AR		WIRE,
15	16		
16	AR		ADHESIVE,
17	AR		TRA-BOND
18	AR		CONFORMAL COAT
19	AR		SHRINK SLEEVING
20	2		
21	1		
22	2		
23	AR		CABLE,
24	1		
25	2		
26	4		
27	AR		LACING CORD
28	AR		BUS WIRE
29	1		
30	0		[DELETED]
31	REF		LEAD FORM DRAWING
32	REF		LEAD FORM DRAWING

Note: Some part information has been censored.  
Expendable Material (Denoted by AR) is visible

# Project Motivation & Objectives

Scrap Cost Due to Expiration  
2010 - 2017



- Improve process flow of consumable material
- Reduce scrap costs
- Generate labor improvements and cost savings
- Reconcile ERP system with reality

# Project Methodology

- Observation of legacy practice
  - Inefficient flow, wasteful process
  - Use of “Placeholders”
  - Misalignment to ERP system
- Launch of Pilot Program
  - 10 Part Numbers
- Creation of new usage metrics
- Installation of new equipment
- Material storage moved to floor
- Establishment of innovative practices





# Project Methodology – Data Analysis

## Query Creation

Query Properties

Data Source Tables Columns Conditions Sort

Columns: <All selected columns>

Condition: =

Value(s):

Added conditions:

```
[TRNDTE CENTURY FIELD] = 20
AND INVTRN.[WAREHOUSE NUMBER] IN('ACD', 'SCP')
AND DATE( [TRANSACTION DATE], MMDDYY ) > &TRNDTE_1
AND RIGHT( INVTRN.[ITEM NUMBER], 3 ) IN( &ITMNUM_1 )
AND [TRANSACTION TYPE] IN('SR', 'PI')
AND [ITEM GROUP] IN('AR-EXP', 'AR-NO EXP')
```

Run OK Cancel Apply Help

## Query Output and Analysis

ITEM NUMBER	Description	Transaction Type	Count of Transaction Quantity	Sum of Transaction Quantity
1	ADHESIVE	PI	1777	
		SR		2139
2	SOLDER PASTE	PI	236	
		SR		85520
3	CONATHANE	PI	339	
		SR		11
4	ADHESIVE 2	PI	177	
		SR		293
5	SLEEVING	PI	205	
		SR		400
6	SLEEVING 2	PI	68	
		SR		100
7	WIRE	PI	131	
8	WIRE 2	PI	121	
		SR		500
9	SOLDER	PI	594	
		SR		75
10	SOLDER 2	PI	189	
		SR		75

# Project Methodology – Kanban Calculations

## Kanban Formula

$$C_c = \frac{\bar{D}_p \times T_r \times F_s}{K}$$

Where:

$C_c$  = container capacity, in units

$\bar{D}_p$  = average period demand (typically days or weeks), in units

$T_r$  = replenishment lead time, in same period as  $\bar{D}_p$

$F_s$  = factor of safety

$K$  = number of kanban, cards and/or containers

Source: *Quality Digest* (2013)

## Kanban Calculations

Item	Description	Total Lead Time (days)	Lead Time (Months)	Issues Required over 2 Year Period	AVG Issues Required for 1 month	Safety Factor Desired	Safety Factor	# of Bins (includes 1 in stockroom)	Bin Size (in issues)	Avg Issue QTY (from previous tab)	Bin Size (in units given average usage)
1	ADHESIVE	61	2.03	1777	74.04	20%	1.20	3	60.22	1.20	72.49
2	SOLDER PASTE	51	1.70	236	9.83	10%	1.10	3	6.13	362.37	2221.14
3	CONATHANE	51	1.70	339	14.13	10%	1.10	3	8.80	0.03	0.29
4	ADHESIVE 2	60	2.00	177	7.38	20%	1.20	3	5.90	1.66	9.77
5	SLEEVING	51	1.70	205	8.54	5%	1.05	3	5.08	1.95	9.92
6	SLEEVING 2	51	1.70	68	2.83	5%	1.05	3	1.69	1.47	2.48
7	WIRE	51	1.70	131	5.46	5%	1.05	3	3.25	1.91	6.20
8	WIRE 2	51	1.70	121	5.04	10%	1.10	3	3.14	4.13	12.99
9	SOLDER	51	1.70	594	24.75	10%	1.10	3	15.43	0.13	1.95
10	SOLDER 2	51	1.70	189	7.88	5%	1.05	3	4.69	0.40	1.86

# Project Results – Labor Savings

## Projected Labor Savings per Delivery

### Savings Per Shipset for First Pilot Item (Item No. 1)

	Product 1 Operations Affected	Product 2 Operations Affected	Product 3 Operations Affected
Number of Uses	124	261	50
Time Saved Per Operation (minutes)	16	16	16
Time Per Ship Set Delivery (minutes)	1984	4176	800
Time Per Ship Set Delivery (Hours)	33.07	69.6	13.33
<b>Savings per Delivery</b>	<b>\$3,472</b>	<b>\$7,308</b>	<b>\$1,400</b>

\$12,000 Savings per Delivery!

## Realized Savings thus far

Transaction Type	PI	
TRANSACTION DATE	(All)	
ITEM NUMBER	Description	Count of Issues
1	ADHESIVE	150
2	SOLDER PASTE	61
3	CONATHANE	21
4	ADHESIVE 2	31
5	SLEEVING	12
6	SLEEVING 2	1
7	WIRE	8
8	WIRE 2	12
9	SOLDER	61
10	SOLDER 2	22
<b>Grand Total</b>		<b>379</b>

\$15,000 Savings so far!

# Project Results – Material Improvements

## Material Improvements

- Lower scrap frequency
- Better alignment between system inventory and physical stock
- Quicker process time to retrieve consumable material, better material flow
  - Improvement of 26 minutes of non-value added time to only 10 minutes

## Process Improvements

[Redacted]		Document Number: [Redacted]	Ver: 2
[Redacted]		Document Name: Stores Requisition	Date: Jun 20, 2016
<b>Stores Requisition</b>			
1	Part Number	Description	Qty Req'd
	Where Used: Assembly #	SN	Work Order
	Requisitioner	Contract Name	Charge Number
	Remarks:	Date:	
Completed by Stockroom/Planner			
2	Check One: Planned <input type="checkbox"/> Unplanned <input type="checkbox"/>		Reason Code:
	Qty Issued	Date Code/Lot	Transacted in OMS PI <input type="checkbox"/> UI <input type="checkbox"/>
		Stock Location	Completed by:

# Next Steps

- What? - Expand upon the pilot program
  - 10 out of roughly 80 eligible part numbers were evaluated
  - See where it makes sense to add onto the program
- How? - Engage the key players
  - Production Manager
  - Shop Floor Personnel
  - Stock Room Technicians
  - Material Planners
  - Senior Management

# Thanks and Acknowledgements

- Dr. Bruce Arntzen
- Pamela Siska
- Justin Snow
- The extended WOB Corp. team
- My family

