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DEPARTMENT OF SUPPLY CHAIN AND INFORMATION SYSTEMS

RETAIL OPERATIONS: OPTIMAL PICK AND SHIP PROCESS

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ABSTRACT

The purpose of this thesis is to design the optimal retail operations process for Golden Co. retail stores. This will require shipment and inventory data from Golden Co. Changes will be recommended to improve both the inventory and shipping process. Additionally, research will be conducted to gauge dollar gain by changing these systems. Furthermore, additional practices will be examined to make further suggestions to improve Golden Co.'s retail operations processes.

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ACKNOWLEDGEMENTS

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Chapter 1

Background

Golden Co. is a private luxury fashion jewelry design company that was founded thirty years ago. Currently, Golden Co. has forty free-standing retail stores within North America and has revenues over $800 million per year. Golden Co.'s distribution facilities operate in a 25,000 square foot space in northern New Jersey. This facility receives shipments containing 2,500-5,000 units every morning and ships out to its free-standing doors and its authorized retailers every afternoon.   Figure 1 shows a high level map of the North Jersey distribution center (DC) and its separate operations areas.
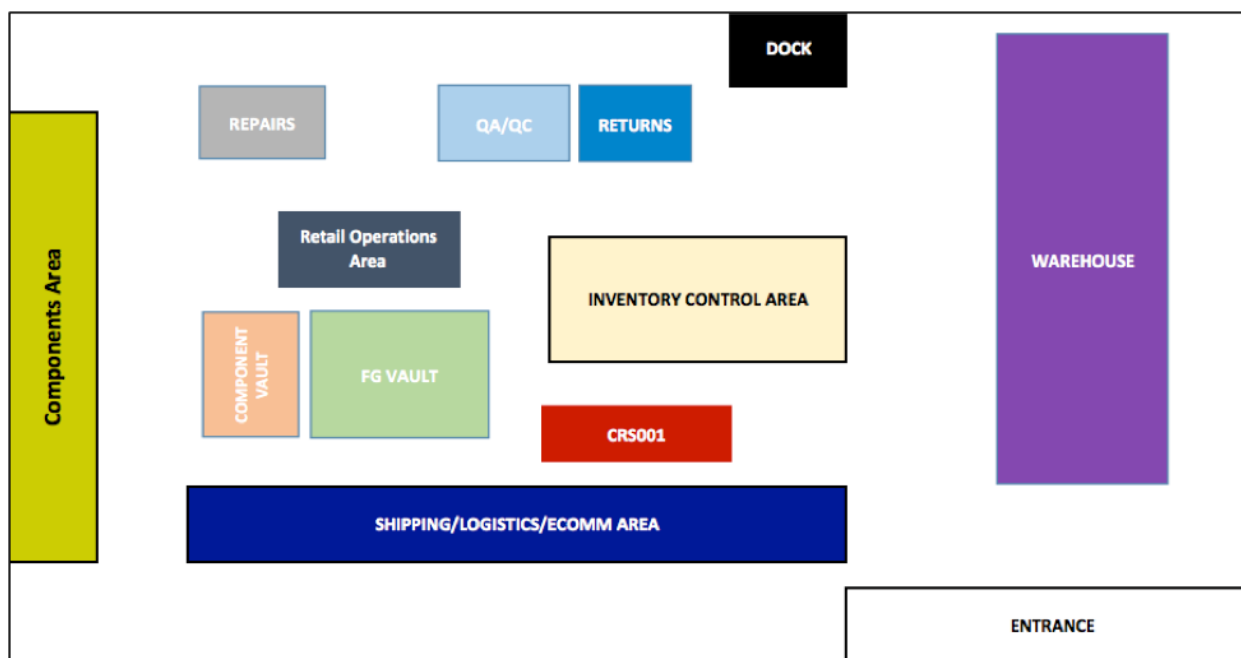

Figure 1: DC Map

The luxury jewelry industry as a whole had global sales over $160 billion in 2013 and will grow on average five to six percent year over year. The keys to success in the luxury market

are high quality, craftsmanship, emotional appeal, brand reputation and customer service. With this said, it is important to note, there are only a few competitors in this lucrative, high margin industry. Compared to a mass merchandise retailer like Walmart that holds over 150,000 stock keeping units (SKU) in a typical store, Golden Co., has 7,297 SKUs in total.

This thesis will focus on improving back end processes while maintaining these core competencies. In a study conducted by McKinsey & Co., analysts concluded that branded jewelry will see the largest increase in market share, as seen in Figure 2, so it is extremely important that jewelry companies should continue implementing unique design and branding techniques. These exceptional designs and product uniqueness will allow them to have high margins. According to a study conducted by McKinsey & Co, only four to five percent of total jewelry sales are done online. Therefore, it is very important for jewelry to be readily available on hand for consumers at brick and mortar stores.
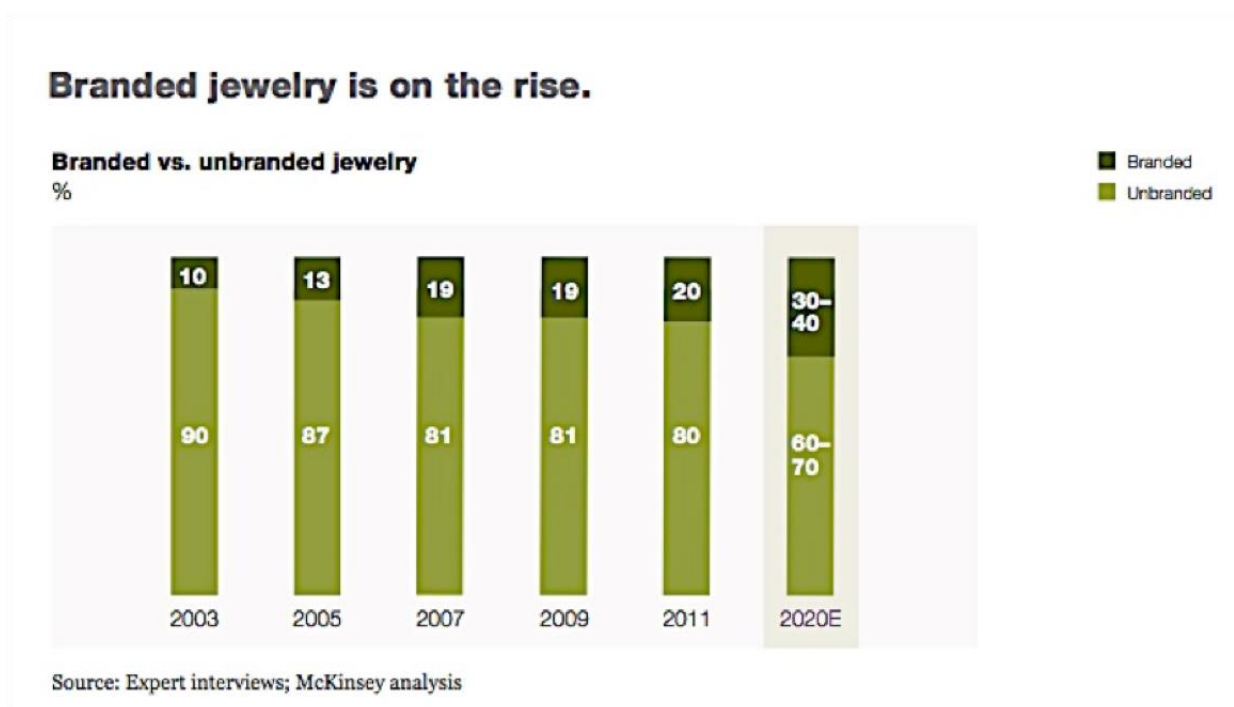
Figure 2: Branded jewelry projections (McKinsey & Co. Study)

Golden Co. has implemented two replenishment processes that are becoming less effective as the order volume increases. Currently, the DC has a separate area dedicated for their retail store stock and one for other major department store stock. There is an area known as the "locker stock" area specifically for the company specific retail stores. As part of the replenishment process, there is a current method for direct to store replenishment and then another process for the retail locker stock and replenishment process.

The first part to this process, as shown in Figure 3, is what is called the direct to store replenishment. This begins with the internal buying team creating an order in the enterprise resource planning system (ERP). The order is then allocated and the wave is released. The picker then goes into the main finished goods sections of the DC, shown in both red and green frames in Figure 1, and the order is invoiced to the retail store. These units are then transferred in the online system and the process ends.
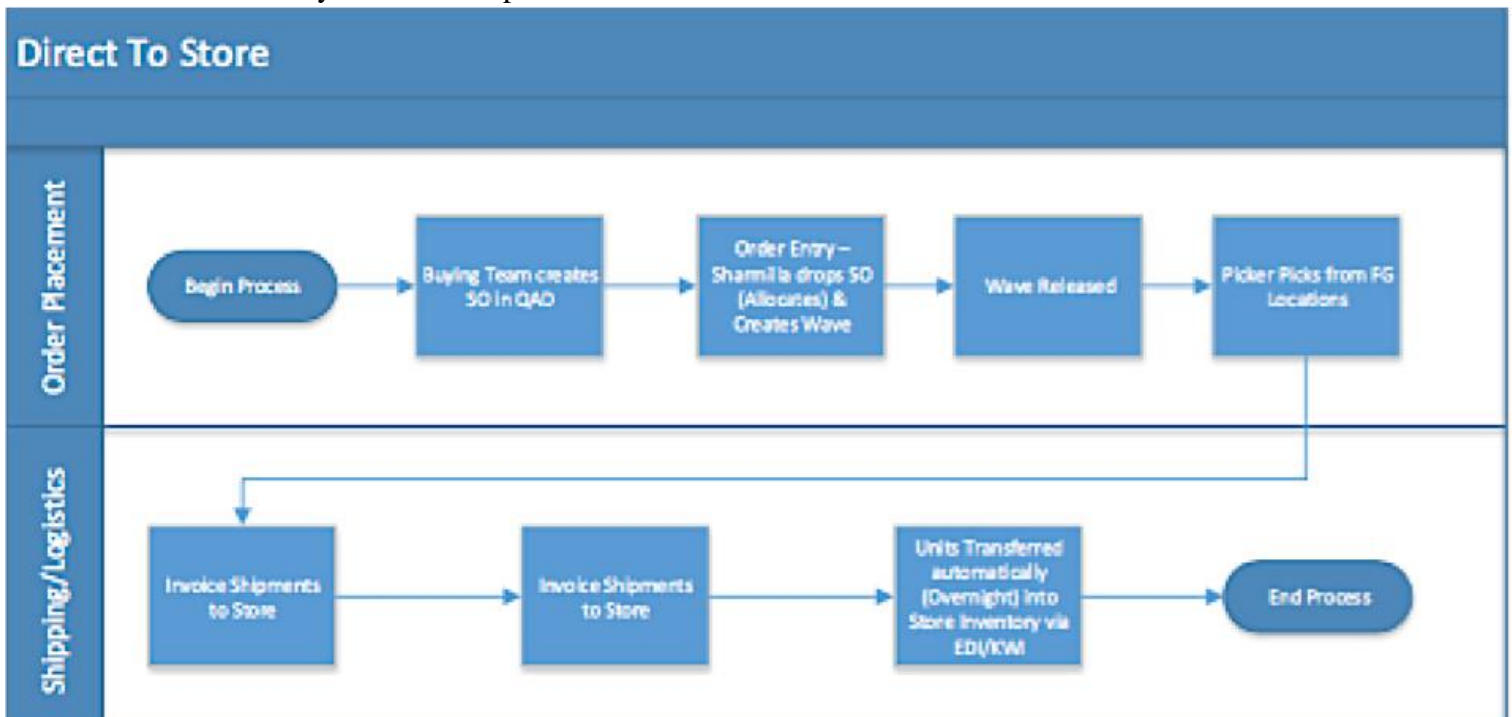
Figure 3: Direct to store replenishment process map

The second part to this process, illustrated in Figure 4, is the retail locker stock and retail replenishment process. Similar to the direct to store process, the internal buying team creates an order in the ERP, the order is allocated and the wave is created and released. The picker then goes into the finished goods section of the distribution center and the advance ship notice (ASN) is sent automatically to the store. The picker takes these units and places them in the locker stock location where they sit until the distribution list is received for each individual retail store.

This begins what is known as the retail operations part of the replenishment process. An individual distribution list is received via e-mail every day from each retail store. The units are picked from the locker stock location in the DC and are placed into a bin. On a typical day, the picking team is picking 200-1000 pieces and during the holiday season, the volume increases to 1200-2500 pieces per day. The pieces are then sorted into respective store bins and the batches are then sent to the stores. This manual process takes three pickers on average and three hours for every 1000 pieces.

Figure 4: Retail locker stock and retail replenishment process map

Chapter 2

Analysis

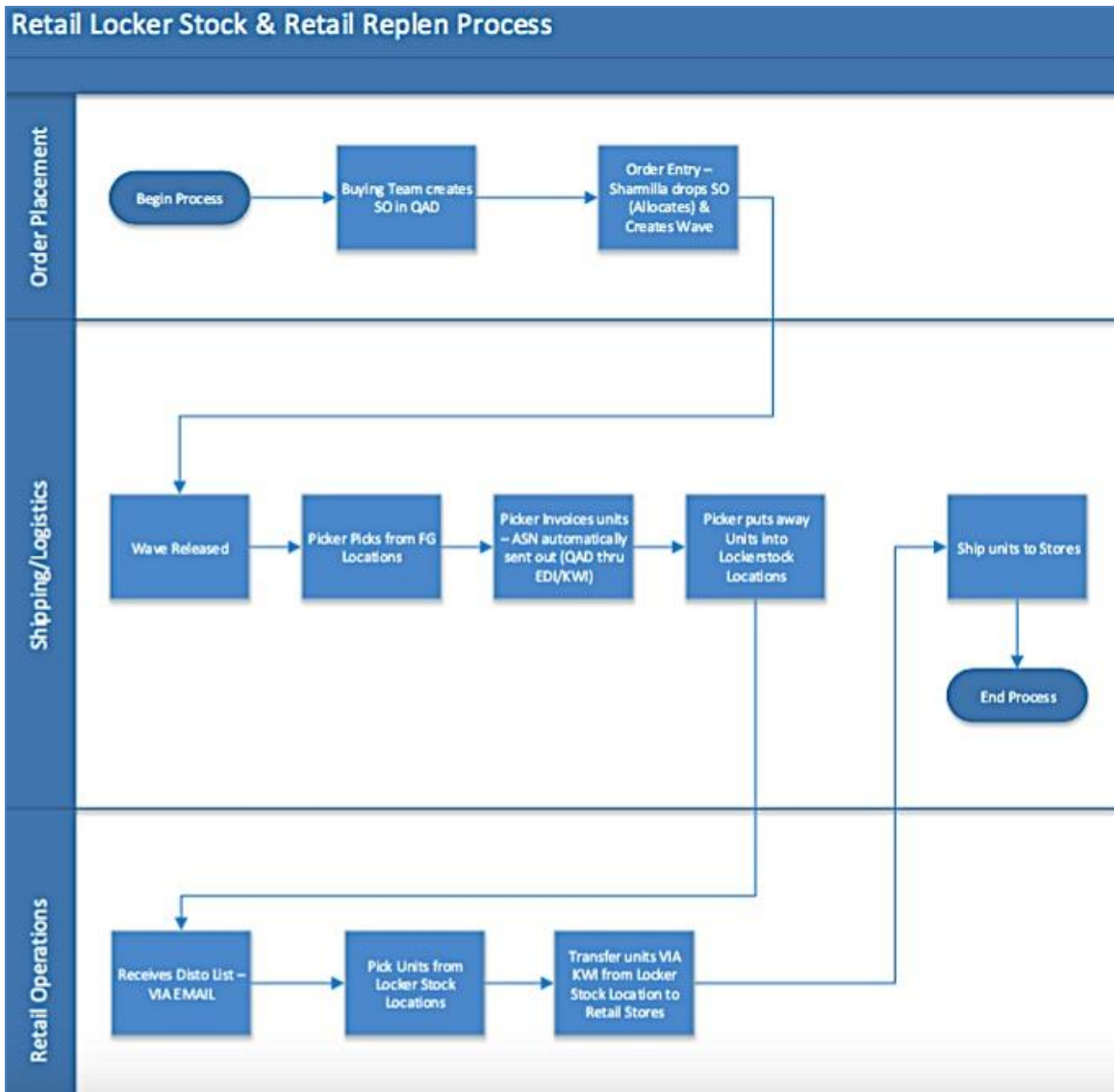In order to develop an effective retail operations strategy, many research steps needed to be taken. The first major point of research was visiting Golden Co.'s distribution facility in northern New Jersey.   During the site visit, a scheduled warehouse tour took place. This tour provided a strong foundation of understanding for the current retail operations processes including receiving, unloading, picking, packing and shipping. Researchers were able to see the site in real time during a typical busy Monday afternoon where roughly, 2500-5000 pieces were received and another 300-1800 units were being picked packed and shipped to their retail stores. Please refer to the Background section of this thesis for further detail on these current processes.

After visiting the operations facility, data needed to be pulled. With the help of the internal team at Golden Co., volumes for each retail store were pulled from the 2015 calendar year. These volumes included all units shipped from the distribution center to the retail store every day in 2015. From there, an Excel spreadsheet was created to show the free standing retail

Customer Code	Customer Name	Customer PO Nbr	Sales Order Nbr	Sales Order Type Code	Item Code	Qty Invoiced	Invoice Date	Month
7000	RETAIL NEW YO	14378	SU138802	S	E11345DSSAPLE	1	1/9/2015	JAN
7000	RETAIL NEW YO	14796	SU142606	S	N09824 SSBBOF	1	1/9/2015	JAN
7000	RETAIL NEW YO	14856	SU143183	S	E06525 SS	1	1/21/2015	JAN
7000	RETAIL NEW YO	14890	SU143774	S	D08713 SSBPE	1	1/22/2015	JAN
7000	RETAIL NEW YO	15175	SU145822	S	E08028 S8	1	1/13/2015	JAN
7000	RETAIL NEW YO	15175	SU145822	S	B11075 SSBPPM	1	1/21/2015	JAN
7000	RETAIL NEW YO	15175	SU145822	S	E11494 SS	1	1/12/2015	JAN
7000	RETAIL NEW YO	15236	SU146249	S	R07437 S86	1	1/12/2015	JAN

Figure 5: Excel spreadsheet of all purchase orders by month, 2015

store location, the units shipped and the invoice date.

The total yearly volumes were summarized to make a map visual for reference. This allowed researchers to analyze the supply chain distribution network, throughout the continental United States. Figure 6 shows the spread of retail stores in the continental United States where the size of the bubble corresponds to the door's volume.

Figure 6: Process map of volume within the continental United States

These volumes were further analyzed. Researchers took data in an Excel document and formed a Pivot Table to create charts showing volumes per door and average units per shipment. These shipments are the daily shipments that are sent from the DC in North Jersey to the various Golden Co. retail doors across the country. Researchers found the average volume of units shipped to each door in the year of 2015 was 24,991. With this, the researchers set parameters as plus one standard deviation and minus one standard deviation from the mean. These parameters set "A" stores (high volume stores) to volumes exceeding 37766.42 units ordered in the 2015

calendar year. "B" stores were set as doors with volumes from 12216.43 to 37766.42 units and

"C" stores were classified as doors with yearly volumes under 12216.43 per year.

Store	Volume/year	Classification	avg units/shipment
RETAIL NEW YORK	53478	A	12.03044655
RETAIL DALLAS	53343	A	11.45875295
RETAIL ATLANTA	48970	A	11.13713896
RETAIL BOSTON	44564	A	9.505171475
RETAIL HOUSTON	44081	A	10.38061961
YR SOHO	34922	B	8.574074074
RETAIL KING OF PRUSSIA	32645	B	9.615907747
RETAIL LAS VEGAS	32521	B	8.01080108
RETAIL TYSON'S GALLERIA	30371	B	10.83071253
YR WASHINGTON DC	28819	B	5.141727672
YR CHARLOTTE	28306	B	10.57486072
RETAIL BEVERLY HILLS	27637	B	10.20141593
RETAIL CHICAGO	27317	B	9.500183352
YR TAMPA	25907	B	5.006307159
RETAIL WESTCHESTER	23648	B	9.983180428
RETAIL SOUTH COAST PLAZA	23428	B	8.923797223
RETAIL ORLANDO	20882	B	8.943443918
YR TROY	20029	B	9.558609539
YR CHERRY CREEK	19581	B	4.820365722
RETAIL SAN JOSE	17559	B	6.64590658
RETAIL SCOTTSDALE	17119	B	5.997394864
RETAIL BOCA RATON	16656	B	8.989238054
RETAIL AUSTIN	16185	B	7.656345566
RETAIL PALM BEACH GARDENS	16115	B	8.167461832
RETAIL BAL HARBOUR	15875	B	6.559568733
YR ALA MOANA	15757	B	5.347275032
YR TOPANGA	13444	B	7.074195666
RETAIL NASHVILLE	13232	B	8.591926283
YR GLENDALE	12657	B	7.9455081
YR ST LOUIS	12168	C	7.369971936
YR EDINA GALLERIA	10774	C	7.238591917
YR OAKBROOK CENTER	27	C	1

Figure 7: Store classifications made in Excel

After these parameters were set, researchers looked at each door and how many units

were in the average shipment to their door. These shipment quantities ranged from 1 to 12.03

units, with the New York City store having the highest volume per shipment and the Oakbrook,

Illinois store on the low end. Units per shipment is a key metric used to help reach the goal to

remove the need to ship to each door every day.

The reasoning behind setting these parameters is to classify stores to ease the current order process system. Golden Co. would like to eliminate the need to send shipments to every retail door every single day while avoiding high stock out costs.   The parameters looked at the standard deviation of total volume for each retail door. Figure 7 shows classification of each U.S. continental retail store.
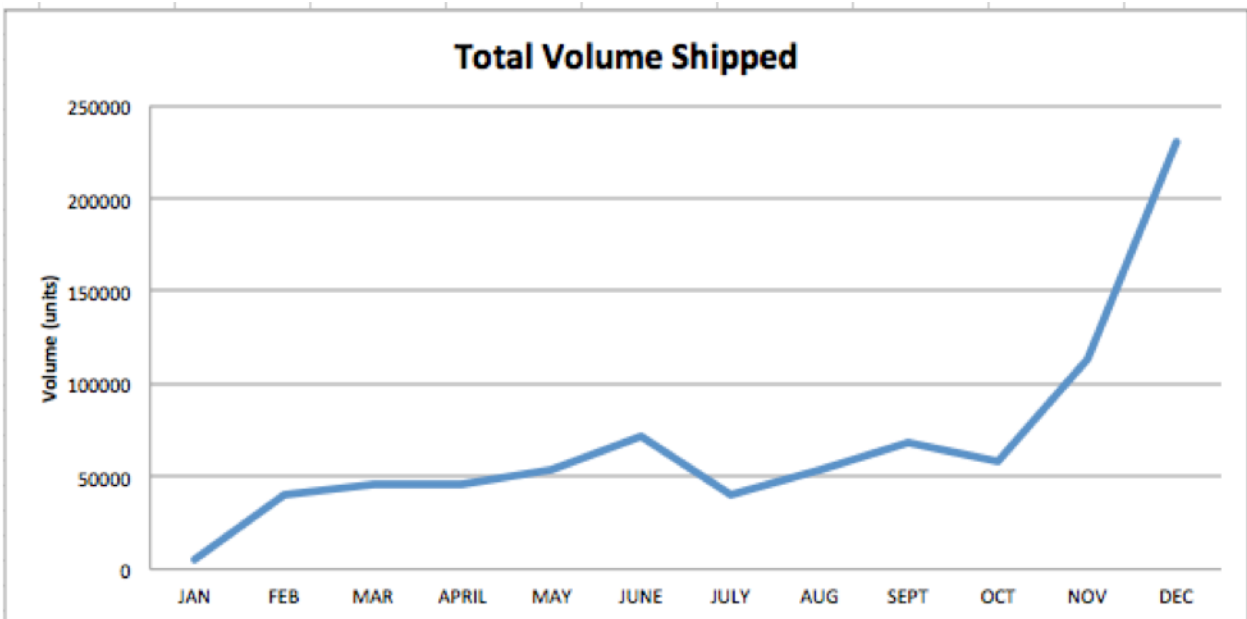
Figure 8: Total volume per month

After looking at data for each doors volume, researchers looked to see the amount of the units they order per shipment. The A stores have at least 10 units per order and Golden Co. will continue to ship to these A doors every day. The second classification is B stores. These stores have volumes between 12,657 and 34,922 units per year and an average of 8 units per shipment. These doors will ship every other day so that they can reach at least 10 units per shipment. Lastly, C doors with volumes less than 12,100 units per year with an average of 7 units per shipment will ship every two days. This will cut down labor costs for picking and packing. Additionally, holding the shipments until the next day will allow the picker to batch pick. Instead of picking for the same door two days in a row, they are consolidating these picks.

These shipping policies will stand during the non-peak months at Golden Co.'s DC. At Golden Co., these moths are January, February, March, April, May, June, July, and August. All of these months ship on average 44,487 units. Then, when the peak season hits in September, Golden Co. will ship to the A doors every day, the B doors every day and C doors every other day. As Figure 8 shows, total volume peaks from September to December with an average of 117,206 units and, therefore, shipments will have to be more frequent.

	A	B	C
Yearly Volume (2015)	> 37766.42	12216.43 - 37766.42	<12216.43
Shipping Pattern – Standard Months	Every Day	Every Other Day	Every 2 Days
Shipping Pattern- Peak Months	Every Day	Every Day	Every Other Day

Figure 9: Shipping pattern for each door classification

Chapter 3

Monetary Savings

The reasoning behind this shipping change is to reduce distribution costs. Currently, Golden Co. uses FedEx overnight domestic services to ship to all of its doors. Figure 10 shows the location zones that correlate directly to different pricing windows for each shipment location. According to Golden Co.'s shipping data in 2015, their shipments average ten pounds and the most frequently shipped package is two pounds. With this information, it is important to note, by increasing these shipments sizes, the incremental prices do not increase exponentially.
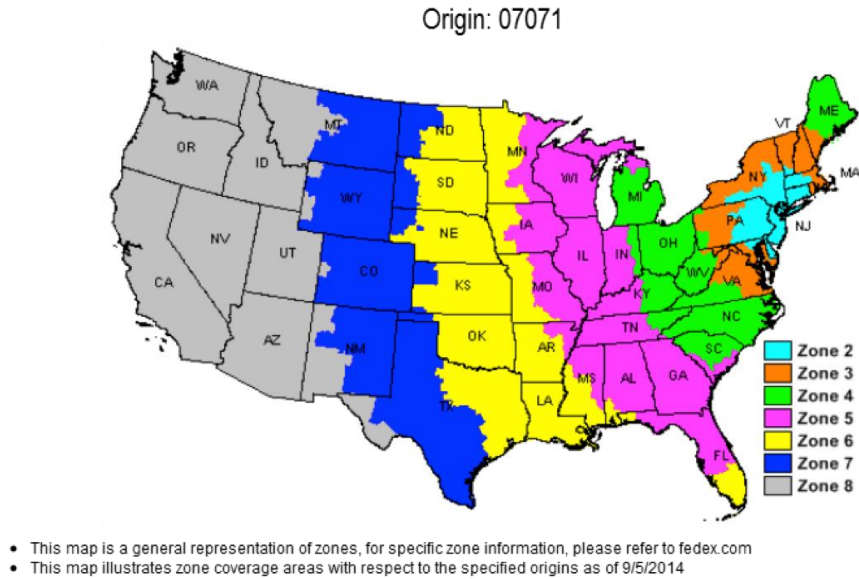
Figure 10: Fed Ex zone map

After reviewing the net rates charged by FedEx as seen in Figure 11 below, summaries can be made that each additional pound added to the shipments will increase the shipping costs slightly. It is a widely known concept across the supply chain field that transportation rates per unit increase at a decreasing rate. Some know this as the tapering rate principle. According to David Ross, the tapering rate principle proves that the transportation rate structure tapers "due to the fact that the greater distance, the more carriers can spread costs, such as handling and shipping monitoring, over a greater mileage base". He goes to further explain that, given the commodity and distance are held equal; the transportation cost per unit will decline as the weight and volume of a shipment increases. To illustrate this in relation to Golden Co., it is important to analyze the shipping zones.

For example, in zone two, a one pound increment will raise the total net charge of a single shipment anywhere from $0-$0.83 depending on the weight. In zone eight, the furthest zone from the New Jersey DC, costs will increase anywhere from $0.03-$3.57. One can see the opportunity by looking at this example, if the DC waited an extra day to send one five pound package to a door in zone 4 for $13.97 instead of shipping one four pound package for $13.49 and another one pound package for $9.97, the company would save $9.49 on a single shipment cost. They would also save a significant amount in labor costs by batch picking this order.

Weight (in Lbs)	Zone -02	Zone -03	Zone -04	Zone -05	Zone -06	Zone -07	Zone -08
FedEx Envelope	$6.00	$6.00	$6.61	$7.06	$7.12	$7.85	$7.96
FedEx 1 Lb Pak	$6.00	$7.49	$9.97	$11.06	$11.65	$12.85	$13.20
FedEx 2 Lbs Pak	6	8.14	10.89	11.88	13.18	13.73	14.74
1	$6.00	$7.49	$9.97	$11.06	$11.65	$12.85	$13.20
2	6	8.14	10.89	11.88	13.18	13.73	14.74
3	6.42	8.65	12.05	13.58	14.6	15.57	16.12
4	6.91	9.12	13.49	14.87	15.95	16.95	17.58
5	7.01	9.44	13.97	15.4	16.56	17.41	18.05
6	7.74	9.98	15.48	17.54	18.34	19.65	20.5
7	8.1	10.55	16.18	18.4	19.64	20.52	21.91
8	8.16	11.05	17.22	20.04	21.4	21.72	22.59
9	8.27	11.38	18.61	20.87	21.76	23.4	24.08
10	8.31	11.42	18.64	20.91	22.14	23.44	24.12
11	9.14	12.68	21.15	23.67	25.41	27.06	27.69
12	9.52	13.1	21.62	24.77	26.65	27.88	29.2
13	9.65	13.59	22.1	25.9	27.73	29.35	30.6
14	10.05	14.21	23.8	26.61	28.21	29.98	31.1
15	10.15	14.4	24.1	26.65	28.24	30.01	31.13
16	10.57	15.15	25.78	29.13	30.22	32.44	33.1
17	11.01	15.62	26.53	30.03	31.58	32.82	33.83
18	11.37	16.11	26.69	30.06	32.28	32.86	34.71
19	11.6	16.55	27.94	31.35	32.99	33.64	36.36
20	11.63	16.65	28.26	31.42	33.02	34.74	36.39

Figure 11: Fed Ex net rates

According to records at Golden Co., labor to invoice and pack each shipment takes nine minutes: five minutes to invoice the shipment and three minutes to pack the shipment plus time for picking.   Golden Co.'s pickers on average picks 150 units per hour. If assuming the picker is productive 80% of the time, they are truly picking 120 units per hour. Considering there are 8.21 units on average per order, conclusions can be drawn that one picker can pick 14.62 orders in one hour. This is equivalent to around 4 minutes per order. With this average pick time of 4 minutes, calculations conclude, total shipment labor time including picking is 13 minutes. If

shipments are combined, there will be less shipments, in turn reducing labor time.   These few actions will reduce bottom line labor costs.

In addition to the monetary benefits, according to an article published by Gardner Business Media Inc, consolidating orders provides additional benefits to shippers and receivers of packages by reducing shipping supply expenses, having better fuel efficiency for the environment and for decreasing time to receive, handle and restock orders.

Chapter 4

Looking Forward

Pool Distribution

Pool distribution is used to distribute orders of multiple destination points within a given geographic territory. According to the Dohrn Company, a transfer company, pool distribution offers a superior and cost-effective alternative to the costs of traditional less than truckload (LTL). With pool distribution, instead of shipping directly to the retailer, orders are sent to a consolidated regional terminal. At this location, the orders are reloaded to local trucks to be delivered to the final destination. This type of shipping method is advantageous because it saves money in freight as well as in warehousing and picking.

Figure 12: Pool distribution

This practice would make further improvements with Golden Co.'s transportation network and is something that they can look to implement in the future. After mapping the locations of Golden Co.'s retail doors, conclusions can be made that three pool distribution

centers would aid in the distribution process. Three pool distribution centers can be strategically

placed in central areas of high volumes. Locations that would be advantageous are Texas,

California and Florida. As seen in Figure 13, the three yellow "x's" represent potential locations

of pool distribution centers. With this, Golden Co. would only have to ship from its DC in New

Jersey to the pool distributors who will then ship directly to the retail doors in their region.

Figure 13: Potential pool distribution locations

The pool distribution would change the whole ordering process and shipping process, it

would lower costs and give responsibility to a third party company to handle many of the

shipments to the individual retail doors. With these locations, instead of the New Jersey DC

shipping to fifteen different doors throughout California, Texas, Nevada and Florida, they would

ship to the three pool distributors and the pool distributors would ship from there to the

individual doors.

Conversely, Golden Co. could look to further optimize shipping by skipping the

intermediate stage all together for the "pooled regions". Golden Co.'s suppliers

instead could ship directly to the pool distributor and then the pool distributor would deliver to the respective doors in their region. This would eliminate the need to ship everything from suppliers to the DC in North Jersey and then out again to the pool distributors. This would allow Golden Co. to ship packages fewer miles.

Figure 14: Pool distribution grouping
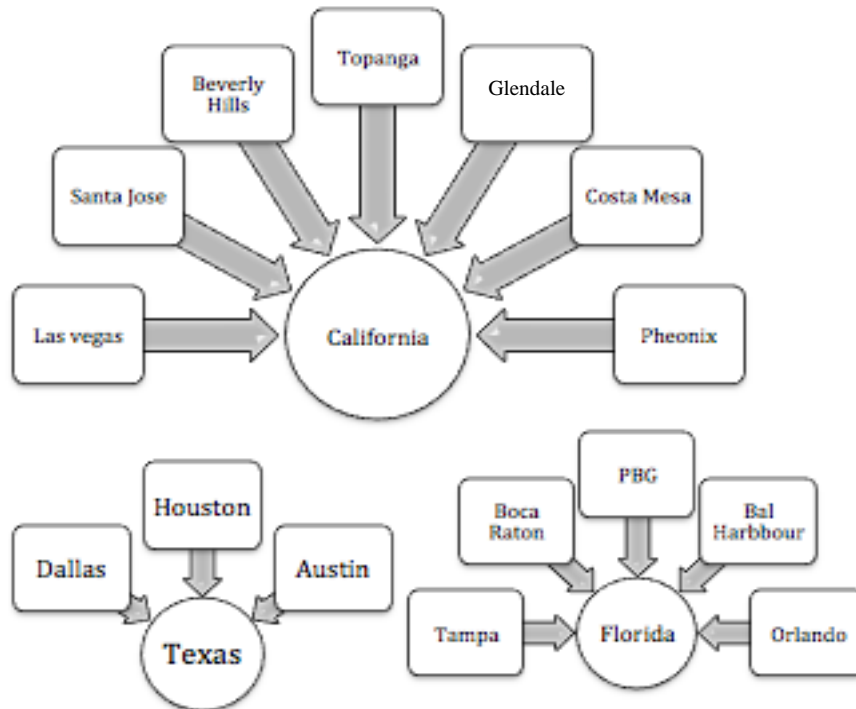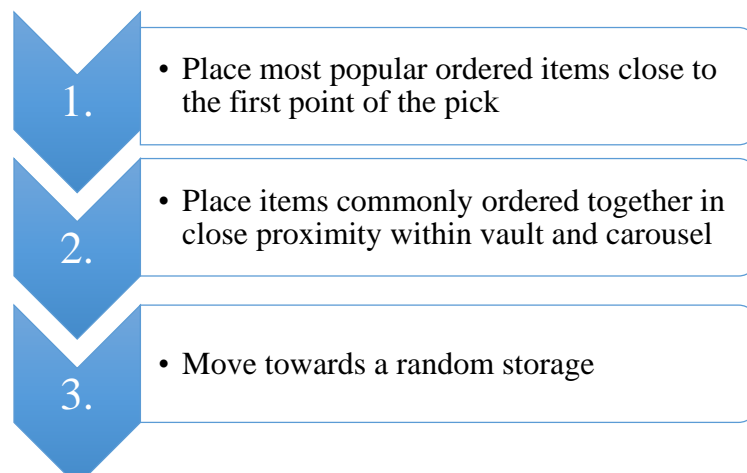
Chaotic Storage

Moving forward it would be beneficial for Golden Co. to look into a new way to store the inventory in the North Jersey DC. Golden Co. can look towards a "chaotic storage" system. Currently, Amazon is using this technique to optimize picker's routes, improve pick accuracy and improve DC flexibility. This type of warehouse technique is unique because it accounts for

the flow of material and makes best use of the space in the entire DC. This technique will allow

Golden Co. to eliminate the locker stock in order to ease picking and warehousing processes.

Golden Co. can use this as a model for a new warehousing system in the vault and

carousel inventory areas. To make this most beneficial for Golden Co., they should follow a few

key guidelines when redesigning their inventory spaces as outlined in Figure 15. Primarily, they

should locate the most popularly shipped items closest to the beginning points of the pick. In

Golden Co.'s situation, this would mean placing the basic, chain necklaces of all metal varieties

along with some of the popular rings, bracelets and earrings closest to the shipping envelopes

outside of the locker stock area or closest to the picker at the carousel.   The idea behind this is to

optimize the picker's route and reduce the total pick time. For example, if an order comes in for

the Atlanta retail door for two chain necklaces, the picker will have to move the minimal amount

pick the order and ship it out. This would take the picker much less time than if the chain was

near the back of the DC. By making these small changes, pickers will have more optimized

paths for all incoming orders and will be able to pick orders with a decreased pick time/unit.

1.	• Place most popular ordered items close to the first point of the pick
2.	• Place items commonly ordered together in close proximity within vault and carousel
3.	• Move towards a random storage

Figure 15: Chaotic storage stages

In addition, Golden Co. should look to identify patterns where certain items are ordered

frequently in the same shipment and place them next to each other on the shelves.

By placing items with this relationship close to each other instead of similar items next to each other, order accuracy will improve. This is because there will be less mix-ups when picking orders for different shipments. Golden Co. analysts can further analyze and monitor orders to match up well suited inventory items so they can be placed in similar locations within the DC to ease picking and reducing pick time/unit.

All other items within the DC will be placed at random. As inventory is shipped out and space is freed up, new inventory will be brought in and placed in open spots. This random method does require barcode scans to identify the location within the DC but has been proven a more efficient method to pick and ship orders from distribution warehouse areas. Golden Co. can look towards software that is compatible with their current systems has this additional capability.

Chapter 5

Conclusions and Recommendations

Summary

The main problem Golden Co. faces with their retail doors is seen in their methodology with picking and shipping. Currently Golden Co. is receiving and shipping orders every day to over thirty retail doors across the continental United States. Additionally, they are double-handling much of their inventory within the DC so that retail stores are allocated proper amounts. The reasoning behind this is to keep the major department stores from "taking units" from the retail doors.

This is a costly system as it is expensive in both labor and transportation costs.   Knowing this, analysis was conducted to create a method that would reduce the number of outgoing shipments per day as well as decrease labor time in the DC. Analysis was data driven with shipment invoices, volume spreadsheets, and outside examination on other companies' operation methodologies.

The key results of changing the retail operations processes are:

- Decreased transportation costs/unit

- Reduced labor costs

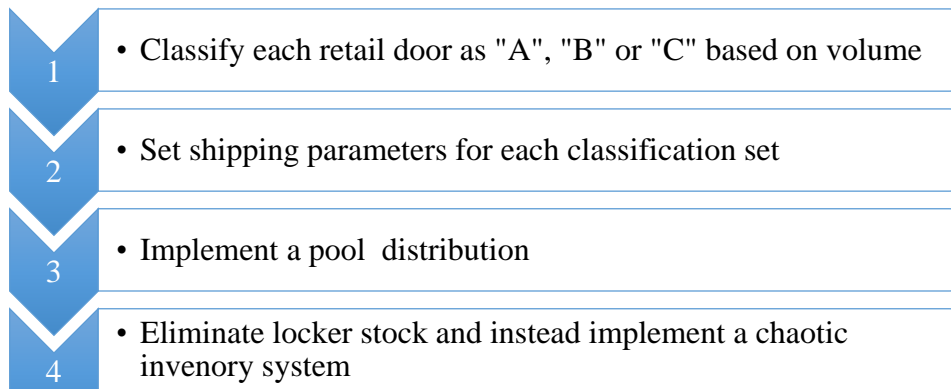- Increased distribution center efficiencies

Action Items

In order to move forward with these changes, it is recommended to first classify each retail door as a high, middle or low volume door.   A simple and effective way to classify doors, as shown in this analysis, is on total yearly volume, conversely, the Golden Co. team can look at a monthly classification based on volumes. Once these classifications are set, this must be communicated to all of the members in the operational team so that they understand the new procedures moving forward.

Next it is suggested that Golden Co. takes these new classifications and sets shipping parameters for each set. This will form unique guidelines so that some doors are sent shipments every day, some every other day and others every two days. These parameters can change based off of seasonality or time of year as explained in the Analysis section of this report.

After executing these shipping changes, Golden Co. can further improve their retail operations process by implementing a pool distribution network. They can look to potential 3rd party distributors and evaluate the best options based on set criteria such as company history, IT capabilities and their network base. This will decrease the amount of shipments from the DC in New Jersey and is a more efficient way for inventory to be transported across the country.

Lastly, Golden Co. can look to redesign their inventory within the finished goods vault and carousel. This should be designed with the idea of a "chaotic" design. Golden Co. should look to put most frequently ordered items closest to initial picking point. This will reduce labor costs by decreasing pick time per unit. Additionally, Golden Co. can place items that are frequently ordered together near each other in the DC so that pick time is reduced across orders.

1. • Classify each retail door as "A", "B" or "C" based on volume

2. • Set shipping parameters for each classification set

3. • Implement a pool distribution

4. • Eliminate locker stock and instead implement a chaotic invenory system

Figure 16: Action items

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Beta Gamma Sigma

WORK EXPERIENCE:

L'Oréal   New York, NY
Operations Intern-US Supply Chain Planning   Summer 2015

- Worked within 2 fast growing cosmetic and fragrance brands to raise and stabilize service to 95% yielding a $1.2M gross opportunity by analyzing current internal processes and retailer specific practices
- Worked with point of sale data to identify patterns of retail volatility to construct demand forecast formula ensuring improvement
- Used Enterprise Information Warehouse data cubes to assess growth for $43M of product launches
- Updated catalog codes through SAP to ensure correct universal product codes were selected for replenishment picks

Diane von Furstenberg   New York, NY
Operations and Logistics Intern   Summer 2014

- Partnered cross-functionally with team of 8 to manage operations and logistics for Diane von Furstenberg to insure inventory was available for retailers in US distribution centers
- Created monthly Excel spreadsheets to evaluate and track on time in full global ecommerce shipments and distributed to cross-functional partners
- Utilized the Blue Cherry enterprise resource planning system to monitor inventory levels and complete domestic and international order entries to insure available inventory and highlight low stock SKUs

ACTIVITIES:

Alpha Omicron Pi
Chapter Vice President

SKILLS:

- SMS Office: Excel, Word, Power Point, Outlook, Access, SQL, Enterprise Information Analytics