TRACKING UNSALEABLES INFORMATION
TO DECREASE PACKAGE DAMAGE AND PRODUCT LOSS

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ABSTRACT

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The literature review summarizes some of the joint grocery industry reports on

unsaleables, discusses technologies that are being used to track distribution data, define and

describe reverse logistics, and discuss types of grocery damage.

This research explores seven case studies. Two independent and three large retail chains

are chosen to represent a range of unsaleables management strategies. Three manufacturers are

chosen because they deal extensively with unsaleables. Flow diagrams are developed to show the

flow of unsaleable goods and information.

It is found that there is an opportunity for electronic data exchange in reverse logistics

that can help in the tracking and sharing of unsaleable product information. This research

recommends seven reason codes to put unsaleable products in clearly defined categories for

retailers to use when gathering unsaleables data: beyond code date, recall, theft, discontinued

product/promotions/product launches, seasonal, damage and other. These reason codes were

chosen to put unsaleable products in clearly defined categories. It is recommended that

manufacturers gather more granular information in their audits.

A list of standard tests for package damage is formed to judge package performance

when damage is found to be a problem. A more scientific approach to determine shelf-life and

ship-life is recommended along with a longer ship-life to better facilitate first-in, first-out (FIFO)

inventory management.

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KEY TO ABBREVIATIONS

ARP – Adjustable Rate Policy

ASCX12 – Accredited Standards Committee

ASTM – American Society for Testing and Materials

Auto ID – Automatic Identification

CEO – Chief Executive Officer

CFO – Chief Financial Officer

COO – Chief Operating Officer

CPG – Consumer Packaging Goods

DC – Distribution Center

DSD – Direct Store Delivery

EDI – Electronic Data Interchange

FIFO – First In/First Out

FMI – Food Marketing Institute

GDSN – Global Data Synchronization Network

GM – Gross Margin

GMA – Grocery Manufacturing Association

ID – Identification

INV – Inventory

ISTA – International Safe Transit Association

JIR – Joint Industry Report

MPI – Ministry for Primary Industries

NDR – Net Disposable Revenue

PSE – Pseudoephedrine

QC – Quality Control

R1 – Retailer 1

R2 – Retailer 2

R3 – Retailer 3

RFID – Radio Frequency Identification

SCM – Supply Chain Management

SKU – Stock Keeping Unit

TAPPI – Technical Association of the Pulp and Paper Industry

TV – Television

U.S. – United States

UK – United Kingdom

UN – United Nations

UPC – Universal Product Code

URF – Unsaleables Reporting Format

UV – Ultra Violet

XML – Extensible Markup Language

YTD – Year to Date

INTRODUCTION

Unsaleables have been a prominent problem for food manufacturers and retailers. The problem has also created business for third-party providers that specialize in managing unsaleables-related product and problems; it also results in offering a steady flow of product to food banks and other secondary markets.

There have been many benchmark reports published in the last twenty years that track the state of industry practices, break down unsaleables data, and offer recommendations for improvement. Although three alternative unsaleables policies have been used (Swell, Joint Industry Report and Adjustable Rate Policy) there has consistently been a lack of statistical information regarding damage versus other reasons for unsaleable status. Although the UPC barcode has been used to sort and track unsaleable products, and some information is gathered by the retailer, it is usually not shared with manufacturers in any degree of detail that could be used to make decisions about packaging adequately, shelf life or other management considerations.

This thesis reports the current state of unsaleable products in the U.S. grocery industry. It begins with a review of the past twenty years of research in the management of reverse logistics and the tracking and sharing of unsaleables data. These reports were conducted jointly by The Food Marketing Institute (FMI) and the Grocery Manufacturing Association (GMA).

The grocery industry has developed reimbursement policies that aim for shared responsibility. The joint industry reports have identified two main issues with unsaleables. One issue is in the collaboration needed to identify the root causes of unsaleables. The second issue is in deciding on sharing the cost of unsaleables. The research will aim to find a way for manufacturers and retailers to collect useful data, and measure the food waste and unsaleables generated by specific packaging and supply chain initiatives.

The research investigates the current flow of unsaleables information. It answers the questions: where does the information go, who pays for what, how information could feed back to decision-makers, and how information can be used to assign proper test methods for damage?

CHAPTER ONE: SELECTED LITERATURE REVIEW

The literature review looks at previous studies and reports done on unsaleables. The first section will cover previous studies on unsaleables that were done by FMI and GMA. The next section will cover different types of information systems used in the supply chain and reverse supply chain. The third section will look at the flow of products and information in the reverse supply chain. The final section of the literature review will look at different kinds of damage done to groceries.

1.1 Summary of FMI/GMA Joint Industry Reports

This section of the literature review covers the information discussed in previous FMI/GMA joint industry reports. It shows the industry history of unsaleables practices starting with the original 1990 JIR policy. Next, it summarizes a report of the industry changes that have occurred from the original JIR policy in 1990 to the year 2005. This allows for a brief history of industry practices while being able to focus more on what has been happening in more recent years. It then summarizes the joint industry reports from the years 2005, 2006, 2008 and 2012. This includes important figures and data from the reports, as well as recommendations and findings from each report.

There are three main types of reimbursement policies for unsaleables, Joint Industry Report (JIR), swell and Adjustable Rate Policy (g). The main idea behind JIR is that "manufacturers cover pre- and post- handling and reclamation center costs for products returned from retailers. The title for the product is returned to the manufacturer as the product enters the reverse value chain" (FMI/GMA 2008, 4). This policy is somewhat outdated as many companies are moving away from it in favor of a swell or ARP policy.

According to the Joint Industry Unsaleables Steering Committee, "one reason for cost declines may be a decrease in the percent of total unsaleables volume covered by "JIR" policies and sent to reclamation centers for processing and data collection" (FMI/GMA 2006, 5). Swell is an older policy that is still widely used in the industry today. Swell "provides a fixed reimbursement rate across all product categories" (FMI/GMA 2008, 4). The original policy provided a 6% direct product cost to retailers but as the price of products increased, this yielded an unfairly high reimbursement rate and values had to be adjusted.

ARP is the newest and most widely used policy in the industry. This policy uses product category-specific reimbursement rates that are set based on periodic audits and re-evaluations of the value chain (FMI/GMA 2008).

1.1.1 Product Reclamation Centers (FMI/GMA 1990)

This report gives manufacturers, distributors and reclamation centers a guideline to go by when discussing the responsibility and ownership of products when they are deemed unsaleable. "The guidelines are purely voluntary and are not legally binding on the industry or any individual firm" (p. v). "The study measures costs of handling unsaleables all the way back through the distribution channel, including identifying and measuring different options that may be used in a reclamation center"(p. v). The report outlines the original JIR policy. For the purposes of this report, there is focus on flow of product, who is responsible for product, and reclamation center operations.

The following items are the manufacturers' responsibility: unlabeled or mislabeled product, improperly sealed product, product that is not the right weight, broken glass, crushed, dented or collapsed product, swollen cans, manufacturer withdrawal, moldy package, rusted can, leakers, and soiled, stained, or sticky cans. The manufacturer is also responsible for hidden

damage, and when there is insufficient packaging or a bad distribution design. The only type of damage for which the retailer should have full responsibility are cut packages. It recommends shared responsibility between manufacturer and retailer for defaced product, expired product, and spoiled or perishable goods.

Another area where damage occurs is in the warehouse. Products that are damaged prior to getting to the retailers dock, and customer pick-ups should not be processed through a reclamation center. These items should be shipped directly back to the manufacturer. On the other hand, damage that occurs in the retailer warehouse or during transportation from the retailer warehouse to the retailer store should go through reclamation and should be the retailer's responsibility.

The report recommends items that should not be handled through the typical reverse supply chain system. Infestations should be discarded at the retail location as a shared responsibility between retailer and manufacturer. Product recalls and government-regulated items usually have a standard government procedure that should be followed. Product loss due to natural disaster should be negotiated between the manufacturer and the supplier prior to doing business together. The following situations should also be negotiated in advance between the supplier and the retailer: customer returns, items that were guaranteed to sell by the manufacturer, retail discontinued items, and manufacturer discontinued items. When there is partial damage to a case at wholesale and retail, the product that is not damaged should be consolidated and returned to the normal distribution system, and the damaged product should be sent to the reclamation center for processing.

The proper removal of unsaleables at the retail level is important "to present the best possible store and product image, control cost for both the manufacturer and distributor, provide

information and identification necessary to eventually lessen damage in the system, prevent further damage to the product as it moves through the process, and provide for acceptable methods of disposal" (p.6). The following are the necessary steps in properly removing unsaleables from the retailer shelves to be sent through reclaim. First, "product should be removed from the selling area and/or backroom as soon as damage is noted" (p.6). Second, unsaleable product should be placed in its designated work area. Third, if the UPC code is missing, identifiable items should have the proper UPC written on them, and unidentifiable items should be destroyed for safety purposes. Finally, if product can be made presentable enough to be resold, it should be.

The designated work areas should have the proper equipment, be located in the store, have one person responsible for the area and should be sorted in the following four groups: (1) food, food service, personal care and paper products (2) other non-food (3) toxic products (4) pet food. The final thing that has to happen at the store is the product being prepped for return. There should be a store tag placed on the inside and outside of a suitable container for shipping. For frozen or refrigerated goods, only the packaging should be retuned, and for all other goods the product and the package should be returned. Finally, product should be palletized using full tiers. Food and safe non-food items should be on the top of the pallet above toxic items.

The next step for the unsaleable products is transportation to the reclamation center. Most of the time, product is transported to a distribution center before a reclamation center. If this is the case, the product should be transported from the distribution center in a timely manner. Toxic product should not be stacked on top of edible products and the individual store items should be kept separate from one another.

After transportation, the product is brought to the reclamation center which has ten important components of operation. The first step is in unloading the product, and, in doing so, the product should be checked for any infestation or leaking of toxic materials and product.

The second step is staging to process the products. The products should be processed as quickly as possible on a first in/first out (FIFO) basis with enough of a staging area to hold a half of a week's volume.

The third step is preparation which includes four steps: (1) a safety check for broken glass and sharp objects, which should be removed (2) a sanitation check for infested or contaminated products, which should be removed and the manufacturer contacted (3) an unauthorized product check for items that are unauthorized for credit, which should be removed and handled the way the manufacturer and distributor agreed and (4) "whenever possible the preparers per-box travel time should be minimized" (p.8).

The fourth step of the reclamation process is scanning and tagging. The "product is scanned (or otherwise recorded), basic information should be gathered and attached to the container in a manner which does not obliterate the UPC" (p.8). If a product has to be destroyed, the product information label should be put on a plastic cup with the UPC of the product and a description of why the product is not there. The label should include "store or warehouse identification, quantity scanned, vendor pay number, manufacturer sort code, date, description, and UPC" (p.8).

The fifth step is sorting of the products. They should be sorted as early as possible by manufacturing division, broker, and with other sorts considering cost.

The sixth step is storing of the products with separation between current and prior billing periods. When product is stored, food and non-food products should be kept separate, and allow access to manufacturers for 21 days after the invoice period.

The seventh step is invoicing. The invoice should occur on a regular cycle. Manufacturers should be given 21 days to review invoiced materials before billing, and make payments for products within 30 days of billing. The invoice should include: "description, UPC, product cost, warehouse damage indicated separately, quantity, cost extension, invoice number for billing, billing period, and credit items identified"(p.9).

The eighth step is review of the unsaleable products by the vendor. The appointments for these reviews should be set up in advance, and if there is no need for review by a manufacturer, the reclamation center should be notified so the product can be disposed of as quickly as possible. "If product UPCs or stickers are not available for the inspection, the manufacturer should not be responsible to reimburse the distribution" (p.10). The manufacturer and distributor should review the damaged products as to reduce the total number of unsaleables in the future.

The ninth reclamation step is product disposition. "The party incurring financial responsibility for products processed through the reclamation center should determine the method of disposal" (p.10). Recycling and repacking of product should be the number one priority when sending an item through reclaim. This will "recapture some of the value of the product or packaging" (p.10). The next priority lies in donating the products, then resale by the retailer, then salvage, with destruction of the product being the final priority. Destruction should only be considered when all other options have been exhausted.

The tenth is not so much a process, but is choosing the proper personnel to run the reclamation center. There are six personnel categories that are recommended:

- clerical- researches unscannable items, invoices vendors, files, performs general office activities

- manager – supervises, trains, settles with vendors

- preparer – unloads trucks, moves in-bound items to line, prepares item for scanner, sorts, discards, rejects

- scanner – scans items

- tagger – tags items, sorts selected items

- sorter – sorts items by path destination

1.1.2 Improving Unsaleables Management Business Practices – Joint Industry Recommendations (FMI/GMA 2005a)

The purpose of this report was to revise "existing guidelines for industry practices influencing the products that became unsaleables in the supply chain" (p.4). This report fills the gap between 1990, when unsaleables and JIR policies were first defined, and 2005 based on the major changes in the industry. In this report, "unsaleables are defined as consumer products which are removed from the primary channel of distribution for any reason and which may or may not be processed through product reclamation centers" (p.5). There are three main problems that FMI and GMA recognizes in the negations between manufacturers and distributors: both sides believe the other side is being fair in unsaleable negotiations, "each side wants the other side to be fair, [and] sales agents and wholesalers find it especially difficult to successfully collaborate with trading partners to control unsaleables costs"(p.4).

There was a huge increase in the total amount of unsaleables from the first 1995 benchmark report to the 2004 report from 0.75% to 1.06%. There are several reasons for this increase in the total amount of unsaleables as there have been many "significant changes in

industry practices and conditions since 1990" (p.7). The focus of the 1990 JIR policy was damaged goods, but today, reclamation centers deal with a slew of unsaleable products, including product recalls. There has been a shift from the manufacturers using JIR, to either adjustable rate or swell allowances that are applied by different manufacturers in different ways. "Most companies have developed policies covering unsaleables business practices" (p.7), and there can be conflict with trading partners when their policies do not agree. In 1990, most reclaim centers were operated by wholesalers and retailers, but by 2005 they were operated by outside companies. "Environmental regulations for landfills are more stringent now. Deductions are now used more often for claims and payments" (p.7). "Service companies pick up for some manufacturers at reclamation centers, where products are held for shorter time periods. Salvage revenue is significant for some retailers and some manufacturers. [Finally], New Bioterrorism Act recordkeeping requirements cover reclamation centers and exclude food banks" (p.7).

Three main observations were made about the importance of reclamation centers and their role in unsaleables. The first is that "reclamation centers are currently the most efficient way to remove unsaleable products from the supply chain and that they are viable tools for unsaleables management" (p.9). The second looks at what would happen if all the reclamation centers ceased operations. It was concluded that the negative implications to the supply chain outweigh the positive ones if all reclamation centers ceased. The reason this is thought to be true is that, "manufacturers and distributors would not be able to readily remove or recall damaged or otherwise compromised products from distribution in the supply chain and would lose centralized data for root cause corrections"(p.9). The final observation is that reclamation centers were in a consolidation phase, driven by retailers and wholesalers, which was expected to result in fewer processing facilities.

The report focuses on the most widely used policy, the ARP policy. There are four main attributes that an ARP policy should hold. The first attribute is that "the policy should be based on statistically sound data that measures the performance of a manufacturer's products and packages throughout the entire supply chain" (p.11). This data should be used to, show where there can be improvements in the performance of the company's supply chain, and establishing the rates that the manufacturer will use to compensate customers for unsaleables. The second attribute is that the measurement and evaluation of the rate of compensation be ongoing and adjusted as needed. The rate will change with time as there are changes in the company's products and other activities, and the rate should reflect those changes. The third attribute is, "the policy should address all causes of and responsibility for unsaleables in a way that fairly acknowledges the challenges and costs associated with the way in which the company does business with its trade partners" (p.11). Lastly, an ARP policy should have a commitment to continuously improve the policy.

Manufacturers need to decide how they will determine the rate of reimbursement. In calculating the rate for an ARP policy, three methods are used. The first is for the manufacturer to use a national average that is applied to all of its customers. This rate could be for one product line, like a different rate for two different products, or one rate for all products provided by the manufacturer. The second way is to calculate a different average for each channel of distribution to customers. "One average per channel may be calculated for all products or separate averages may be calculated for product groups" (p.14). The third way a rate can be determined is by a geographic average. This would be a different rate for each major market area where the manufacturer has customers. "This could be one rate for all of the manufacturer's products or channel-specific or product group-specific averages could be calculated" (p.14). "The task force

recommends that individual manufacturers conduct a robust supply chain audit and consider the results of that audit across the three major variables when choosing the appropriate type or types of rate averaging"(p.15).

1.1.3 2005 Unsaleables Benchmark Report (FMI/GM 2005b)

The purpose for publishing this report was to "provide the consumer packaging goods (CPG) industry with valuable tools to manage and reduce the costs of unsaleables in the total supply chain" (p.2). The findings and answers to interview questions are intended to give individual companies a way to compare their practices and numbers with those of the rest of the industry to improve their own operations and reduce total unsaleables. This is done by trying to "refine the definitions of unsaleables costs for distributors and manufacturers" (p.2). This can prove to be a difficult task due to companies using different methodologies and policies for unsaleables. The information in this report is collected "from 50 manufacturers, 26 distributors (wholesalers and retailers) and four companies that provide services in the unsaleables or reverse distribution supply chain" (p.3). The information in this study only included U.S. customer data from manufacturers and U.S. sales from distributors. 29 of the 50 manufacturers provided information from 2004.

Manufacturers had the second consecutive decrease in total unsaleables in 2003 and 2004. The average company paid 1.18% of gross sales on unsaleables in 2002, 1.11% in 2003 and 1.06% in 2004. Of all the outlets that manufacturers distribute to, "the supermarkets and mass retailers showed the largest decline in manufacturer unsaleables rate" (p.6). From this information it would be expected that the incidence of unsaleables be the least in supermarkets, but over one third of the survey respondents do not know which channel they distribute to have the least amount of unsaleables. The payments of unsaleables is mostly invoice deductions at

39%, then swell or adjustable rate allowances at 38%, then reclamation center invoices at 21%, and store claims at only 2% of respondents. Case returns were put back into the forward supply chain by 60% of distributors, 25% moved product to closeout liquidation, 9% destroyed product and only 6% donate product.

Since there were only about half the distributors surveyed as manufacturers, there was not as much data available for distributors and there is only data for 2003 and 2004. The distributors that were surveyed showed a decrease in unsaleables from 0.84% of sales in 2003 to 0.76% of sales in 2004, but "the total 'gap' increased from 6% to 6.7% of their unsaleables costs from 2003 to 2004"(p.9). The reason for this gap is thought to be "a decrease in the percent of total unsaleables volume covered by 'JIR' policies and sent to reclamation centers for processing and data collection" (p.9). Dry grocery products accounted for 55% of distributor costs of unsaleables, 16% is from Health and beauty care, 13% from dairy, 8% from frozen goods, and 8% from general merchandise.

Manufacturers that experienced an increase in unsaleables believed the driving force behind the increase were discontinuations, product introductions, loss of focus and seasonal returns and recalls. According to distributors, the major factors affecting unsaleables were manufacturers moving from JIR to a swell or ARP, manufacturers having lower reimbursement rates, increased damage due to poor packaging and expired product.

1.1.4 2006 Unsaleables Benchmark Report (FMI/GMA 2006)

Unsaleables are defined in this report as "products removed from their normal channel of distribution, regardless of the reason for removal" (p.2). This is a very different definition of unsaleables from the 1990 JIR which only included damaged goods. This report "excludes data published in prior years' reports. The steering committee decided to focus on current data and

conditions rather than historical information. Where prior year data are reported, they represent answers to questions asked in this year's survey and may differ from data published previously" (p.2). "Survey participants provided annual data for 2005, or their most recent fiscal year and for 2004" (p.3). The data included "warehouse-delivered product and excluded data about direct store delivery (DSD) products, fresh meat, bakery, produce and deli products" (p.3). Manufacturers only included U.S. consumer data and distributors only included U.S. sales and data. It should also be noted that in this report, retailers are referred to as distributors.

This report does not have a lot of information on recommendations for the management of unsaleables, but it offers a lot in the way of benchmark data that can be used by companies to compare where they stand in regards to other companies. The table below shows a drop in total unsaleables, and a lower average unsaleables rate for manufacturers using an ARP or swell policy over some other policy.

Table 1: Manufacturer Unsaleable Rates

Manufacturer Unsaleable Rates		
	2004	2005
Company average	1.13%	1.05%
Industry-weighted average	0.88%	0.81%
ARP or swell allowances	0.81%	0.72%
Policy other than ARP or swell	0.96%	0.92%

In 2005, only 75% of the manufacturers that were surveyed knew the channel-specific data for their unsaleables. This means that 25% of the companies did not know through which channel they had the highest rate of unsaleables. Of these manufacturers, it was found that most of the unsaleable payments were to chain drug stores, followed by supermarkets. But, when comparing the unsaleables payments to the gross sales from the company, supermarkets paid out more compared to sales than drug stores. This shows that "manufacturer efforts to reduce the

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incidence of unsaleables would most likely yield the greatest supply chain improvements when focused on the supermarket and chain drug store channels" (p.6).

As opposed to manufacturers, distributors saw an increase in their total percent of unsaleables. The distributor unsaleables cost as a percent of sales among the companies that took the survey was 1.13% in 2004 and 1.17% in 2005. "Some distributors reported that their total receipts for unsaleables from manufacturers were 5.9% below their total costs for unsaleables in 2005" (p.11). The distributors were getting smaller payments from manufacturers than their total unsaleables cost. "Distributors on the Joint Industry Unsaleables Steering Committee pose that one reason for cost and receipt declines may be a decrease in the percent of total unsaleables volume covered by "JIR" policies and sent to reclamation centers for processing and data collection"(p.11).

The main reasons for increased unsaleables for manufacturers was believed to be the same as the increases outlined in the 2005 report in the previous section, with the addition of PSE legislation. The main issues for distributors is the same as the issues stated in the previous report as well, with the addition of a lack of collaboration between trading partners, the Bioterrorism Act and the handling of hazardous materials.

1.1.5 2008 Joint Industry Unsaleables Report: The Real Causes and Actionable Solutions (FMI/GMA 2008)

The purpose of this report is to "discover and analyze the underlying causes of unsaleables throughout the value chain and identify actionable solutions companies can adopt and customize" (p.2). The report consists of two phases: data collection and analysis, which includes surveys and interviews with manufacturers and distributors, and validating and

synthesizing findings given by the survey respondents. There were 73 companies that were surveyed and all of them gave data for the U.S. for 2007.

Unsaleables are an avoidable cost that represent "1% to 2% of gross sales on average" (p.6), or $15 billion dollars annually. There are four main trends that are affecting and changing the industry, thus leading to an increase in the number of unsaleables. The first is "the accelerating pace of new product introductions" (p.6). Products are being introduced to the market very quickly that are not generating revenue, with no way to reduce high inventory for failed launches. The second is that "the expiration date of many products is now visible to the customer" (p.6). Manufacturers do not want a customer to get a product that is spoiled with an expiration date that is still valid, so they are more conservative with the date they post on the package. The third reason is that "companies are increasing the use of eco-friendly packaging" (p.6) that may save money or reduce waste but fails in the distribution system, creating more damaged products. The fourth reason is "companies continue to focus on growing the health and wellness platform, exacerbating the first trend as product formulations are changed and new products to capitalize on this trend are introduced" (p.6). All of these trends are contributing to the change and increase in the types of unsaleables. "Now discontinued, expired, seasonal and other non-damaged products account for over 50% of all unsaleables" (p.6).

The next section of this report covers the five key findings in the state of unsaleables management. The findings are:

- Root causes driven by the same fundamentals

- Damages are only half the problem

- It's time to bring planning to unsaleables management

- Unsaleables reduction requires balanced incentives

- Unsaleables is now a 'C' level agenda item.

These findings will be described in detail in the next few paragraphs.

The first finding is "root causes driven by the same fundamentals" (p.7). There are four root causes affecting both manufacturers and retailers that result in about 50% of the total unsaleables. The first is that according to manufacturers, plan-o-gram and assortment changes account for 12% of the root cause of unsaleables, and according to retailers, 21% of unsaleables is caused by a lack of external collaboration on product launches and discontinuations. "These two causes are closely related as plan-o-gram changes reflect retailer decisions around discontinuations/launches" (p.8). If these two facets are not communicated well between the manufacturer and retailer, a change in one will have an adverse effect on the other. The second root cause is that according to manufacturers, 12% of unsaleables is due to a lack of product rotation, and according to retailers, 14% is caused by code dating standards and procedures. Retailers are saying that manufacturers are not delivering products with a visible and easy-to-understand best-by date on the package, and manufacturers are saying retailers are not rotating product on the shelf properly and product is going bad on the back shelf. The third root cause is that manufacturers are saying 11% and retailers are saying 10% of unsaleables are caused by a lack of collaboration in regular business. They both agree that there is a lack of communication on inventory management on a day to day basis. Finally, manufacturers say 10% of unsaleables is caused by product delivery and handling practices, and retailers say 10% is caused by product packaging design and changes. Manufacturers feel most damage is caused by distribution from the retailer warehouse to shelf, and retailers believe that while damage is caused while in retailer possession, it is due to a lack of protection of the product by package design or materials.

The second finding associated with the state of unsaleables management is that "damages are only half the problem" (p.11). "Although the average unsaleables rate has remained relatively constant, the proportion of unsaleables due to damages is noticeably declining" (p.11). Product damage as a cause of unsaleables has decreased "from 58% to 48% since 2003" (p.11). Discontinued and expired products account for the largest increase in unsaleables from 2005 to 2007, while most retailers reported that damages decreased or stayed the same.

The third finding associated with the state of unsaleables management is that "it's time to bring planning to unsaleables management" (p.13). In the past, companies would deal with unsaleables with more of a reactive philosophy by executing on existing problems. In order for the industry to move forward in unsaleables handling, companies need to start planning based on historical trends and forecasting.

There are four main focus areas that need to be examined for future planning. They are collaboration on product discontinuations and launches, inventory planning, trade promotion and mark-down planning, and SKU rationalization. "Industry analysis indicates that collaborating with trading partners on product launch and discontinuation can decrease unsaleables cost by as much as 0.3% of sales which represents $15 million dollars a year for a $5 billion company" (p.14). A simple way to collaborate is to provide trading partners with more lead time on discontinued products. Inventory planning is the next area that needs focus for future planning. There is an average loss of $23 million for every $1 billion in sales due to stock-outs. Furthermore, "half of grocery retailers indicated that more than 5% of the inventory is near expiration at any given time" (p.15). The next factor that needs more collaboration deals with trade promotions. Trade promotions can be very beneficial to a manufacturer's gross sales if they do well, but they often result in an oversupply of product due to un-met retailer

commitments. "Combining sophisticated trade promotions management with better forecasting, inventory management and promotions planning over the life of the product can lead to revenue growth and cost reductions, including lower unsaleables costs" (p.16). The final collaborative planning focus area is in SKU rationalization. SKU rationalization is manufacturers having a formalized process for deciding which products they keep, and which products they discontinue. "The most effective SKU rationalization programs occur on a quarterly basis with sales, marketing, finance and operations all coming together to evaluate the economic contribution of high priority items where all parties have aligned incentives" (p.16).

The fourth finding in managing unsaleables is that "unsaleables reduction requires balanced incentives" (p.17). There has been a huge shift in larger manufacturers from a JIR policy to an ARP policy. Since there is more cost sharing between retailers and manufacturers with the ARP policy, there are more disputes on what the reimbursement policy should be. When there is a lack of communication and discrepancies between retailers and manufacturers, the ultimate cost lies on the shoulders of the consumer. Since retailers are feeling cheated about their returns policy, they are more likely to reject saleable product at the receiving dock because of partial damage. The price of this hits the manufacturer first, but also drives the price of the product up so it ultimately hits the consumer. The ultimate goal of this finding is to open the lines of communication between retailers and manufacturers so that reasonable policies can be formed that are agreeable on both sides.

The fifth and final finding is that "unsaleables is now a 'C' level agenda item" (p.23). What is meant by "C" (corporate) level is that it has not had the attention of CEOs, CFOs and COOs. Now, in order for there to be a real reduction of unsaleables, the executives of both manufacturers and retailers need to be directly involved in their management. "Companies with

senior executive attention on unsaleables experienced unsaleables rates about 0.5% of sales lower than those with limited to no executive attention" (p.23). The current trend in most companies is that there has been an increase in senior executives' involvement in unsaleables, and in order for unsaleables to continue to decline this trend needs to continue.

1.1.6 A Study of Unsaleables: State of ARP 2012 (FMI 2012)

The purpose of the adjustable rate policy (ARP) is to reward retailers when they have a reduced rate of unsaleables, and to penalize retailers when their unsaleables rates are high. Currently, this concept has failed in doing this. The idea behind an ARP policy is to use periodic audits to adjust reimbursement rates based on the rate of unsaleables during the audit period. "The responsibility for unsaleable product was determined to be 20% for the retailer and 80% for the manufacturer" (p.8).

There are four main things that have had a negative effect on the supply chain since the introduction of ARP in 1996. The first is open code dating. Since there is an expiration date on the package, customers are more aware of expired product on the shelf, thus expired product in reclamation. The second is the food broker business model has changed. "Brokers reduced their presence at the retail shelf resulting in an increase in the amount of damaged and out-of-date product in the retailers' reclamation process" (p.3). The third is new environmental sustainability initiatives. Using less packaging for the sake of sustainability has led to a reduction in protection and an increase in damage. This is discussed in greater detail later in the literature review. The final thing is an increase in new product failures and discontinuations. ARP does not cover the product that sent through the retail reclamation process due to product failures and discontinuations. So the retailer is penalized for something that is the manufacturer's responsibility.

One major problem with ARP is that dollar gaps "are a significant financial problem for retailer trading partners" (p.11). The retailers are incurring a greater cost, and manufacturers are benefiting from it. This is having a major effect on retailer profitability. The manufacturers are using the ARP to make up for the shortcomings of their supply chain system. A solution for these gaps would involve the trading partners to agree upon a reasonable rate that would be fair for both parties. This would include a clearly defined definition of which party is responsible for the product at certain points in the supply chain. Another issue with the current ARP system is that the rate of reclamation is increasing while the ARP payouts are decreasing. This gap is leading JIR manufacturers to switch to an ARP system because of the benefits of lower payouts. The retailer should not be responsible for paying the increasing money gap and they need to re-evaluate their ARP model as soon as possible.

1.2 Information Systems in SCM

Understanding the supply chain and the flow of information is crucial in the reduction of unsaleables. It is very important to know who owns products at certain points in the supply chain, and who is responsible for a product when it is damaged. This starts with data collection. Products need to be tracked from the import of raw materials to the manufacturer, to customer checkout at the retailer, as well as data collection on the event of a return. Without a system for data collection, there is going to be discrepancy as to who owns what, as product is delivered through the supply chain. "Whenever there are differences of opinion, they are typically driven by different perspectives on the amount of unsaleables as well as who owns the process within the supply chain where the unsaleables occur" (Karolefski 2007, 2). This section outlines the typical method of collecting data in purchasing, shipping and receiving.

Information sharing in the forward supply chain has grown drastically in the last few decades. Once the technology was available to track product in the forward supply chain down to the SKU level in real time, it was demanded by customers. Customers wanted real time tracking data that could be used to reduce inventory requirements, increase flexibility of resource allocation, and use information transfer to facilitate collaboration among trading partners.

There are many benefits to a fully functional supply chain data system. The data system allows a firm to respond to changes in the supply chain in a timely manner because they have access to real time data. The system also allows the firm to process large amounts of information in a very complicated system of transactions and planning. Finally, the data system results in a huge increase in resource utilization which results in increased performance, which leads to customer satisfaction. With all these benefits, there are still many places in the system that can result in disaster for the firm. It is very important that all the information in the system is accurate. For example, if the weight of a product is wrong in the data system, the system will estimate an inaccurate number of products allowed on a truck load and this will result in an issue with logistics. (Bowersox 2010)

The information sharing systems and databases that have been developed for tracking of product are in place because they were demanded by the customer, and fulfilled by the suppliers. They have led to an increase in efficiency, and decrease duplications and inconsistencies in the central databases. The functions of the information sharing systems span across the whole supply chain system from customer accommodations, logistics, manufacturing, purchasing, and inventory deployment. But the tracking of product by the manufacturer stops once the retailer has possession of the product. At this point, the data is no longer shared between manufacturer and retailer, and this is where the majority of products become unsaleable.

The retailer does not share information with the manufacturer on the product until the product becomes unsaleable and is required to go through the reverse logistics system. This system is explained in detail later in the literature review.

1.2.1 Communication Technology

With the increasing complexity of supply chain systems, data systems would be nearly impossible to maintain if it were not for the use of communication technology. This section of the report will discuss the use of global data synchronization network (GDSN) and extensible markup language XML systems, and the use of automatic identification that is typically used in the forward and reverse supply chain.

There are currently over 20,000 trading partners using some kind of a GDSN system for monitoring the progress of trade goods (Bracken 2013). With a GDSN system, it allows suppliers to enter data into a system one time and share the data among its many customers, and allows retailers to access the data from many suppliers in one location (Bracken 2013). The most common GDSN system is electronic data interchange (EDI), which is "direct computer-to-computer exchange of business documents in standard formats to facilitate high-volume transactions" (Bowersox 2010, 121). There are currently no common standards in regards to the transfer of information in an EDI system, but in order for this system to work, there at least needs to be a standard between suppliers and retailers. EDI is used more commonly among businesses that need to handle large amounts of data because they are expensive to set up and they are used to handle very large amounts of information.

The next common system used for information transfer is XML, which is "a flexible computer language that facilitates information transfer between a wide range of applications and is readily interpretable by humans" (Bowersox 2010, 127). An example of the way a data

transmission looks is, <address> 123 main st. <address>. The information between the carrots

tells the system where the information is to go; in this case, the '123 main st.' is what will be

seen on the form under the address. XML has many benefits. The system is inexpensive to set

up, it is easily convertible to HTML so it is easy to maintain, and it is easily adjustable in case

for a need for deviation from standard forms. (Bowersox 2010)

1.2.2 Auto ID

The most common forms of automatic identification in the retail environment are

barcodes and radio frequency identification (RFID). These two forms of identification are

placed on individual products, shipping containers, pallet loads and truck loads for tracking of

information to be used in databases as described above. These systems are very useful because

they reduce the error associated with human inputs, and they are a huge time saver when it

comes to entering and looking up data. (Clarke 2011)

RFID is used mostly in the retail industry for tracking of containers and their contents in

warehousing and transportation. It is also used as an anti-theft device that will sound an alarm if

someone tries to leave the store with unpaid product. Since there is a high cost associated with

RFID, most manufacturers do not use it. But the manufacturers that do use it, only use it to track

whole pallet loads or cases of product. (Clarke 2011) To get the SKU information of products,

barcodes are the preferred method of tracking. Barcodes are used to track individual items,

cartons, containers, pallets and rail cars. Product information is scanned and sent to the central

database to track product progression through the supply chain using barcodes. Barcodes are

used at the retail store as well. They are used to ring up customer receipts, provide inventory

control at the store level, and used for the tracking of restocking needs. Barcodes are also the

main use in the tracking of product in the reverse supply chain. Since all the information on the

product is on the barcode, it is the easiest way to track product going through the reverse supply chain. (Bowersox 2010)

1.3 Product Flow in the Reverse Supply Chain

The first section of this part of the review covers the process of reverse logistics. It answers the questions: what is reverse logistics? Why do products need to enter the reverse supply chain? Who is responsible for the various processes in the reverse supply chain? Where do products enter the reverse supply chain? And how does reverse logistics affect the bottom line?

1.3.1 What is Reverse Logistics?

In order to define reverse logistics, it is important to first define logistics. There are several definitions for logistics, but the following definition gives a really good all-encompassing view of what logistics is and how it is utilized. "Logistics refers to the responsibility to design and administer systems to control movement and geographical positioning of raw materials, work-in-process, and finished inventory at the lowest total cost"(Bowersox 2010, 22). Basically, logistics involves the whole process of moving goods through the supply chain, from raw materials to the finished product, and then moving finished product from the manufacturer to the retailer to the customer, and all this while minimizing costs wherever possible.

Knowing what logistics involves, it is easy to define reverse logistics. "Reverse logistics can be defined as the reverse process of logistics" (Krumwiede 2002, 327). Many companies define reverse logistics in different ways depending on their specific need. Reverse logistics was first defined as a means of recycling used and excess packaging (Krumwiede 2002). Now, retailers and manufacturers view the definition of reverse logistics in different ways. "Retailers see reverse logistics as a way to get product that has been returned by a consumer back to the

vendor. Manufacturers tend to view reverse logistics as the process of receiving defective

products or reusable containers back from the user" (Krumwiede 2002, 327). The authors in the

paper titled *Going Backwards: Reverse Logistics Trends and Practices,* gives a more objective

definition of reverse logistics. They define reverse logistics as, "the process of planning,

implementing, and controlling the efficient, cost effective flow of raw materials, in process

inventory, finished goods and related information from the point of consumption to the point of

origin for the purpose of recapturing value, or proper disposal"(Rogers 1998, 2). Looking at the

two definitions, the conclusion can be drawn that "a reverse logistics flow is much more reactive

[than a forward logistics flow], with much less visibility" (Tibben-Lembke 2002, 272).

Now that reverse logistics has been defined, it is important to view the flow of

information and product in the supply chain and the reverse supply chain. The forward logistics

information flow is as follows: sales forecast, planned shipments to DC, shipment to DC,

shipment to store, put away at store, actual sales, and actual sales information is sent to sales

forecast and shipment to store to adjust shipments. The forward logistics product flow goes from

the distribution center, to the store, is put away at the store, and the sale is made. The reverse

logistics information flow goes from the customer returning an item, to return information going

to the distribution center, to sortation and disposition decision making. The reverse logistics

product flow goes from the customer returning an item, to items collected at the store, to

collection at the distribution center, to sortation and disposition decision making, and finally, the

product goes to disposition destination. (Tibben-Lembke 2002)

This shows that reverse logistics is compiled of four main processes that need to be

maintained to have an effective returns program. The first process is gatekeeping which "is the

screening of defective and unwarranted returned merchandise at the entry point into the reverse

logistics process" (Rogers 1998, 38). The second process is collection, which "is the accumulation of the products for the reverse logistics system" (Meade 2002, 287). The third process is sortation, which "is deciding what to do with each product" (Meade 2002, 287). The final process is disposition, which "is the sending of the products to their desired destination" (Meade 2002, 287).

1.3.2 Why Do Products Need to Enter the Reverse Supply Chain?

There are several reasons a product may need to enter the reverse supply chain. These reasons include five main types of returns: "consumer returns, marketing returns, asset returns, product recalls and environmental returns" (Rogers 2002, 3). Consumer returns are products that are bought by a customer at a retailer and are then returned to the store. The largest number of consumer returns are due to defects and "buyers' remorse". "Marketing returns consist of product returned from a position forward in the supply chain, often due to slow sales, quality issues, or need to reposition inventory"(Rogers 2002, 3). In other words, these are products that are returned because they, in some way, give the company a marketing advantage. Either they no longer look good to a company's image, are not selling well, or the company finds it makes more money with the product elsewhere. "Asset returns consist of recapturing and repositioning of an asset" (Rogers 2002, 3). These products are not sold to customers. Rather they are used to move product, such as reusable containers, totes and racks. Product recalls are products that must be returned to the manufacturer because of safety or quality issues. "Recalls can be voluntary or mandated by a government agency" (Rogers 2002, 4). Environmental returns include dealing with and disposing of products that are considered hazardous materials. These types of products are heavily regulated by the UN and other government agencies, such as the Environmental Protection Agency. (Rogers 2002,)

Among the above categories of returns, there are several more specific reasons a product must enter the reverse supply chain. These are known as reason codes. Each company has their own set of reason codes based upon their specific needs. But these codes can be put into five main categories: damage, discontinued, expired, seasonal, and no apparent damage. (FMI 2008, 12)

1.3.3 Where Do Products Go in the Reverse Supply Chain?

As stated previously, a product enters the reverse supply chain any time it leaves the forward supply chain. This can happen at almost any point in the forward logistics process. Anytime from manufacture to post-sale, product can incur some kind of defect that makes selling the product unfavorable. This section of the review will focus on the disposition of products once they have entered the reverse supply chain. Once a product is in the reverse supply chain, a firm has four options for the disposition of a product. These four are: reuse, product upgrade, material recovery and waste management. (Hazen 2011)

Reuse is only really an option when a product is returned by a customer and is still in new condition. Other than the store putting the product back on the shelf, the product can be "shipped laterally to another retailer, shipped back to the distributor, or shipped to any other place within the forward or reverse supply chain where stock levels require such an item" (Hazen 2011, 248). The issue with reuse is if it is not properly forecasted and accommodated for, the variability of the product can cause a "bullwhip effect within the supply chain and can lead to increased inventory" (Hazen 2011, 249). To avoid this, each item that is returned should be accounted for when ordering new product and offset product in the forward supply chain. (Hazen 2011)

"The product upgrade alternative is concerned with repairing, refurbishing, or remanufacturing an item in order to extend the life of and derive value from the original core unit" (Hazen 2011, 249). This option involves taking a product that is no longer able to be sold and, in some way, making it acceptable for sale again. "If executed properly, product upgrade can create profitable business opportunities through recapturing value that would otherwise have been lost" (Hazen 2011, 249).

Material recovery involves the taking valuable parts of a product out that can be used elsewhere. This process occurs when a product has reached the end of its useable life, and rather than completely destroying the product, part of the product is recycled for reuse. This can often be difficult as it can be more profitable to destroy the product rather than recycle it. (Hazen 2011)

Once a product has been determined completely useless by a company it is destroyed and goes through the waste management disposition. (Hazen 2011) This option is the last option to a company because they want to get as much value out of products as they can.

1.3.4 Who is Responsible for the Various Processes in the Reverse Supply Chain?

"Three choices can be made with respect to the development of reverse logistics functions: do nothing, develop an internal reverse logistics function, or find a third-party reverse logistics provider and partner with them" (Meade 2002, 285). This section of the review will discuss these three options, their pros and cons to a business and who is responsible for the processes.

The first option is to do nothing. Doing nothing with reverse logistics means everything that cannot be sold is being thrown away, or sent to the manufacturer. Product is only sent to the manufacturer if that is what the manufacturer requests of the product. This might seem like a lot

less annoyance than to deal with the products, but it is a huge waste of resources and can actually cost more than the other two options.

The second option is handling the reverse logistics process internally. This option has some handling of returns in-house which can be disruptive to the rest of the organization's operations (Meade 2002). This is also known as decentralized reverse supply chain with pre-ponement. In this process product returns and unsaleables are evaluated in the retailer or resellers facility and either restocked, scrapped or sent to a test and repair facility. This method requires testing specialty in the retailer or resellers facility to determine the proper mode of transport through the reverse supply chain. The product that is sent to the test and repair facility is then sent to be refurbished for resale or to a facility to recover parts from the product that can be used elsewhere. (Kumar 2011)

The final option is to partner with a third party reverse logistics provider. This is known as centralized efficient reverse supply chain, in which, unsaleable goods and product returns are taken from the store and placed in a centralized evaluation and test facility. From this facility the products are either restocked, refurbished, parts are recovered from the product or the product is scrapped completely. This method of reverse supply chain "sacrifices speed over cost efficiency and is typically applicable to products with shorter time/ value depreciation" (Kumar 2011, 5). After product is processed through the centralized evaluation and testing facility, credit is issued to the retailer, and "the retailer or reseller doesn't partake in any product evaluation" (Kumar 2011, 5).

1.3.5 How Does Reverse Logistics Affect the Bottom Line?

"Business organizations exist for the benefit of shareholders and stakeholders. When making the disposition decision, one must always consider the bottom line" (Hazen 2011, 259).

Throughout the distribution system, there is going to be damaged, outdated, and returned

products. This is why reverse logistics is needed. Without a well formed and implemented

reverse supply chain, there can be a huge loss in product resulting in a huge hit to a company's

bottom line. As stated in the document *Reverse logistics disposition decision-making*, "Costs will

endure to be a primary consideration in business decision-making", and how the reverse supply

chain is handled is a business decision that affects the profitability of a business (Hazen 2011,

258). With a good reverse supply chain in place, the impact of goods that make their way

through the reverse supply chain has a minimal effect on the bottom line. This section of the

review looks at how companies are using reverse logistics as a strategic advantage to reduce cost

of unsaleable products.

The first thing that needs to be discussed when considering the bottom line is the return

policy. This may beg the question, what does a company's return policy have to do with reverse

logistics? According to an article in *Warehousing Forum*, "Reverse logistics is all about

customer satisfaction. There is a direct relationship between customer satisfaction and the

company's return policy"(Greve 2012, 1). That being said, there are two main findings that

pertain to the return policy. The first is that the return policy has a great influence on where, and

how much people shop. The second finding is that some people abuse the return policy. An

example of abusing returns policies is people might buy a big screen TV right before the Super

Bowl and then return it in a week or two. (Skinner 2008) There was never any real intention of

buying the new TV, but they found a way to acquire a big screen TV for free for the Super Bowl

party.

When product goes through the reverse supply chain there is an asset loss of about 45%.

This loss is due to restock, refurbish, repair and remanufacture, and salvage costs, along with

product loss from scrapped product. There is also an asset loss due to product's value decreasing over time. (Kumar 2011). A "large retailer found that 25% of the profit of the entire firm was derived from its reverse logistics improvements during its initial phase" (Rogers 1998, 18). There is evidence of cost savings if you just look at the historical data that was presented in the FMI studies above. Every year, as the systems for managing unsaleables and reverse logistics improved, the companies would see a reduced cost associate with unsaleable products.

1.4 Grocery Damage versus Sustainability

There are three main ways in which companies are working to make their products more sustainable. The first is in light-weighting the package, the second is to look for an alternative material for the package that is more recyclable and more environmentally friendly to process, and the third is to eliminate secondary packaging. (Connolly 2009) But these practices can lead to many problems in the integrity of the package in distribution.

To relate the effect "sustainable packaging" has on the damage incurred by products, the definition of sustainable must first be defined. This is not an easy term to define as there is not a set rule that defines something as being sustainable or not. The term sustainable means different things to different people and business entities. "One of the most cited interpretations of 'sustainability' comes from a 1987 report by the Bruntland Commission on Environment and Development (formerly the World Commission on Environment and Development) that defines sustainability as 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs.' The definition [of sustainable] has evolved into addressing three measurements—environment, economic and social, a trio that is often referred to as the 'Triple Bottom Line,' and recognizes responsibility to all three

measurements" (Egan 2012, 22). The long and short of it is, the definition is constantly changing and can be interpreted in different ways.

Beverage companies have been at the forefront of light-weighting activities. This should be fairly obvious to anyone who has bought a case of water from the store in the last few years. It seems like every time you go the store the bottle walls get thinner and thinner. The question is, how far can the light-weighting process be taken before product damage starts costing more money than a company is saving on materials? There are many benefits to light-weighting. The largest benefit is that there is a cost reduction due to less use of materials, both to the manufacturer and the consumer. The package is also seen as more environmentally accepted since there is an increase in recycled product or less material in the landfills. But with these benefits, it is easy for manufacturers to get carried away with the potential savings and reduce too much. It is important not to lose sight of the purpose of the package, getting the product in the package to the end consumer without damage. When a bottle is not strong enough to make it through the supply chain to the end consumer or even too weak to make it through the bottling process at the manufacturing plant, there is an issue with excessive light-weighting. (Koss 2009)

Companies are finding that a more sustainable approach to packaging efforts is leading to an increase in sales. The reason is that environmental friendliness is very important in consumer buying decisions. The more the packaging can convey the efforts the company is making to make their packaging more sustainable, the more likely a consumer is going to be to choose that product over another product. (Connolly 2009)

A quote from *Sustainable Packaging in the Fridge and Freezer* explains company efforts for sustainable packaging in a very good way that needs to be considered in all company sustainability models. "Food companies must never lose sight that wasted food is the poorest

sustainable outcome. Regardless of how recyclable, reusable, biodegradable or compostable the package is or how few resources its production and distribution consumed, if the refrigerated or frozen food product is never sold—because it exceeded the expiration date or due to freezer burn—it fails and the sustainable contributions of the package are lost" (Egan 2012, 22).

While companies are making all these packaging changes to make product more sustainable and appealing to the consumer to increase sales, they need to also consider if the changes they are making are resulting in more product in the reverse supply chain. If a change in the packaging decreases cost of materials, and increases sales because of customer appreciation of the sustainability effort, the product could still be less sustainable if more product is ending up in the reverse supply chain due to the change.

This raises a very important question when looking at the balance between sustainability and damage. How does a company know if the packaging change is causing more product in the reverse supply chain? Tests can be done to ensure a packages integrity but they are time consuming and expensive, and companies do not want to spend time and money on something if they do not have to. This is why accurate and actionable information is very important in unsaleables management. If a company can have access to information on where and when damage is occurring on the product and in the supply chain, more accurate tests can be applied to specific types of damage, and the problem may even be able to be fixed without testing.

1.4.1 Damage Reproduction Testing

Standard distribution dynamics tests do not aim to reproduce specific types of damage, but rather aim to simulate a series of dynamic forces that are likely to occur. Examples of this include impact, vibration and compression tests. (ASTM and ISTA) On the other hand, types of damage vary by package and product type. For example, cans dent, flour bags break and apples

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bruise. As damage information becomes more specific, there is an opportunity to develop tests that better reproduce the damage.

For example, there is no standard test specific to denting damage of cans. The usual impact test for full boxes does not accurately replicate the denting damage in cans that is seen in the supply chain system. The reason is believed to be that most cases that are dropped in distribution are dropped on an edge or corner onto a yielding surface and not flat on a hard surface. This type of impact is the leading cause of damage to cans because it offsets the alignment of the cans and the edges of the cans cause dents in the sides of neighboring cans. To replicate this type of damage, the standard drop test needs to be modified. This is done by orienting the box on a shock machine so that the impact will occur on the edge of the box in contact with a high density Polyethylene foam cushion on the table surface. (Goff and Twede 1979)

Cans were found to perform better in tightly wrapped containers, rather than the standard corrugated box. Tighter packaging was found to reduce the main kind of damage done to cans, the can-to-can damage that occurs by offset cans in the corrugated container. Shrink wrap was considered as an option that might be better suited for can distribution. The benefits include that the fork lift operators can see the cans and sort out damaged product at an early stage in distribution. Catching damaged product early is a good way to reduce unnecessary shipping of damaged product which will reduce shipping cost. One of the outputs from this research is a table of common grocery damage types and some recommendations for tests to reproduce each type. (Goff and Twede 1979)

CHAPTER TWO: METHODOLOGY

Qualitative research methods were chosen for this study because it was unclear what would be uncovered, and because the goal is to gather information on a process and information flow. Quantitative information in this case would only allow for comparative observation and would not allow for actionable information. Qualitative research gives the opportunity for comparing the process from each retailer and manufacturer, and gives information that can be compared to find the best solution to the problem.

The case study method was chosen for this research for many reasons. The first among them is that the information in this study is exploratory. The questions being asked in the research are meant to explore actions being taken by businesses.   The case study approach also allows for behavioral analysis of business decision making as it pertains to unsaleables practices. It allows for comparative analysis of business practices and mapping of information and product flow.

The case study method was also used because data was collected through a series of phone and in-person interviews.   The study is comparing cases of several different firms. There were a total of five retailers interviewed, three manufacturers, and two third-party reclamation center providers, one of which was a donation center. Two of the retailers are small and independent, and the other three are large chains. The purpose of the interviews was to map process and information flow, discover who carried the responsibilities of the unsaleable product (and when the responsibility shifted), and understand methods of reimbursement, product disposition and information sharing.

There is a large amount of data transfer and sharing between the manufacturer and the retailer when the product is being shipped to the retail facility. Once product is no longer in

possession of the manufacturer, the two entities stop communicating about the product until the product becomes unsaleable. The goal of the interviews was to find out when the transfer of responsibility happens from the manufacturer to the retailer (and back again if the product becomes unsaleable), what the means of tracking data through the reverse supply chain are, what actions are being taken to reduce unsaleables and how disposition decision making is made for unsaleable product.

Information flow is analyzed and strategies are compared. The best practices of each firm are evaluated and considered for recommendation as industry standards.

2.1 Interview Questions

The interview questions were what the team came up with before starting the interview, but during the interviews other questions arose. This is the list of questions that were predetermined. The manufacturer interviews were conducted over the phone or by an in person meeting. The retailer interviews were conducted in person at the retail location with an accompanied tour of the operations; with the exception of one interview that was done over the phone. The third-party and donation center interviews were also conducted in person with an accompanied tour of operations. It is also important to note that some retailers and manufacturers did not want to disclose certain details of their operation and would not answer some questions.

2.2.1 Questions for Manufacturers

Each interview started with the simple request to "Tell us about your unsaleables program". This request answered many of the questions the research posed, and brought up new questions. The following, list the set of predetermined questions that were asked of each manufacturer.

What types of information does your company receive from retailers about unsaleables? Costs?

SKU-specific? Reason codes?

Who (what position in the company) is the unsaleables information gatekeeper? What

information do they have?

Who (what job position) is responsible for negotiating swell or adjustable rate damage

allowances?

What kind of unsaleables information would the company like to have? SKU-specific? Cost?

Reason codes?

Does the company contract with third-party providers to do audits of unsaleables on your behalf?

Does the company have a specific set of "reasons" for unsaleables that they can share? Do they

have a way to assign "blame" for those reasons (manufacturer vs. retail)?

How does your company use the unsaleables information that it does have?

2.2.2 Questions for Retailers and Third -party Providers

The questions asked in this section are the predetermined questions asked of the retailers

on the store visits, and the third party providers on the facility visits. The general idea of these

visits was to gain information on how they track unsaleable product and what channels the

product goes through. The following is not all the questions that were asked during the

interview, but are a general idea of what types of questions were asked.

Example questions:

Who is in charge, and how many, and which people determine the disposition of the product?

Who decides, and how is it decided what makes a product unsaleable?

Where does the product go when it leaves the retail facility?

How is information shared with your manufacturers?

How is product tracked when going through the reverse supply chain?

What is done with unsaleable information after it is collected?

What is the difference between JIR, ARP and swell policies?

CHAPTER THREE: RESULTS

It should be noted that first, the product is shipped from the manufacturer (vendor) to the retail or wholesale distribution center (DC). If damaged products are found on arrival at the DC ("over, short or damaged"), they are either disposed of or sent back to the vendor for a credit. This system is a well-established part of the transaction. The following case profiles map the route of products that are deemed to be unsaleable after the retailer has assumed ownership, and the route of information generated by the process.

3.1 Retailer 1: Uses a Third-party Provider to Handle All Unsaleables

Items that are removed from the store floor, and returns received by the store are sent to the back room of the store and sorted. If rejected products are considered hazardous, the products are wrapped in heavy duty bags and placed in buckets with the proper hazardous waste class. The UPC code is scanned to remove it from the store's inventory. If the product cannot be reclaimed, the product is destroyed at the store. If the product can be reclaimed, it is scanned at the store and then packed into banana boxes. A new bar ID code assigned to the box is associated, in the computer system, with the scanned contents. The boxes are palletized, identified by a bar-coded pallet tag that is correlated with all of the boxes, and sent back to the DC.

Next, trucks are cross-docked at the DC and the pallet code is scanned. This identifies every box and individual product UPC that is on a pallet. Likewise, the full truck has a seal identification that is associated with the pallet IDs on the truck.

The products are transported to the third-party reclamation center where the pallet ID is scanned and moved to a holding station. From the holding station, the pallets are moved to the scanning stations. When scanned, the box ID tells the scanner what was placed in each box.

Then the boxes are unpacked, each individual item is scanned, and the computer directs the worker to the proper disposition destination. There is a new UPC generated for each item and the handler has three options for disposition; destroy, send to liquidation, or send back to the manufacturer.

If the product is sent back to the manufacturer, the product is placed in a color-coded tote based on its disposition. The items are then scanned again for verification and boxed to be sent back to the manufacturer.

If the product is to be sent to liquidation (usually resale on the secondary market), the items are placed in banana boxes that are going to the same disposition. A new label is generated and placed on each box. The boxes are then palletized based on disposition and a new pallet ID is generated. The full pallets are then placed in a liquidation holding station. Depending on disposition, the product is either donated, shipped to a secondary market, or the product is destroyed.

3.1.1 Who Aggregates Data?

The third-party provider is responsible for collecting data for the retailer and consolidating the information into weekly reports. Before the third party was used, Retailer 1 did not have the information that they currently have to track, understand and negotiate allowance programs. The third-party reports contain various pieces of information that the retailer can use to pinpoint major problems and improve the process of reducing unsaleables.

The third-party reports include: the number of returns by store, the number of returns by UPC, and the percent of product that has been destroyed, moved to secondary market, donated or returned to the vendor. Sometimes, the retailer will put a program in place for the third-party provider to track the progress of specific products. This is common among items that tend to

have a high level of returns. An example of such a program is the tracking of seasonal products, or products that tend to go out of code date regularly. The third-party tracks the progress of these programs to determine the most efficient way to reduce returns on these products.

3.1.2 Where Does the Information Go?

Once the retailer has the report from the third-party provider, the retailer compiles a one-page report for each vendor that is given to the retailer's merchandiser. The merchandiser then uses this information to negotiate damage allowances with the vendors.

3.1.3 How Does Retailer 1 Share Data?

The vendors have access to the information from the third-party provider, but the retailer does not have a good sense of how often the vendor looks at the information. The only vendors that seem to discuss returns with the retailer are the vendors that have the product returned to them.

When a vendor notices they are having problems with a specific product, they will sometimes come to the retailer with new packaging changes. This will sometimes result in a decrease of returns for that product. There is very little direct sharing of information between the retailer and the vendor because there is a lack of trust when it comes to unsaleables. The only time there is any routine sharing is in negotiation of the returns rate.

3.1.4 Success Story: Bags and Labels

When Retailer 1 found excessive damage to some bags and labels, the unsaleables manager met with the vendors to identify the opportunities for packaging improvement. When the manufacturers did change the package, Retailer 1 tracked the reduction in damage, and rewarded the manufacturers with a lower ARP rate.

Figure 1: Retailer 1 Process Map
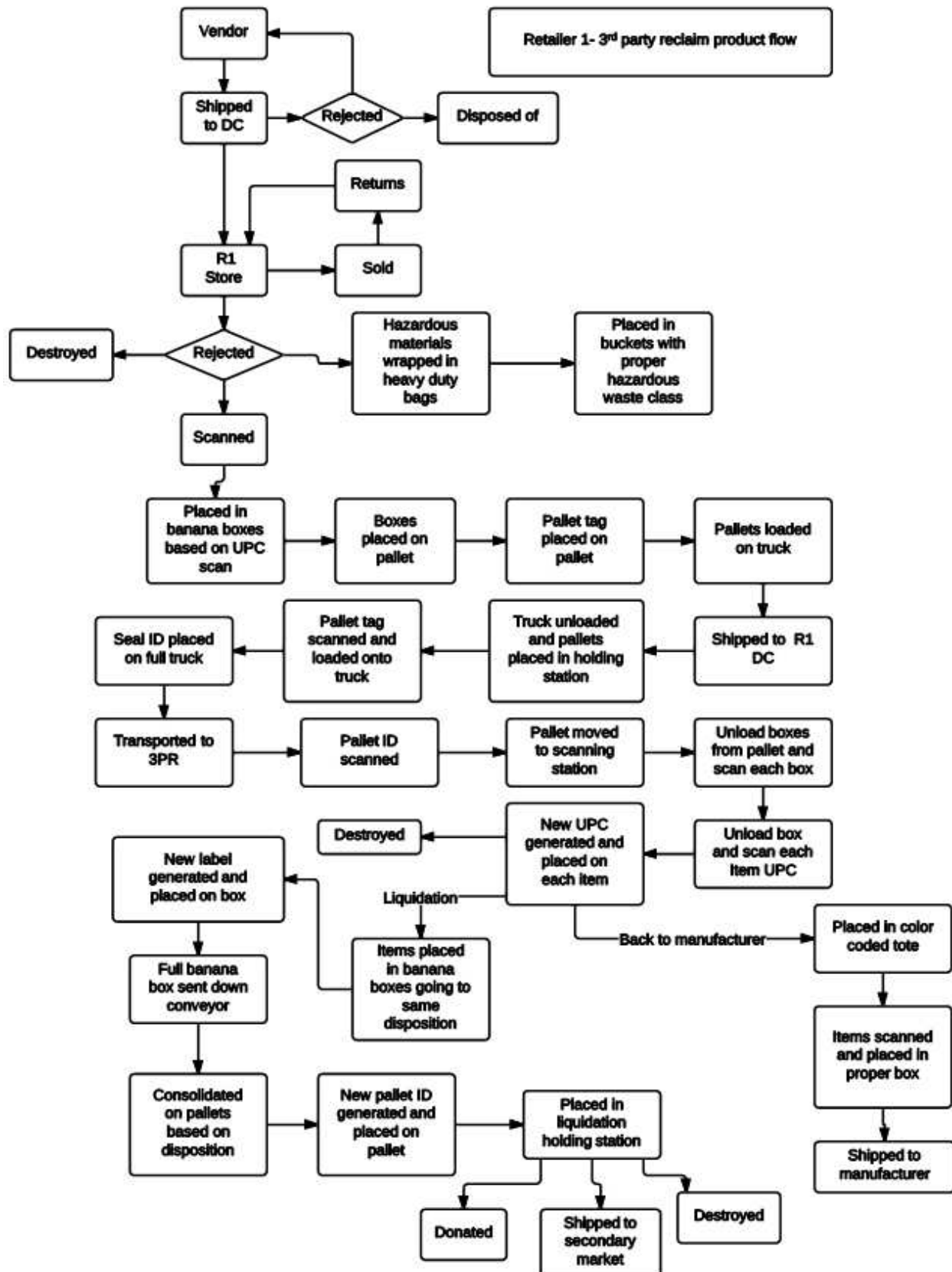
3.2 Retailer 2: Donates to a Charity

Unsaleable products are moved to the back room and sorted. Products are returned to the shelves, discarded, moved to the markdown section, moved to hazardous waste, returned, or sent to a food bank charity. Disposition is based on the negotiated agreement with the manufacturer and the condition of the goods. Discard is specified by some manufacturers and is used if the package is too damaged for use. The markdown option has grown based on positive feedback from "loyalty card" customers. Instead of paying a third-party reclamation center that generates 20% of cost in the secondary market, the food bank option has been chosen. The company has a philanthropic philosophy and prefers the combined financial benefits of selling marked-down product in its own stores and receiving 16% of cost in donation tax credits.

An experienced worker is responsible for scanning and sorting unsaleable products in the back room. This worker is knowledgeable about the system and how it works. A wrist-mounted scanner prompts the worker to enter a reason code and determine its disposition. There are ten reason codes to choose from: theft, reclaim, corporate/brand damage, mispick, quality damage, out of date, warehouse returns, item recall, daily donation, and warehouse damage. Retailer 2 has found that limiting the number of reason codes and employing knowledgeable store-level personnel are keys to a reliable system.

If the product is sent to markdown, a new barcode is generated and placed over the old barcode, and the product is put in the markdown section to be sold. If the product cannot be sold in markdown, it is taken off the shelf and moved to the back room to be processed again. If the rejected product is a hazardous material, it is placed in a bin with the proper hazmat class, and these items are picked up by a third-party entity. If the product is destined for the food bank, the items are placed in banana boxes, each box tagged with the store number and division, and the

boxes are shipped to the retailer's DC. At the DC, the products from multiple stores are consolidated onto pallets and shipped to the reclaim center that supplies the food bank.

At the reclaim center, the items are scanned and sorted. Products that are to be held for the vendor are packed in boxes and then shipped to another center for processing. At the second processing center the products are reconditioned or salvaged if possible. Products that are to be donated are loaded onto pallets, and then volunteers take the products off the pallet to be sorted into gaylords based on the product type. The gaylords are then shipped to the food bank location.

3.2.1 Who Aggregates Data?

The information is collected in two places: from back-room scans and from scans at the reclamation center. Both scanning systems are owned by Retailer 2.

3.2.2 Where Does the Information Go?

The information that is collected at the retail store is kept by the retailer for internal use, but is not routinely shared with a manufacturer, in part because of mutual mistrust. Items that cause the most problems are reported to Retailer 2's category managers once per period. Retailer 2 uses the data to pinpoint problem products and to change processes to reduce the number of unsaleables.

3.2.3 How Does Retailer 2 Share Data?

The information gathered at the reclamation center is visible to both retailer and vendor.

This data, which does not include the reason codes, is accessible to vendors through a portal to the reclamation database.

3.2.4 Success Story: Bags

Two vendors supply a product packed in bags. One company switched to stronger bags, cut the rate of unsaleables in half, and was rewarded by negotiating a better unsaleable allowance. The company that did not make the change was denied an allowance reduction, based on the fact that Retailer 2 had the data to support the denial. Retailer 2 believes that other retailers gave both companies the allowance reduction because they did not have the data to show the difference.

Figure 2: Retailer 2 Process Map
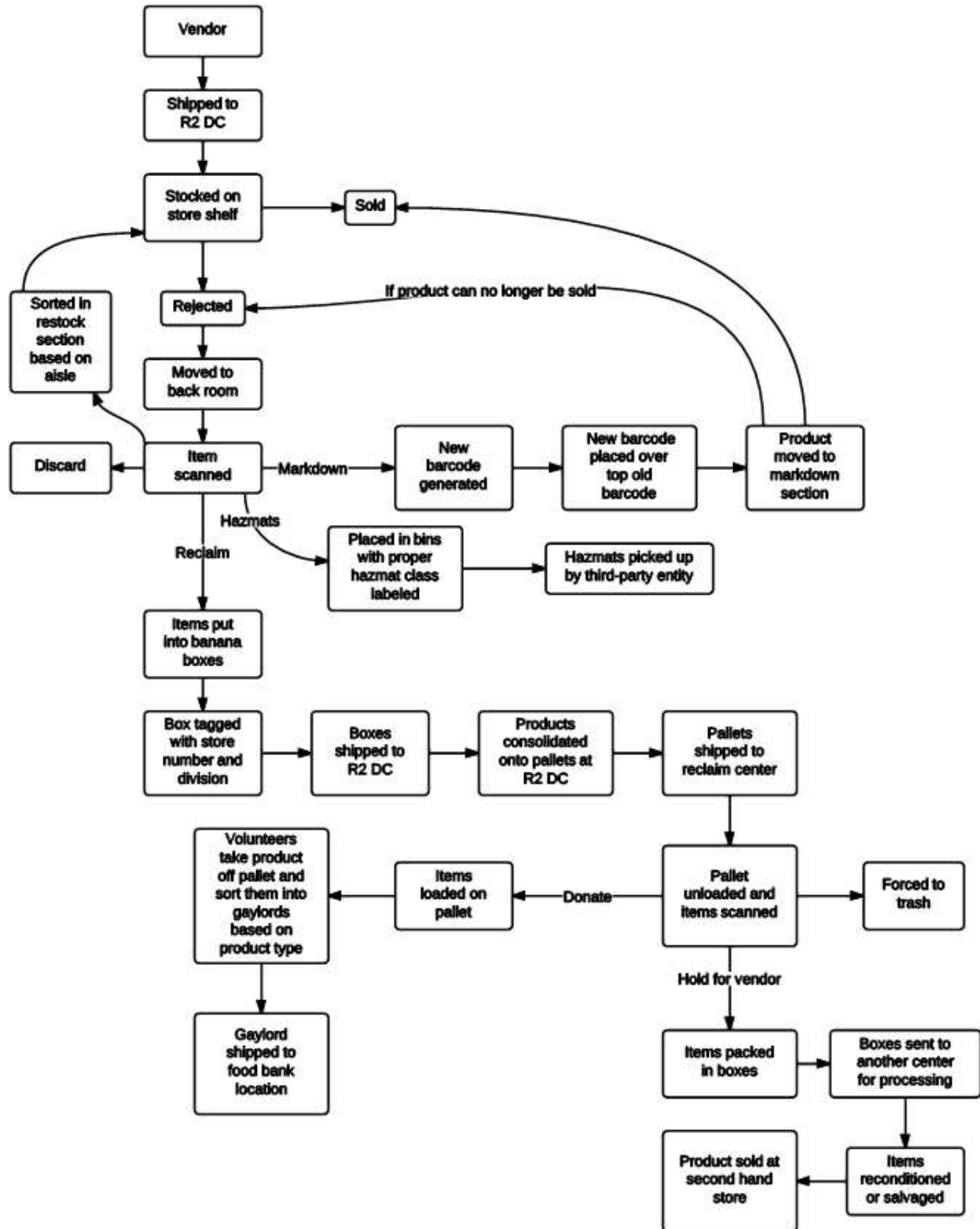
3.3 Retailer 3: Uses a Third-party Reclamation Center

If there is damage upon arrival to a store, the product is put in boxes in the transportation damage section to be sent to reclaim. All other products are stocked on the shelves. From here the product is either sold, rejected due to damage or out-of-date, or discontinued due to lack of sales. If the product is sold, the product is sometimes returned, and in that case it is moved to the back room for processing. If the product is discontinued, it is moved to a markdown section of the store and, if it is not sold, is eventually moved to the back room. All rejected product is moved to the back room for sorting.

The product is sorted at the store into three categories: transportation damage, out-of-code date, and all other damage. Once the product is sorted into these three categories, it is shipped back to the retailer's DC, where it is consolidated with other stores' unsaleables and shipped to the reclamation center. At the reclamation center, the product is scanned and either returned to the manufacturer, sold through secondary markets, donated or sent to salvage.

3.3.1 Who Aggregates Data?

Retailer 3 uses an ARP return policy. They adjust their rates using data from the reclamation center as well as a series of periodic audits. Retailer 3 generates data at the reclamation center, and has its own office there. It prepares reports at the SKU-level for manufacturers with the following categories: out-of date and transportation damage -- compared to total sales in units, dollars gross margin and unsaleable rate.

Retailer 3 has nine years of audit data, sorted by UPC and tracked by causes. The audits are conducted by a third-party provider. The unsaleables manager says, "Granularity happens on the tail end, especially once we find something with a problem."

Retailer 3 is committed at the highest level in the company to managing unsaleables. The unsaleables department, which reports to operations, is powerful. It has its own P&L out of which the department pays for reclaim and gets salvage sales. Retailer 3 has an experienced analyst to track data from the reclamation center and audits, and the company manages the process by holding the unsaleables managers of each store accountable for reducing damage, and by fiercely negotiating unsaleable agreements with vendors.

3.3.2 Where Does the Information Go?

Reports are generated for internal management use. Reports are all-inclusive, not just a function of the audit.

Retailer 3 does not give manufacturers access to the actual data, but does share the SKU-level data from the reclamation center.

3.3.3 How Does Retailer 3 Share Data?

If there is a serious problem with a specific product, Retailer 3 contacts the manufacturer to find out what is causing the problem. When this happens, the manufacturer sends someone to the store so they can see what the problem is first hand. Other than that, the company does not require any previous damage control testing for products. Information on the SKU level is shared with manufacturers in the form of a monthly report.

3.3.4 Success Story: Crushed Cans

Retailer 3 found a large number of dented cans "all of a sudden," across some of one manufacturer's SKUs. This triggered a meeting with the manufacturer and a "battle" until a senior manager confessed to purchasing inferior cans. Access to timely data was sufficient proof to force the manufacturer to compensate the retailer for full value. Some other retailers did not get the same compensation.

Figure 3: Retailer 3 Process Map
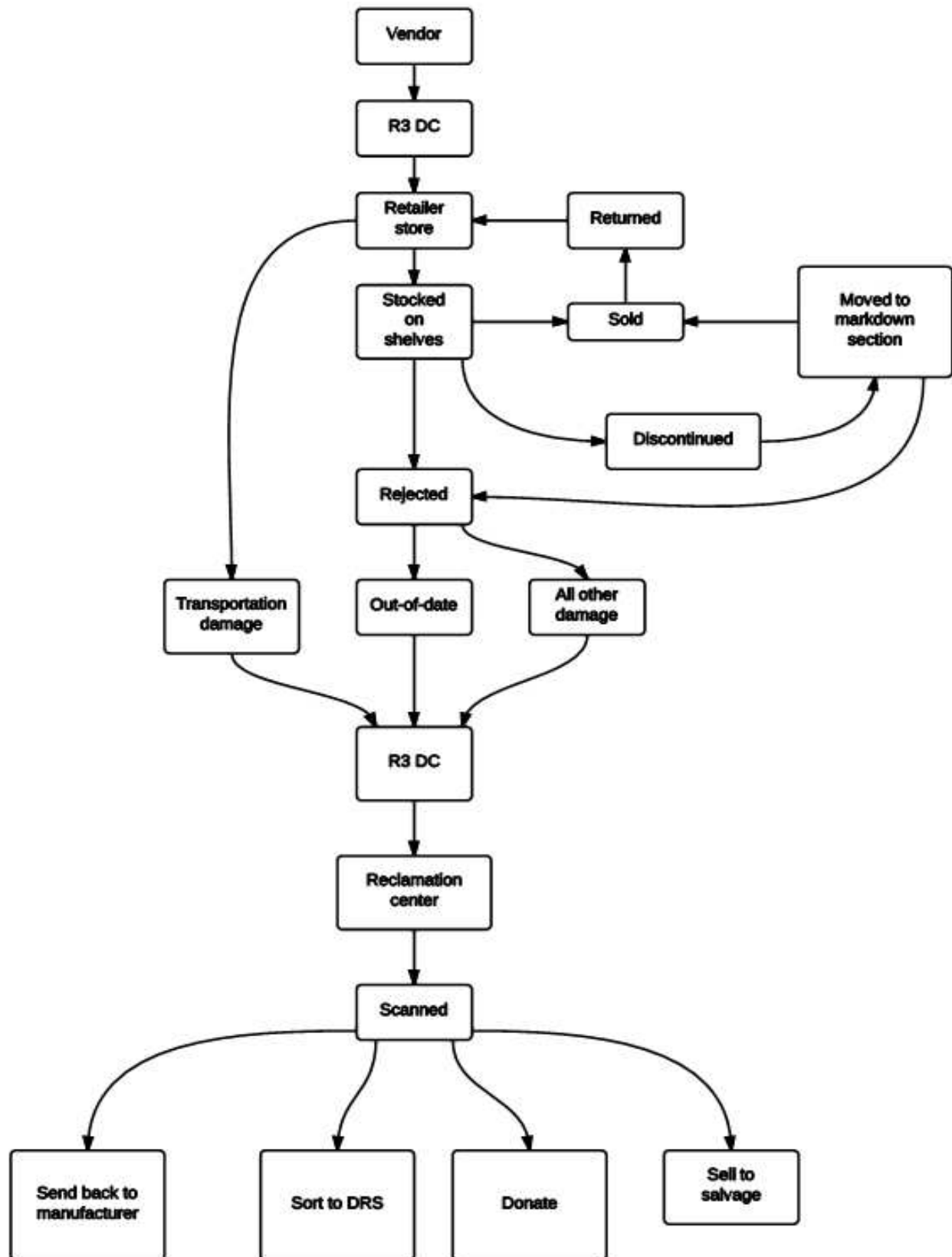
3.4 Independent Retailers 4 and 5, Supplied by Wholesaler

The product that does not sell is moved to the back room and either destroyed, sent to reclaim, or sent to markdown.   If the product is sent to markdown, a new barcode is placed on the item and it is moved to the markdown section of the store. This product is either sold or, if it does not sell in the allotted time, it is rejected and moved to the back room. There is a chart in the back room that tells the workers the disposition of the items.   If the item is on the chart, it is destroyed at the store. If the product is not on the chart, the item UPC is scanned and the items are placed into banana boxes. If the item is perishable, the product is dumped and just the packaging goes into the banana box. The banana boxes are then shipped to the wholesaler's DC. The wholesaler deals with reclamation, and the process was not followed any further.

3.4.1 Who Aggregates Data?

Since the wholesaler gives compensation for unsaleables, there is not any type of third-party reclamation that is visible to the retailers. The items going back to the wholesaler are scanned at the retail store for internal use only, and the wholesaler does not have access to this data. The wholesaler gives the retailers a quarterly report, but the retailer does not match it up with the scan data because it is not worth the time. The retailer accepts the wholesaler's swell allowance for the products.

Retailer 4 even goes so far as to assign reason codes, just in case the company might sometime in the future want them. It has great concerns about out-of-date product, because when the company buys, it has no information about a given lot's shelf-life. Retailer 4 would most like manufacturers to better communicate code dates as part of the purchasing process, and a date on each shipping container would be even better.

Overall, the independents seem to do the best job of minimizing and salvaging unsaleables in the store. One respondent summed it up: "I have no power, no illusion. I take what I can get and minimize what goes back, period."

3.4.2 Where Does the Information Go?

The information is used internally and is not shared with vendors or the wholesaler.

3.4.3 Success Story: Out-of-Date Mayonnaise

Independent retailers, like these, once ordered full pallet loads of products that were offered on discount by wholesalers. Mayonnaise, which is in high demand in the summertime, was cited as an example where forward buys may have been made to gain a discount as well as ensure product availability. Formerly, when the mayonnaise was packed in glass jars, it had a much longer shelf-life. However, since changing the packaging to plastic, the shelf-life for mayonnaise is shorter. Smaller retailers can no longer purchase in larger quantities as they risk increasing unsaleables due to out-of-date codes. Ordering in smaller quantities, more frequently, not only adds costs to retailers, but may also increases the risk of stock outs at the store.

Figure 4: Independent Retailer Process Map
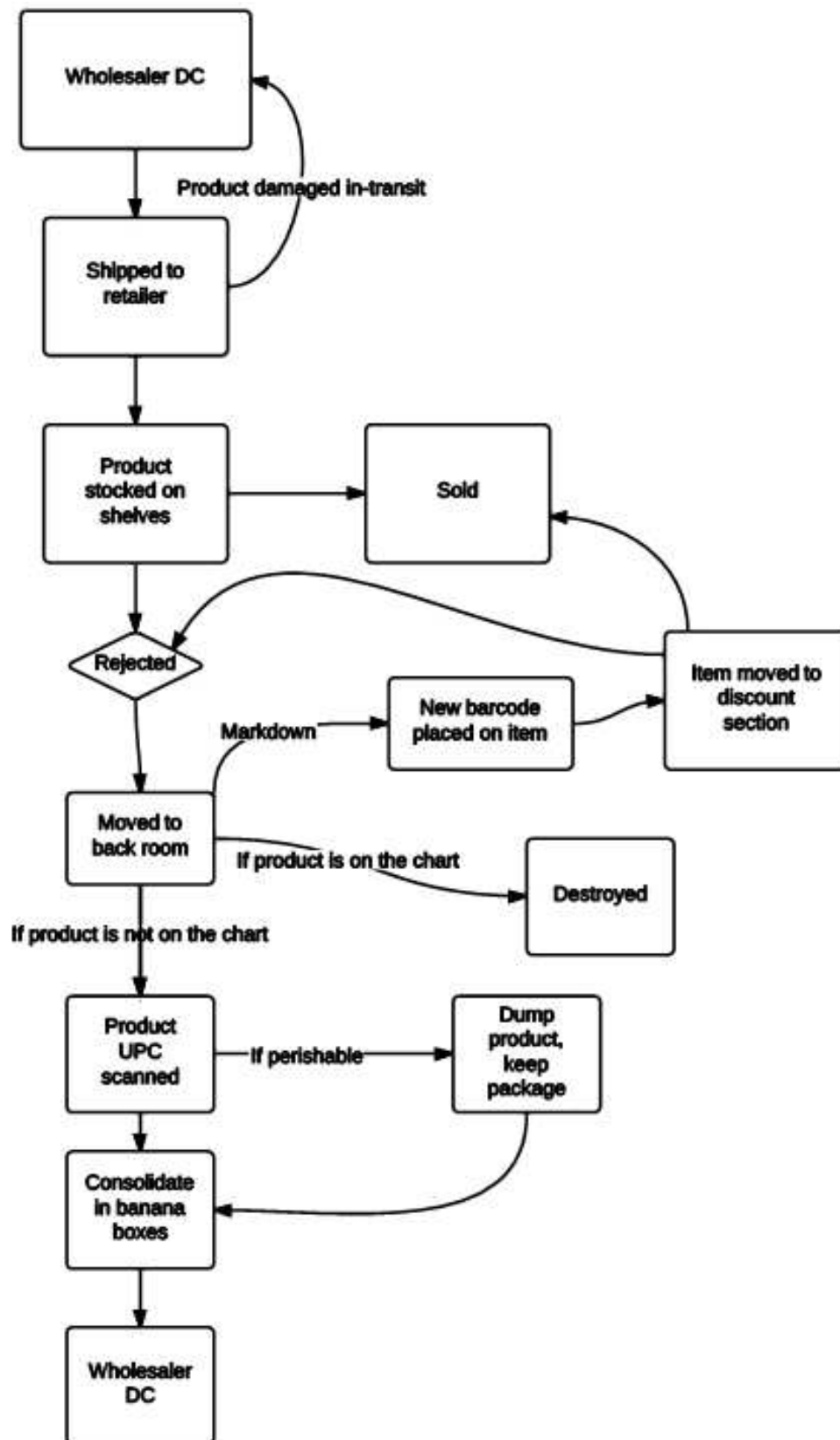
3.5 Manufacturer A

Manufacturer A adjusts its rate of reimbursement on an annual basis. Because the information gathered by retailers varies greatly, the manufacturer does not necessarily trust the data. Instead, retailer feedback is just one type of data Manufacturer A uses.

Manufacturer A relies more on data from audits conducted internally and by third parties to propose the returns rate policy. The third-party performs over 100 weeklong audits per year, at retail stores and DCs, and at the manufacturer's DC, simultaneously all over the country. It analyzes the data by plant and even by trailer. The third-party has about thirty reason codes, including cut open, open flaps, crush (vertical, horizontal and corner), ink rub, visual, code date is missing or misprinted, etc.

Manufacturer A has the vision of applying quality control principles to distribution. The information gathered in these audits is shared with the retailers so they have the opportunity to improve, and it is used internally to rate packing lines and packaging teams. The company is proud of the fact that its audits and unsaleables management focuses on improvement and not just accounting.

The manufacturer heavily invests time and money into gathering information from the audits. This company has nine personnel that work on the unsaleables team. These personnel have elevated status, above the common "shrink manager." Their status gives them protection from blame and continuity as they uncover problems. The unsaleables team reports their findings and data to sales, and the salespeople execute the policy. Through taking a proactive approach in monitoring and gauging its unsaleables, this manufacturer has been able to reduce its total unsaleables and reimbursement rates tremendously.

The data Manufacturer A collects from external and internal audits is not only used to determine reimbursement rates, but is also shared with customers so the customer can work on areas where they may be lacking. Most customers seem to appreciate this information. The information that is gathered is used primarily in annual meetings to negotiate the unsaleables rate.

Manufacturer A relies more on its own audit data than data generated by retailers. The main reason is a lack of trust. The manufacturer looks at information gathered by retailers, but does not use the data for ARP negotiation. Just as retailers look at and consider the audit information from Manufacturer A. The third-party gives a non-discriminatory look at the data and determines the reimbursement rate.

3.5.1 Success Story: Hold Packaging (and Everybody Else) Responsible

Manufacturer A "turns data into dollars." It knows the contribution to damage from every packing line, plant and DC. The company creates goals, metrics and accountability, including holding their Packaging professionals responsible for excess damage. It gives packaging professionals a broader viewpoint, cradle-to-grave. For example the manufacturer found problems with open perforations that the Packaging department went on to solve.

3.6 Manufacturer B

This manufacturer uses a policy for its unsaleables that is in line with the original 1990 JIR policy. It uses a third party to provide audits to adjust the rate based on real-time, fact-based data at the SKU level.

The data that Manufacturer B would like from retailers is SKU-level with reason codes as to what specifically the damage was, and where on the package the damage occurred.

Every retailer has a different format, and Manufacturer B would very much like to have an EDI standard implemented with fields that everyone is familiar with.   For example, over 98% of all customers pay via EDI, which can be a model for unsaleables information interchange too.

When Manufacturer B conducts audits, it uses eleven reason codes: tear, puncture (top, middle or bottom), foreign material, top or bottom failure, closure failure, dented product, crushed vertically, crushed horizontally, can leaking and can swell.

There are twenty people who work in the unsaleables department. These personnel spend a lot of time on customer audits. Along with these twenty people, there is an operations manager as well as two data analysts who work on identifying more significant trends in damage and returns.

3.6.1 Success Story: Improved Packaging Due to Damage Information

In 2002, Manufacturer B's audits identified top and bottom closure failure and puncture as the biggest problems. Since then, the manufacturer has adopted a stronger package that reduced these failures by 60%.   Through working with the customer to reduce its share of unsaleables, this company has reduced its reimbursement rate 36%, from 1.25% to 0.8%.

3.7 Manufacturer C

Manufacturer C uses an ARP that is adjusted on the basis of audits performed by a third-party service. The manufacturer uses the audit information and applies statistical algorithms to the data to determine the ARP reimbursement rate.

Manufacturer C also gets information from retailers, but it uses this information more as a basis for comparing retailers than for determining the reimbursement rate. It is difficult to partner with retailers in a systematic way because they use different tracking methods.

Manufacturer C has an unsaleables team that tracks and manages damage with the help of thirty-five supply chain personnel, some fully dedicated to a customer or region. They are the ones who negotiate the ARP. Manufacturer C has a cross-functional unsaleables advisory board that meets quarterly to discuss the ARP rates.

If there is an unusual damage spike for a specific product, Manufacturer C and the retailer will have a discussion about the issues with that product and come to an agreement on the course of action. This could include further reimbursement for the damaged product and/or an in-depth look at the cause of the unusual damage spike. The manufacturer has a new program for acquiring reclamation data to make the ARP more robust: partnering with a firm that associates reason-codes to the unsaleable product.

Another concern is that product can show up in secondary markets in a truly unsaleable condition. For example the manufacturer found its product being sold in garbage bags.

3.7.1 Success Story: Improved Packaging Due to Damage Information

Manufacturer C improved its packaging as a reaction to high unsaleable rates on certain products. It used to sell a granular product in expensive, but sturdy, three-gallon plastic pails. The company wanted to find something less expensive so it changed to paper bags. But when the bags experienced more damage, tearing and leaking, Manufacturer C began experimenting with boxes. The manufacturer is having problems with the boxes at the weak points where the handles are located, so it is now looking into a poly-woven reinforcement for the box that is strong enough to handle the weight of the product. In another example, overhang on the pallet caused significant damage to one SKU. Over a period of time, Manufacturer C was able to rework the packaging so there was no more overhang and damage was reduced. Another problem Manufacturer C faced involved paper labels coming off its plastic bottles due to scuffing from

vibration in transportation. To solve this problem, the company changed the paper label to a sturdier plastic label.

These problems were identified by the collecting and sharing of information in the reverse supply chain and audits.

3.8 Third-party Reclaim and Audit Service Provider

Third parties play an important role in the grocery unsaleables process. There are two types: reclamation centers and audit service providers. These third parties are the current gatekeepers of information.

The reclamation centers process some or all of a retailer's unsaleables, providing an accounting of the volume and cost. They resell most of the goods on the secondary market, or (depending on the terms of the agreement with retailer and manufacturer) return or destroy them. They are willing to provide data at whatever scale is desired by the retailer. They charge for the service on a per-package basis, and reimburse the retailer a percentage of the resell price.

Audit service providers may or may not be affiliated with a reclamation center. They contract primarily with manufacturers, but also sometimes with retailers, to conduct market audits. They survey every product in a limited number of markets and distribution centers for a prescribed length of time. The number of saleable products is compared to unsaleable, and reason codes are associated with all unsaleables. Audit service providers have a large arsenal of extremely specific reason codes. For example, glue failures are distinguished from cut-open damage and bags that are open on the top are distinguished from bottom-end failures, as well as from tears and punctures in the body of the bag.

CHAPTER FOUR: FINDINGS AND RECOMMENDATIONS

This section summarizes the results from the report produced for the sponsors of this study (Twede, Whipple, Clarke and Sanders 2014) and amplifies on the packaging implications.

4.1 Proactive versus Reactive Unsaleables Practices

Retailers and manufacturers deal with unsaleables in two main ways: proactively or reactively. Proactive strategies are those that deal with unsaleables by trying to manage and reduce the number of unsaleables. Reactive strategies are those that try to dispose of unsaleables as easily and inexpensively as possible without trying to reduce the number of unsaleables in the reverse supply chain.

Proactive retailers use several different strategies and they have executive management in charge of the practices. They reduce and manage unsaleable product through internal efforts and by working with third-party retailer providers. Strategies include: making unsaleables management a part of the sustainability initiative, using it as a tool to reduce cost of disposal, partnering with local food banks to give back to the community, and utilizing tools like a markdown section for items that are close to being expired. The proactive retailers show initiative from the top down. Getting senior management involved in dealing with unsaleables management ensures the necessary resources are available for proactive approaches.

The proactive retailers incorporate new and more sophisticated information tracking systems. Apart from simply tracking information, they also share it with manufacturers to strategies new unsaleables reducing practices.

On the other hand, smaller, independent retailers have a more reactive approach. The main focus for dealing with unsaleables is to use a markdown in the store only, trying to sell off

as much product as possible in the store. If they could not sell the product, it was either discard or sent back to the wholesaler.

Proactive manufacturers collaborate with retailers by sharing information, using third-party auditing processes, and conducting audits internally. An example of proactive collaboration with retailers is to make packaging changes to products that are damaged consistently in the same way. By collaboration, they are able to discover the problem with the packaging and remedy the situation at a lower expense than if the manufacturer attempted to do it alone. Auditing is done by many manufacturers to discover weak areas, and used as a tool to effectively reduce unsaleables.

Another reason for a proactive approach to unsaleables is to protect the integrity of the manufacturers' products. One manufacturer reported one of their products being sold in a second-hand store in garbage bags. By taking a proactive approach, they were able to discover this and find the root cause of the problem and fix it.

All three of the manufacturers that were interviewed are classified as proactive, but there was reported reactive behavior by manufacturers includes collecting data but doing nothing with it, and disposing of product that still had potential value.

4.2 Retail Unsaleables Data

All retailers interviewed, proactive and reactive, have unsaleable data. The barcodes are scanned on all unsaleable products at the retail store for stock-keeping and disposition purposes, and sometimes reason codes are assigned. There is further scanning done at reclamation centers if one is used.

Retailers use data for at least one of the following purposes:

1. Product is removed from inventory and sorted based on the manufacturer agreement into resell, donate, or return to manufacturer.

2. Data is aggregated by the store to better manage unsaleables on the store level. This includes rewarding good store performance and punishing bad store performance.

3. Data collected by stores is used to negotiate ARP rates with manufacturers.

Proactive retailers go a step further by using the data collected by manufacturers to identify improvement opportunities. These retailers use the data that is collected in negotiations with manufacturers in the ARP rate, and use the information to recommend improvements for packaging and inventory control.

Granular data is very important in order for a retailer to continually improve its strategy. By tracking information at the SKU level, or the vendor level, retailers can calculate detailed cost information. They can determine unsaleables as a percent of store sales and/or as a percent of vendor total reclaim. This information can be shared with vendors to find areas where they can improve.

Retailers 1 and 3 make the information collected at the third-party reclamation center available to manufacturers in the form of a monthly report. Retailer 2 allows direct access of information at the reclamation center by use of a cloud-based sharing system.

Retailer 1 separates damage, recall and "store throw to compactor" on their reports for ARP negotiation. This provides a powerful tool for negotiating ARP rates with manufacturers, but the lack of SKU level data hinders their ability to identify opportunities for improvement. The SKU-level data is available to both the retailer and the manufacturers electronically, but it is rarely used unless there is a specific noticeable problem that needs to be addressed.

Retailer 3 has a slightly more advanced process than Retailer 1. Retailer 3 is committed from the top of the company to managing unsaleables. They have a powerful department that reports to operations, and they have their own P&L from which they pay for reclaim and get salvage sales. On top of the third-party audits that are shared with manufacturers, Retailer 3 also conducts its own audits that are sorted by UPC and tracked by causes, and have nine years of audit data.

Table 2 shows information that is included in two retailer's unsaleables reports that they share with manufacturers. The two retailers use the same third-party reclamation center for processing unsaleables, but the way and extent to which they share data is quite different. If there was a standard way for data sharing, manufacturers would know which stores need more focus in the distribution channel. Since there are so many different ways of conveying the same information, it can be hard to determine unsaleable rates.

Table 2: Retailer 1 and Retailer 3 Reporting Information

Company name	Retailer 1	Retailer 3
Type of reporting	Annual report	YTD report
Length of Information on report	2 years of information	YTD information
Periods	13 periods/year	YTD monthly
Type of information	quantity and cost	quantity and cost
SKU level? Yes or No	NO	YES
Sub Categories	Processed in reclaim: Damage review, NDR Review, Recall Review; Processed at store: Store throw to compactor; Vendor total	UPC, Description of product, UPC status, Year to date, out of date, transportation damage, sales, GM $, cost $, Unsaleables rate%

Table 2 (cont'd)

Vendor Total information	Store sales (mix), Total non-saleables, Total NDR Value, Grand total, Actual non-saleable %	Vendor ID, YTD total reclaim $, YTD total Sales $, YTD GM $, YTD total net sales $, Unsaleable rate %, Swell payment $, Warehouse Dump $, YTD total reclaim Campbell's $, YTD Swell payment $, YTD loss/Gain $
Warehouse dump details		Vendor #, vendor name, UPC, Description, Item, Total Cases, Total cost, DC, Period, Reason
Calculations	Total non-saleables = Vendor Total extended cost - NDR review extended cost	Cost = sales $ - GM $
	Grand total = store sales (mix) + total non-saleables + total NDR Value	Unsaleables rate at sku level % = YTD $ INV/Cost
	Actual non-saleables % = Total non-saleables/Grand total * 100%	Unsaleables rate total % = YTD Total reclaim/YTD total net sales

The retailer with the most granular data is Retailer 2. They have ten reason codes to which they assign unsaleables: theft, reclaim, corporate/brand damage, mispick, quality damage, out of date, warehouse returns, item recall, daily donation, and warehouse damage. They are able to keep data consistent by using fewer reason codes, as well as having a couple well trained employees handle all the scanning and disposition of unsaleables. Retailer 2 uses internal reporting to compare stores, and identify manufacturer problems that are discussed during ARP negotiations. They do not share reason code data directly with manufacturers, but they do provide the manufacturers real time data as items are scanned at the reclamation center.

Retailers 4 and 5 are smaller independent retailers. They collect unsaleables data, but lack the resources and power to use the information to their advantage.

The information that retailers collect is mostly used as evidence in ARP negotiations with manufacturers, and to reward or punish certain stores for performance.

4.3 Manufacturer Unsaleables Data

Most manufacturers conduct audits of their own and/or use a third-party provider to conduct audits. They use audits for personal data collection and in ARP negotiations to assess retailers' claims. Some of the audits conducted for manufacturers are performed by third party providers who also provide reclamation services to the retailers.

The audits conducted on the manufacturer end tends to be in much greater detail with many more reason codes than retailers use. Manufacturers use as many as 100 reason codes that are very specific to package type. They go into such detail with reason codes because they want to narrow down exactly when and where the problem occurred in the supply chain. For example, manufacturers of bagged dog food has different reason codes for top seal failure and bottom seal failure. The reason is that one is sealed by the manufacturer and one is sealed by their supplier, so they can tell if it is a problem with their sealer or the supplier's.

Most of the audits conducted for manufacturers are done by third-party providers. They might also receive supplemental data from retailers, but they may mistrust the data for negotiation of reimbursement rates. Through audits done by third-party providers, manufacturers can get causal data. So if they realize a certain package is being damaged in the same way over and over, they can strengthen the package in that area. For example, one manufacturer was having a high rate of damage on one package. To reduce this damage they strengthened the package for a certain kind of damage. They thought this would fix the problem, but through the audits they found the problem was in the seal on the bag. They were able to strengthen that seal to reduce leaking because of the audit information.

Manufacturers receive information on a quarterly basis from retailers, but this information is mostly used in the negotiation of the reimbursement rate by the retailer. The information can offer some insight to the manufacturer about which products have a high rate of unsaleables, but the information is not granular enough to determine what the problem might be. They can, however, use this information to look further into one of their products.

4.4 Recommended Unsaleables Reporting Format

There is currently no standard way for retailers and manufacturers to track and report unsaleable data. Each one has a unique set of reason codes and different ways of passing information between parties. Therefore, it would be beneficial for all parties if they used a standard Unsaleables Reporting Format (URF) on the SKU level.

A URF would enable retailers to track the impact of package and shelf-life changes, compare the performance of their stores' stock rotation and handling operations, and make it easier for them to compare vendors. The following list of codes are chosen to reduce the probability of error and keep tracking and information exchange simple.

1. Beyond code date

2. Recall

3. Theft

4. Discontinued product, promotions and launches

5. Seasonal

6. Damage

7. Other

A system like this allows for easy electronic transmission of data, and make it easy to analyze and calculate the largest contributor to unsaleables. By tracking by SKU, it makes it

easy for manufacturers to see the most common failures in package protection so they can improve packaging changes. This also makes it easy to benchmark industry statistics to work towards a solution.

4.5 Reason Code Justification

The small number of reason codes are chosen to simplify judgment and sorting. The seven codes are chosen to make it easy to classify unsaleable types, and give manufacturers and retailers actionable information. The following describes the stipulations of each code.

1. Beyond-code date: These are items that have exceeded the designated code date assigned by the manufacturer. Since the code date is visible on the package, it is easy to assess and determine what to do with the product. Some stores choose to sell these items at a discount a short time before the code date expires

2. Recall: These items are recalled by either the manufacturer or the government, and are to be removed because of liability reasons. These need to be tracked to prevent resale on a secondary market, for customer safety and to allow for testing, detection and prevention.

3. Theft: This is a hard one to track since it is mostly only known about by gaps in inventory. Sometimes the product is stolen and the package is left behind, making it easier to track. It is important to track to compare theft problems across retail locations, and to see what products are more likely to be stolen so proper action can be taken to reduce theft.

4. Discontinued products, promotions and product launches: It is usually a collaborative effort between the manufacturers and retailers to decide to add or remove a product from the product portfolio or the store shelves. When the promotion is over, or a product is discontinued, there is leftover inventory that needs to be removed from the distribution chain.

5. Seasonal: Seasonal items have a short window to move product, so proper alignment with respect to supply and demand is crucial. Good forecasting is important for determining the proper amount of product to try and move, but there is often product leftover. Depending on the shelf life of the product, it can be saved for future sale, but it is usually removed from stores and distribution.

6. Damage: To cut down on mislabeled damage types, it is decided to put all damaged product under one category. By tracking by SKU, it is easy to determine trends in products that have damage, and find out what the greatest cause of damage is for that product. It also gives a performance of package change that is easy to measure in the early stages of the change.

7. Other: This code is assigned to any product that does not fit the description of the previous codes. An example is a store that has a policy to not put any product returned by customers back on the store shelves. This product does not fit any of the descriptions above, so it is placed in the other category.

4.6 Reason Code Assignment, Scanning and EDI Recommendations

Scanning and reason code assignment can occur in two places in the reverse supply chain; at the retail store, and/or at a reclamation center. Both of these will be discussed next.

4.6.1 In-Store Retail Scanning and Reason Code Assignment

Scanning in the back room of a retail store needs to take place to deduct unsaleable product from inventory, determine disposition, and assign reason codes. The same employee that scans the product should be responsible for assigning a reason code. This gives several advantages: store employees are familiar with store operations and policies regarding reason codes, and the reason codes can easily be entered into the handheld devise after the product is scanned.

4.6.2 Reclamation Center Scanning and Reason Code Assignment

Product is scanned at reclamation centers for accounting and disposition purposes, and employees can assign reason codes. The employees at these centers are trained in sorting for audits, so they have methods for training employees for code determination. Reclamation centers could go so far as to combine the reclamation data for retailers and the audit data for manufacturers, thus creating a collaborative information system that could be shared among parties.

4.6.3 Symbol, Software and Electronic Data Exchange (EDI)

Retailers' information about unsaleables is currently being shared with manufacturers in a wide variety of ways, and reporting is done at different periods. Different retailers use different software programs and methods of tracking unsaleables data making a computer based data exchange between retailers and manufacturers very difficult. If would require manufacturers to have all the different software that its retailers use to track data for meaningful data transfer and sharing. This discontinuity results in data not being transferred in a way that is actionable and could benefit the whole supply chain.

All retailers are capturing unsaleables data at the SKU level using the UPC barcode, but what is done with the information varies based on the specific retailer's corporate goals. The barcode is an excellent way to track data, but what is done with the information once it is scanned should be integrated.

One of the main uses of information technology is in the tracking of product in the supply chain so vendors can evaluate the travel history of the product. The reverse supply chain involves many operations including: testing and refurbishing at multiple facilities, routing of vehicles

between facilities, and scheduling of operations. All these operations need to be tracked and information technology can be a powerful tool in aiding in these functions. (Kumar 2011)

One application that would help in benefiting the transfer of data between all members of the supply chain is Electronic Data Exchange (EDI). This system was discussed earlier in the section on communication technology. The basic idea behind EDI is that it allows for sharing of business documents between computers using the internet.   It can be used for internal or external use, and can coordinated regardless of the different computer systems that different trading partners use. EDI would replace paper documents with electronic ones, increasing speed of transfer of information and reducing the clutter and inconvenience of paper copies.

With current systems of paper transactions, there are many different operations that must take place: extensive keying in of information, faxing, mailing, express deliveries and other transactions that can result in errors and high cost. EDI could reduce the manual data entry and manual transfer of documents, reducing the amount of errors, improve cycle times, and save money.

The standards for EDI are set and maintained by the Accredited Standards Committee, ASCX12, which is chartered by the American National Standards Institute. There are currently over 50 EDI transaction sets for supply chain management, but the transaction set for non-conformance is currently too general to be applied to unsaleables.

One of the largest hurdles with implementing an EDI system is the amount of initial startup cost, a personnel increase, and a training period. But once all the initial costs and inconveniences are over, the system will save time and money in the long run.

4.6.4 Opportunities for EDI

Current users of EDI for electronic ordering and invoicing have reported to have saved millions of dollars when compared to the paper based data transfer previously used. Research has shown that EDI costs at most one third of that of a paper based equivalent system. One major U.S. company reported a reduction in order costs from $38/order to $1.35/order by switching to an EDI system for order processing. (Trunda) EDI is recognized as a tool that can be used to create a sustainable supply chain, reducing paper, time and errors. It gives cost benefits, "green" benefits to all parties involved, and should be explored as to how this technology could be exploited further. (UK's grocery 2010)

With this in mind, it is recommended that EDI be applied to the reverse supply chain with a special transaction set that includes the unsaleables reason codes that were recommended previously. The system will provide a uniform way of reporting and benefit the whole industry. Table 3 shows a possible set of standard data transactions that could be used in transferring of information from retailers to manufacturers. This kind of automatic data transfer will increase communication, and provide fast access for actionable information.

Table 3: Recommended EDI Data

Information in Database from UPC Scan	Data pre-programmed into scanner	Manually added information

SKU data
Date Manufactured
Disposition decision
Location of Manufacturer:
    Name of company
    Street address
    City
    State
    Zip
	Date scanned
	Location of scan:
	    Name of facility
	    Street address
	    City
	    State
	    Zip
		Reason code:
		1. Beyond-code date
		2. Recall
		3. Theft
		4. Discontinued, promotions and product launches
		5. Seasonal
		6. Damage
		7. Other

4.6.5 Audit Recommendations for Reason Codes and Standard Tests for Different Types of Damage

      With the limited number of unsaleables codes recommended previously, there is an opportunity for further coding for manufacturer audits. In many instances, manufacturers want more granular data for audits, in particular with respect to damage. With this being the case, there is an opportunity for retailers or reclamation centers to assign more specific reason codes with respect to damage. An example of this data could be classified as (1) crushed or dented, (2) torn, punctured or cut; (3) all other damage. (FMI/GMA 2006)

      In most cases, when manufacturers do audits, they use damage codes that are more granular and specific for each package type. For example, manufacturers might have a different reason code for bag closure failure on the top of the bag and the bottom of the bag. The reason is the bag manufacturer seals the bottom of the bag and they seal the top of the bag after filling. This specific damage identified by specific codes helps manufacturers and supply chain specialists analyze and identify the root causes of the failures. Table 4 produces some typical types of damage. Some of these, like crush, open closure, cut, infested, etc. apply to all package types. Others are more specific. Examples include, crazing and hazing, which is exclusive to plastics, and dents and rust, which are exclusive to cans.

      Table 4 also presents an attempt to recommend standard test methods to reproduce specific damage modes. The damage types marked with QC are damage that may not be determined with standard tests, but can be checked as part of a quality control practice on a regular basis to ensure package integrity. A big thing relating to unsaleables that is missing from the table is determining shelf life. Shelf life is one of the largest causes of unsaleable product and will be discussed in greater detail later. It should also be noted that for a number of damage

modes, no standard test is shown. This may indicate a gap in package testing technology, as was

illustrated by the can dent story in the literature review, as well as test development to break

bagged flour and bruise fresh fruit in boxes. (Goff and Twede 1979)

Table 4: Test for Type of Damage to Product

Damage Type	Test Code	Description of Test
All packages		
Crush	ASTM D642	Test Method for Determining Compressive Resistance of Shipping Containers, Components, and Unit Loads
	TAPPI 804	Compression test for fiberboard shipping containers
Open closure	ASTM D2063/D2063M	Standard Test Methods for Measurement of Torque Retention for Packages with Continuous Thread Closures Using Non-Automated (Manual) Torque Testing Equipment
Improperly sealed	ASTM F2391	Standard Test Method for Measuring Package and Seal Integrity Using Helium as the Tracer Gas
Top/middle/bottom location		
Cut		
Leaking	ASTM D3078	Determination of Leaks in Flexible Packaging by Bubble Emission
	ASTM D5094	Gross Leakage of liquids from Containers with Threaded or Lug-Style Closures
	ASTM D4991	Leakage Testing of Empty Rigid Containers by Vacuum Method
Infestation		
Unlabeled or mislabeled	QC	
Over/short weight or partially filled	QC	
Crushed, dented or collapsed	ASTM D6537	Standard Practice for Instrumented Package Shock Testing For Determination of Package Performance
Soiled, stained, sticky, etc.		
Misprinted code date	QC	

Table 4 (cont'd)

Labels		
Coming off	ASTM D5252/D6252M	Standard Test Method for Peel Adhesion of Pressure-Sensitive Label Stocks at a 90° Angle
Scuffing	ASTM D5264	Standard Practice for Abrasion Resistance of Printed Materials by the Sutherland Rub Tester
Bad print	QC	
Off-center	QC	
Cans		
Dent,		
Middle or near chime location		
Swells		
Rust		
Cartons		
Cut-open	ASTM D5330/D5330M	Standard Specification for Pressure-Sensitive Tape for Packaging, Filament-Reinforced
Compression: clamp vs top-to-bottom vs corner	ASTM D642	Determining Compressive Resistance of Shipping Containers, Components, and Unit Loads
	ASTM D7030	Standard Test Method for Short Term Creep Performance of Corrugated Fiberboard Containers Under Constant Load Using a Compression Test Machine
	ASTM D4577	Standard Test Method for Compression Resistance of a Container Under Constant Load
	ISTA 4AB	Enhanced Simulation performance Test
	ISTA 2A	Packaged-Products Weighing 150 lbs. or less, Partial Simulation Performance Test
	ISTA 1A	Packaged-Products Weighing 150 lbs. or less, Partial Simulation Performance Test
	ISTA 3A	Packaged-Products Weighing 150 lbs. or less, for Parcel Delivery System Shipment, General Simulation Performance Test

Table 4 (cont'd)

	ISTA 2B	Packaged-Products Weighing Over 150 lbs., Partial-Simulation Performance Test
Compression: clamp vs top-to-bottom vs corner (cont'd)	ISTA 1B	Packaged-Products Weighing Over 150 lbs., Non-Simulation Integrity Performance Test
	ISTA 3E	Unitized Loads of Same Product, General Simulation Performance Test
	TAPPI 802 OM	Drop test for fiberboard shipping containers
	TAPPI 803	Puncture test of container board
	TAPPI 804	Compression test for fiberboard shipping containers
Bags		
Torn		
Burst	ASTM D5487	Standard Test Method for Simulated Drop of Loaded Containers by Shock Machines
Pouches		
Torn	ASTM F1278	Standard Guide for Use and Handling of Flexible Retort Food Pouches in the Processing Environment
Plastic bottles		
Crazing, hazing	ASTM F791	Standard Test Method for Stress Crazing of Transparent Plastics
Stress-crack	ASTM D5419	Standard Test Method for Environmental Stress Crack Resistance (ESCR) of Threaded Plastic Closures
Leaking closure	ASTM D2911	Standard Specification for Dimensions and Tolerances for Plastic Bottles
Missing closure or induction seal	QC	
Tamper-evident features breached		
Fresh produce		
Bruising		
Rotten		
Infestation		

Table 4 (cont'd)

Glass bottles		
Broken	ASTM C149	Standard Test Method for Thermal Shock Resistance of Glass Containers
Clear causes		
Pallet overhang		
Rail switching damage	ASTM D5277	Standard Test Method for Performing Programmed Horizontal Impacts Using an Inclined Impact Tester

Obviously it would be very time consuming and expensive to apply testing of this nature to all products a manufacturer produces. This is where the accurate and granular collection of unsaleables data can become utilized. A product that is suffering from the same type of damage over and over can be subject to a specific test that will determine the weak points of the package where improvement is needed, and relative performance of alternatives.

For example, with less granular data, it might be realize that water bottle flats are becoming unsaleable. Okay, but what is making them unsaleable? Maybe go so far as to say they are unsaleables because of damaged. Okay but what is the damage? Is it crushed? Leaking? Are they not full? Is there a puncture? The more granular the data about where the damage occurs on the package, the more likely the proper test is administered. So it is realized there is high damage on water bottles. Drop tests, vibration tests, vacuum tests and crush tests are then administered to see which one yields the most damage or is the weakest point and adjust the packaging based on the results. This could be a huge waste of time and money, especially if the weakest point is not even where the product is failing.

Granular data, such as the product is unsaleable because the bottle is crushed, allows for the knowledge to run a compression test to see if the product can handle the force of the

distribution channel. With this granular data, it is possible to avoid over spending and increase

product integrity.

Also, the moment a package becomes damaged is very important. Going back to the

water bottle example, a test might be run on the water bottle for the distribution channels from

manufacturer to retailer and the crush damage is well within the threshold of what is expected in

that distribution channel. But product is still coming back unsaleable for crush damage. Without

knowing that the damage was actually occurring in transit from the retailer distribution center to

the retailer store, money is being wasted testing the conditions of the manufacturer distribution

channels when that is not the problem.

4.7 Shelf-life

The research found that one of the most common reasons a product becomes unsaleable

is that the sell-by, use-by, or best-by date that is clearly readable by consumers on the package

has expired. Open code dating was something that was pushed by Walmart in 2004 and quickly

picked up by most manufacturers. Walmart demanded that all of their suppliers put an expiration

date on the package, or they would not be able to sell their products in Walmart stores. This

quickly translated to all grocery chains as customers demanded it and manufacturers found it

easier to put code dates on all products rather than just product going to Walmart. Many

companies already had code dates on product prior to this push, but did not have code dates on

all products, or used a "closed" code date that could not be decoded by consumers.

The result of this push for open code dating is that there are many different definitions for

the date, and a non-uniform determination of what the code should be. Many manufacturers put

a code date on the product that expires far before the product is truly unsaleable. Reasons for

this may be to prevent the spoilage before the code date expires. Or, in the case of cereal, the

product may become a little stale, but is not a safety issue. But manufacturers do not want to sell product that is less than their high quality, so they make sure to put a date on the box that will expire far before the product goes bad. This type of code dating takes the blame off of the manufacturer, while forcing many retailers to reject product resulting in edible product that is "expired" in the reverse supply chain. Some products can even be good years after the code date expires. An example is vinegar. Before open-code dating, vinegar had a shelf-life of seven years. The date on vinegar now is about one years. There is even a joke about vinegar among many people in the field. What is going to happen to vinegar after one year? Will it turn to vinegar?

4.7.1 Ship-life

The standard ship-life of grocery products is 90 days. That means the manufacturer can hold the product to within 90 days of the expiration date before shipping the product to the retailer's DC. This gives very little time for the retailer to ship the product to the individual retailers, and get the product on store shelves and sold before the product expires. One retailer that was interviewed said that 38% of their dry goods become unsaleable because of expiration, and the number is even higher for refrigerated goods. This high number of expired goods was attributed to the short ship-life of the product.

For the reasons stated above, it is recommended that the ship-life of the product be increased. This will give retailers a better opportunity to cycle through product in a FIFO management style, instead of trying to have to search for the product that is closest to expiring and getting it on the shelves as soon as possible. The problems with stock rotation will vary from one retailer and retail location to the next.

4.7.2 Shelf-life Estimation Testing

Shelf-life estimation should be based on scientific research for each product and package type. Different package types experience different types of degradation throughout their life, and provide varying degrees and types of protection. When choosing a package type for a product, it is important to consider what type of protection is most important in protecting the product.

There are five basic package materials that are used to protect product: plastics, metal (aluminum and steel), paper, glass, and wood. Each of these package materials experience a different type of degradation and have a limited amount of time they will protect the product based on the storing and shipping environment. Packages will undergo several different kinds of degradation including: oxidation, chemical, thermal, mechanical, UV and biodegradation. Degradation does not affect packages in one way, but is a combination of several different kinds of degradation. (Selke 2013)

Plastics can be affected by all degradation types and the degree to which the plastic is affected depends on the chemical makeup of the polymer, the processing history, additives, and other contaminants. This can lead to leaching of product into the package, migration of plastic into the product, and permeation of chemicals through the package from outside environments into the product. It can also cause weakness in the package, decreasing the amount of weight it can handle. This can cause spoilage of the product, off flavors and quality loss. (Selke 2013)

Metals have problems with corrosion due to oxidation and chemical product interactions. This can be reduced by the use of coatings and laminates. This can result in oxidation of the product which will result in spoilage or a loss in product quality. (Selke 2013) Dents are also a problem for metals. It will not necessarily make the product spoil faster, but it does make the product unappealing to consumers. This can result in expired product in the reverse supply chain

When it comes to glass, the biggest problem with protection is in protecting against UV radiation. Without the use of additives like UV inhibitors, clear glass will let UV light into the package that can cause off flavors and spoilage in many products. (Harte 2014)

Paper and wood will undergo similar types of degradation because they are made of the same base material. Moisture absorption into the package can occur, which can cause an increase in moisture in the product causing spoilage. With paper and wood, small insects can be an issue resulting in infestation. When this occurs the product must be disposed of and cannot be salvaged. (Selke 2013)

With all these different factors that can affect the package, which ultimately results in quality loss, it is important to determine which package is best for the product, and how long the product is still edible with acceptable quality. The use of active packaging can reduce quality loss by absorbing deteriorative elements before it can reach the product. These can include: oxygen absorbers, desiccants, carbon dioxide absorbers or emitters, ethylene absorbers, antimicrobials, UV light absorbers and antioxidants. This can reduce degradation and extend product shelf life. (Harte 2014)

When testing for shelf-life for consumer goods, it is recommended that ASTM E2454 "Standard Guide for Sensory Evaluation Methods to Determine the Sensory Shelf Life of Consumer Products" be used. (ASTM 2014) This test standard goes through the process necessary to determine the shelf-life of a product based on sensory changes of the product. This can include texture, taste and flavor. It does not necessarily mean the product is unsafe for consumption, it might because these signs can be a sign of spoilage, but it means the product is less than quality. (ASTM 2014)

When determining shelf-life, it is important to define shelf-life more precisely. It can be defined as either minimum durability or technical shelf-life. Minimum durability is amount of time under normal storage conditions that the product is still marketable, and the product can still be good after this time. Technical shelf-life is the period of time under normal storage conditions that the product can no longer be consumed. (Coles and Kirwan 2011)

4.7.3 Standardized Expression of Shelf-life

Most manufacturers already have a way of determining the usable life of the product, depending on product type, and packaging usage. The problem is manufacturers are setting the code dates so far before product expires, it is hard to get all the product sold before that date goes bad. So this section will cover a way to standardize the definition of shelf-life.

There are many benefits to open code dating. Including easy recognition of expired product, ensuring customers that product is still good, and customers knowing when they should dispose of product that might make them sick. So the big question is, what should the code date standard be? Should it be best-by, sell-by or use-by? There are benefits of each. A sell-by date would allow for easy recognition by the retailer of when they should no longer sell product. A use-by date would offer customers a definitive date where product should no longer be consumed. A best-by date gives more of a suggestion of when to get rid of product, but it gives customers an option to consume product after the date expires at their own discretion.

Sell-by dates do not offer any benefit to the customer. The customer might know if it is a good idea to buy the product, but how long after the product is bought is it still good? Since one of the main purposes of open code dating is to help the customer, it is recommended that a sell-by date be used on the shipping container, but not the product.

When choosing between best-by and use-by dates for product, the Ministry for Primary Industries in New Zealand gives good guidance when making the decision. If the product is meant to provide the consumer the sole source of nutrition for a specific period, and there is a potential loss of nutrition for that time period, then a use-by date should be used. A use-by date should also be used if the pathogenic microorganisms in the product exceed safe level and the food can become poisonous if consumed. (MPI 2012)

A best-by date should only be used when the product can retain its sensory, chemical, physical and microbiological characteristics to quality, and when the shelf-life is under two years. (MPI 2012).

4.8 Unsaleables as a Collaborative Effort

This research found that there is a serious distrust between manufacturers and retailers on the topic of unsaleables. Manufacturers do not trust retailers' unsaleables data, so they conduct their own audits. Retailers don't trust manufacturers to be fair in ARP negotiations, so they have to collect their own data to fight for a fair rate. This might not be a product of general business distrust, but a product of the history of the way this part of the industry was handled. In previous years, negotiations generally occur on a periodic bases with very little sharing of information between meetings. Both sides collect their data and fight for the upper hand in negotiations to receive what they believe to be a fair rate. This might work to determine a rate of reimbursement, but it does not help build a trust between trading partners and can leave one side feeling cheated. This can turn into resentment, driving the business partners further apart until there is no communication unless absolutely necessary, hence the no sharing of data until it is time for rate negotiations.

Recommendations focus on ways to better communicate and share data. If partners start to share data more completely and openly without being so secretive, it will not only help reduce total unsaleables, but could also improve the relationships between business partners. This could create a more open relationship where frequent sharing of information can result in a collaborative and active effort to reduce unsaleables on both sides. One of the easiest ways to start this open sharing of data is with the implementation of an EDI program as discussed in previous sections. This, in collaboration with granular unsaleables data, will allow both sides to see what the other is doing and where they are getting their information for negotiations. A collaborative effort to reduce unsaleables on both sides will be more beneficial than each side making a case to present to the other to try to grab a bigger slice.

One of the manufacturers interviewed goes so far as to apply a quality control system to distribution. The information they gather in their audits is shared with the retailers so they can improve upon their system, as well as use the information internally to rate packaging lines and teams. This is the kind of collaborative effort that should be modeled when it comes to unsaleables management. A full sharing of data to improve the whole system can go a long way in unsaleables reduction.

CHAPTER FIVE: CONCLUSION

Unsaleables is an area that most companies do not consider as a source of profit. But unsaleables should be on the forefront of upper management's mind as an opportunity for strategic advantage rather than with as the problem comes along without much thought from upper management. There needs to be a department dedicated to reducing unsaleables as it can be seen as a valuable opportunity rather than an inevitable problem.

Gathering and, more importantly, sharing of information among trading partners is very important to the health of a company's unsaleables initiative. Unsaleables management should be more than just a bidding war to reduce rates. It should be a collaborative effort of information gathering and sharing, and cross-functional involvement to find root causes of problems.

Proper data collection and sharing can lead to the right packaging tests and changes that are necessary to fix root causes. It will reduce unnecessary spending on tests that do not need to be done, and give information needed to test package performance in the correct way.

Shelf-life should be based on science and standardized to reduce the incidence of consumer confusion, and along with reducing good product in the reverse supply chain. Audit information can reveal shelf-life problems that can be adjusted to reduce the incidence of out of date product.

Sharing and collaboration, along with proactive practices, will go a long way in reducing unsaleables cost. Unsaleables should be more than a bidding war for the lowest possible price, and a systems approach to unsaleables management should be the focus of a healthy relationship and unsaleables practice.

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