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DEPARTMENT OF SUPPLY CHAIN AND INFORMATION SYSTEMS

SUPPLY CHAIN TRANSPARENCY IN THE PHARMACEUTICAL RETURNS INDUSTRY: OPTIMZING COMPANY X COMPLIANCE WITH THE DRUG SUPPLY CHAIN SECURITY ACT (DSCSA)

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ABSTRACT

Company X, a pharmaceutical manufacturer, is seeking clarity on best practices for complying with the Drug Supply Chain Security Act (DSCSA). Additionally, they are looking to reevaluate current relationships with reverse distributor third-party logistics partners, as well as explore new entrants to the market. This thesis provides insight as to what two competitors are doing to meet compliance. It also includes a Strengths, Weaknesses, Opportunities, Threats (S.W.O.T.) Analysis of current RD 3PL partners, and compares the strengths and weaknesses of four additional entities. The methodology of thesis consists of reviewing publicly available sources, as well as expertise from representatives of Company X. The publicly available sources are found primarily through keyword searches, as well as reviewing online supply chain journals. Competitor practices and the RD 3PL S.W.O.T. analysis indicated that to stay competitive in the industry, investment in technological development is necessary. The information collected is intended to give Company X a broader view of the pharmaceutical returns industry, and assist them in creating a future request for proposal (RFP).

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Chapter 1

Introduction

On November 27, 2013, the Drug Supply Chain Security Act (DSCSA) was enacted by the United States Congress with the goal of combatting drug counterfeiting by tracing drugs through their end-to-end supply chains. Manufacturers, re-packagers, wholesale distributors, and pharmacies, labeled "trading partners" by the Food and Drug Administration (FDA), were initially given a deadline of 10 years to reach full compliance with the act. This deadline has since been extended to November 27, 2024. Increased emphasis on supply chain transparency in the pharmaceutical industry has had significant impacts and is requiring companies to make changes to comply. The goal of this research is to get a better understanding of supply chain transparency practices industry-wide and provide "Company X" recommendations to optimize DSCSA compliance.

The research for this thesis will be conducted through data collection and advising via regular meetings with a representative from Company X, as well as the review of publicly available resources related to the topic. Research to determine standard industry practices and updates in the DSCSA compliance timeline will be conducted by searching for key terms and articles in news reporting websites. Additionally, frequent meetings with a Company X representative will provide insight on the company's current compliance strategies and challenges they wish to address. This will aid in determining effective recommendations for Company X which is the goal of this thesis.

The remainder of this thesis will include a background section which will explain the context of the act and its impact on the pharmaceutical industry. It will also include information on current DSCSA compliance strategies practiced by Company X, as well as definitions of

serialization and morgue inventory which are two criteria on which competitors will be assessed. Next, the thesis will include a methodology section explaining how and why research was conducted. The following chapter will be broken down into subchapters. The first two subchapters will include competitor analyses based on their serialization and morgue inventory practices. The third subchapter will feature a SWOT analysis of third party returns centers to discuss their strategies. After providing an analysis of the information collected, this thesis will then discuss key findings. The conclusion of this thesis will share final recommendations of how Company X can implement new strategies to better comply with the Drug Supply Chain Security Act.

Chapter 2

Background & Terminology

To understand the pharmaceutical returns industry, a look at why returns are made must first be conducted. Pharmaceutical products can be returned for a wide variety of reasons. Some of the most common reasons why products are returned include product is expired/soon-to-expire, contamination, improper storage, and excess inventory. (U.S. Food & Drug Administration, 2022). There is incentive for retailers and pharmacies to return product. Many manufacturers and wholesalers offer credit for the return of unsaleable drug products. The majority of these returns are processed through third-party reverse distributors.

There are a few key players in the pharmaceutical returns process. Manufacturers, wholesalers/distributors, retailers, and institutional buyers all play a part in getting product to the end consumer. Manufacturers like Company X produce the actual product. Wholesalers and distributors act as intermediaries between manufacturers and retailers/institutional buyers. They manage inventory and facilitate the delivery of pharmaceutical product. An example of an intermediary company would be McKesson, which is the largest pharmaceutical distributor in the United States. Retailers and institutional buyers (hospitals/clinics) purchase product to serve the end consumer. When it comes to returns, product flows through the same supply chain, but in reverse. These returns are often times facilitated by third-party reverse distributors who bring product from retailers and industry buyers back to the manufacturer. Third-party reverse distributors are a big focus of this research and will be discussed in the next section. To gain further clarity on the process, a process flow map was created (Figure 1). Figure 1 indicates the forward flow of finished goods and the reverse flow of returns in the pharmaceutical product supply chain.

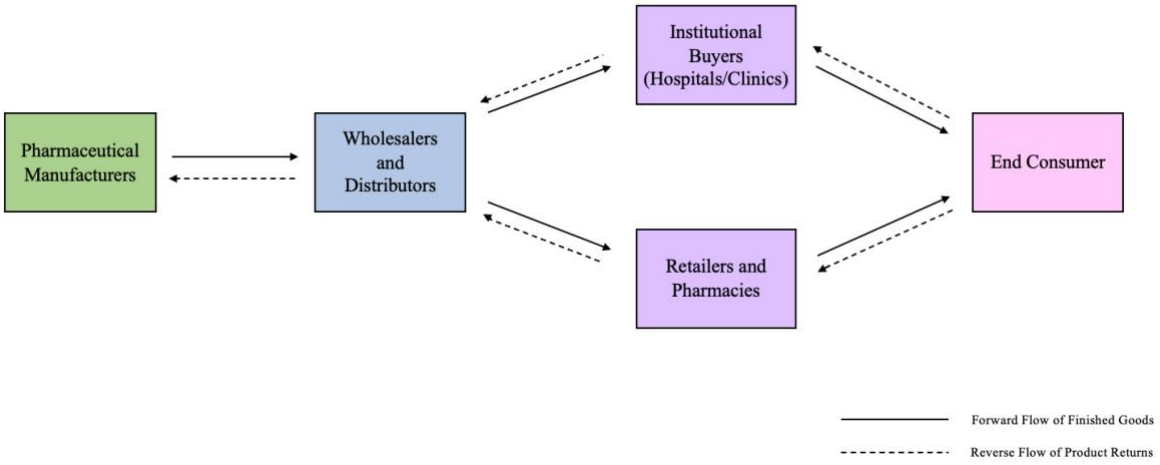

Figure 1: Process flow map from pharmaceutical manufacturers to wholesalers and distributors, to institutional buyers and retailers/pharmacies, to end consumer.

Reverse distribution third-party logistics companies (RD 3PLs) are companies that manage product returns and remediation. Rather than having product cycle back through its original supply chain, RD 3PLs take unsaleable product and determine next steps for end-of-life. In some cases, product is returned to the original manufacturer for a credit that is passed on to retail customers. Another outcome would be the RD 3PL sends product to be disposed of directly. The appeal of RD 3PLs is that they are able to provide services that can be difficult for a product's manufacturer. 3PLs provide dedicated logistics and inventory management for returns. While a third-party intermediary has many benefits in terms of outsourcing transportation and inventory of expired/unsaleable goods, there are challenges that come with these partnerships. Reverse distributors make it difficult for manufacturers to gain a clear view of a product's lifecycle. Often times pharmacies and retailers will send soon-to-expire product to RD 3PLs to be stored until expiration, and then returned for a credit. All the manufacturers can see is when product is received back, and its expiration date, giving little information on the basis of when and why product was initially returned. RD 3PLs that Company X has existing relationships with

are Inmar, PharmaLink, Sedgwick, and Stericycle. Additional logistics providers will be evaluated in Chapter 4 – Analysis. The addition of a 3PL to a supply chain significantly alters the flow. A process flow map was created (Figure 2) to show the difference in the forward flow of finished goods and reverse flow of product returns with an RD 3PL added to the supply chain.

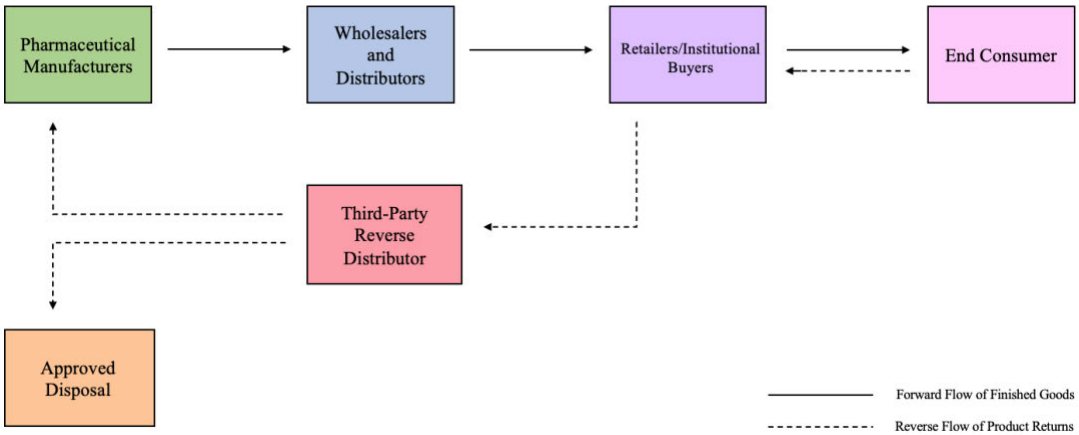

Figure 2: Process flow map of the pharmaceutical supply chain with the addition of a third-party reverse distributor.

"The Morgue" is an inventory holding location for soon-to-expire products. Once expired, these products can be sent to the manufacturer for credit. There are a few reasons products end up in the morgue. Two major reasons are the loss of product exclusivity, and manufacturers misjudging product demand (Healthcare Distribution Management Association, 2009). Loss of exclusivity occurs when the patent for a drug formula expires, meaning other companies can produce and sell generic versions of the drug developed by its parent company. Often times when this happens, distributors will switch their preferred product to the cheapest option, which may then lead to excess inventory that ends up in the morgue. Misjudging product demand is a common occurrence and can be attributed to things like seasonality. A prime example would be a mild cold and flu season resulting in high levels of unused drug inventory

sent to the morgue. Morgue Inventory is a major paint point for manufacturers like Company X, as they have little clarity over what products end up there and why.

One of the biggest focuses of this research is serialization and how it can be feasibly implemented. Serialization is a practice that was implemented to meet compliance with the Drug Supply Chain Security Act (DSCSA), which aims to reduce drug counterfeiting. Serialization itself is the process of assigning unique codes to the packaging of each prescription product unit (VISIOTT Traceability Solutions 2021). These codes are designed to be used at every step of the supply chain to enable accurate tracking and data reporting. The data matrix on each unit, known as a Unique Product Identifier (UPI) contains information about a product's origin, batch number, and validity date. In Figure 3 (Honeywell 2023) examples of these UPIs can be seen. The figure compares a standard USA UPI to those originating in other countries, specifically, Russia, Brazil, Argentina, Saudi Arabia, and the European Union. The components of each are fairly consistent which would make the tracing of products through an international supply chain a feasible process in the future.

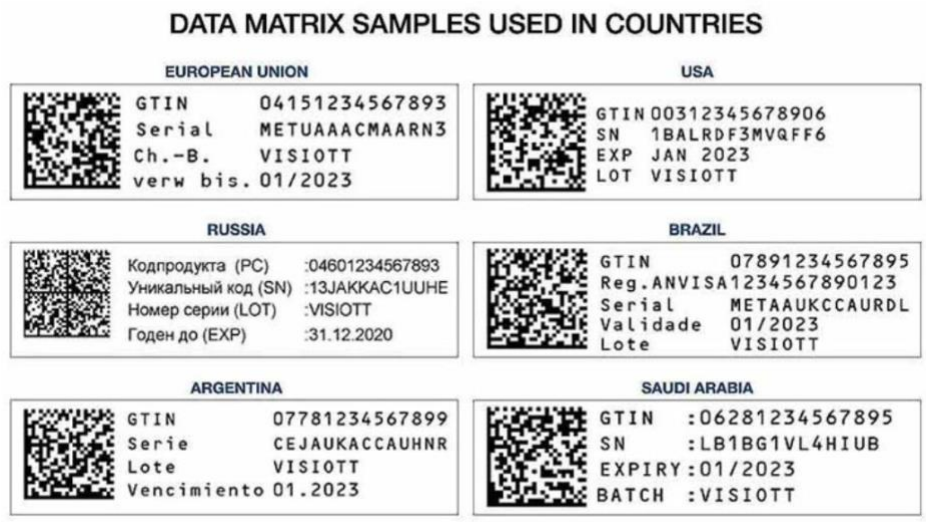

Figure 3: A comparison of Unique Product Identifiers by country

UPIs are printed at three different levels of packaging. The first is at the primary level, which includes packaging in contact with the actual drug (i.e., bottle, aluminum bister). Serialization is only required at the primary packaging level in American and Indian markets. The secondary level includes packaging that contains primary packaged medicine(s) (i.e., carton). Serialization at this level is required universally. The final level is the tertiary level. Package headings at the tertiary level include bundles, cases, and pallets. Serialization at this level is essential to ensure traceability in the supply chain.

The goal of serialization is to improve product traceability through all stages of the supply chain, but implementation has proven to be difficult. In order to print UPIs on each pharmaceutical product, companies will need to invest heavily in equipment, software development, and employee training. Serialization at all packaging levels will require significant changes in the manufacturing process. Companies in the pharmaceutical industry will need to acquire new equipment to be able to print codes on units of different sizes. They will also need to develop new software to create and process UPIs. Additionally, training and development for employees will be required to ensure proper tracking and handling at each step of the supply chain (Bairu, 2023). These challenges have caused companies, including Company X, to struggle to reach full compliance with DSCSA standards. When it was officially enacted in November of 2013, a 10-year compliance timeline was outlined, meaning manufacturers, distributors, third-party logistics providers, and other entities would need to reach full compliance by November 2023. This deadline has since been extended to November 2024 (U.S. Food & Drug Administration, 2022).

The primary focus of this research is to explore how Company X can optimize DSCSA

Compliance, in order to do so, the company's current practices must be assessed. The company took action by establishing a Pharmaceutical Serialization/Traceability Team whose efforts are focused on meeting deadlines set by world health authorities. This team has made strides toward compliance by standardizing on the GS1 Global Trade Identification Number (GTIN) as the standard identifier for all products produced by Company X. Additionally, changes have been made to product labels in accordance with the act. Labels on all individual pharmaceutical packages will have a 2D data matrix barcode which will contact the following elements: GTIN, serial number, expiry, and batch.

Currently, Company X uses an internally developed platform to trace product validity. The platform is not very advanced and gives little insight on where a product is in its lifecycle. Company X and its constituents can input a purchase order number, zip code, and date range as search components to identify a product, from there the platform will really only indicate expiry date and whether it is a valid Company X product. Figure 4 shows how this search tool appears to the user. This data management system, among other strategies, is an area Company X is looking to improve upon as it seeks to reach compliance.

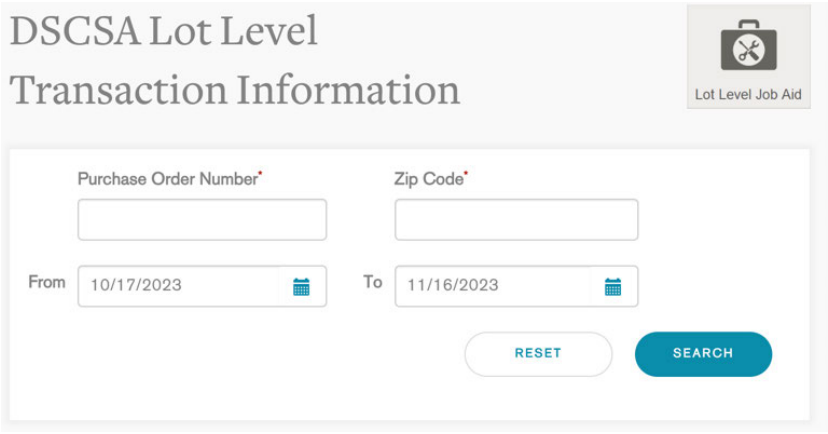

Figure 4: Company X DSCSA Compliance Data Management System

The biggest challenge Company X is facing as it makes adjustments to operations in

compliance with DSCSA is understanding the practices of its RD 3PL partners. Company X currently has relationships with Inmar, PharmaLink, Sedgwick, and Stericycle, and relies on them heavily in the returns space. Of these four, by far the strongest relationship is with Inmar. Inmar is the largest reverse distributor in the country, processing eighty-five percent of U.S. pharmaceutical returns. These third-party logistics providers pose a challenge for Company X as they make tracking product data as it moves through the supply much more difficult. RD 3PLs do not share the information of their customers (retailers and industry buyers discussed above) so all Company X can see is what quantity of product is returned and when. An analysis of Company X's current partnerships as well as an exploration of additional RD 3PLs will be conducted in Chapter 4 – Analysis.

Chapter 3

Methodology

This research was primarily guided by Susan Smith (pseudonym). Smith is a Reverse Distribution Analyst at Company X. Biweekly meetings were conducted to guide the research process and provide direction on research material. She has first-hand experience working with Reverse Distribution 3PLs and has been part of team witnessing changes in company practices to meet compliance with DSCSA. Smith was able to utilize her network of connections and existing resources to provide information on Company X compliance strategies as well as industry-wide standards.

In addition to the meetings with the thesis sponsor from Company X, a significant portion of this research was conducted through online research of publicly available sources. Information was gathered from Pharma Journals/publication and government sources such as the FDA website. Research on competitor practices was conducted using information provided on their external sites.

After completing guided research with Company X and online research, it was determined that the direction of this research would be laid out in the following format: A competitor analysis looking at how two competitors of Company X have adapted to meet serialization compliance, a SWOT analysis of 3PLs Company X has existing relationships with, as well as four new ones. These findings are discussed in Chapter Four – Analysis.

Chapter 4

Analysis

This chapter will evaluate ways Company X can shift strategies to better comply with DSCSA regulations. It will first take a look at the current strategies of two competitors and their approach to implement serialization. The second part of this section will conduct a S.W.O.T. (Stengths, Weaknesses, Opportunities, Threats) analysis of Company X's current RD 3PL partners and explore four additional providers. The goal is not to suggest only one solution, but provide Company X with insight on how other market players are approaching the challenge of reaching DSCSA compliance. The information provided is intended to help Company X reevaluate their current strategies and compliance plan, and consider alternate approaches. All findings will be presented to aid Company X in developing future RFPs (Requests for Proposal). It is important to note that these strategies and RD 3PLs are not the only ones available for analysis, but were deemed relevant to the research and goals of Company X due to their intention to optimize pharma returns. Additional approaches could have taken a deeper look into manufacturing and logistics practices, however recommendations in those areas would require further analysis that would be outside the scope of this research.

Sub-Chapter 4.1: Competitor Analysis – Pfizer

The first competitor identified in this analysis is Pfizer, Inc. Pfizer is an American multinational pharmaceutical and biotechnology company. The company uses a compliance data management system called TraceLink. The platform offers the secure creation, management, and exchange of track and trace data for supply chain partners across the United States (TraceLink, 2024). TraceLink is an all in one platform that connects all links of a supply chain, and works in four parts. The first function is the Master Data Exchange which stores all product information. Next is the Serial Number Manager, which creates serial numbers meeting all DSCSA regulations. Third is the Serial Number Exchange (SXM) which distributes and manages serial numbers across all company sites. Finally, the Serial Operations Manager (SOM) manages inventory operations such as internal distribution, shipping, receiving, returns, and destruction.

In comparison to Company X's internal tracking site discussed in the background section of this paper, TraceLink is much more sophisticated and has better developed functionality. TraceLink prides itself on being an industry leader in technology, and allows customers to see the bigger picture of a product's lifecycle. It also helps to provide a stronger connection between manufacturers, retailers, and distributors.

Should Company X consider partnering with TraceLink, they would see many benefits. Because TraceLink provides more clarity on a product's entire journey through the supply chain, manufacturers like Company X could use the data collected (order and returns history/percentage of order returned) to forecast returns. Aside from forecasting opportunities, the biggest benefit of the platform is that it allows companies to outsource compliance with a focus on meeting deadlines. Developing effective software to accurately track and trace products requires

significant investments in IT. Outsourcing saves time and allows companies to leverage experts' resources when needed.

In terms of feasibility, Company X could implement TraceLink fairly easily due to their existing relationship with PharmaLink. TraceLink and PharmaLink have partnered, to offer DSCSA compliance capabilities for PharmaLink customers (Pharmaceutical Commerce, 2023). Company X could utilize this connection to upgrade to a more developed data management system, as they identified this as an area they would like to grow.

Sub-Chapter 4.2 – Merck & Co.

The second competitor identified in this analysis is Merck & Co. Merck is an American pharmaceutical company. In order to meet DSCSA requirements, Merck participated in a Blockchain Pilot in collaboration with Walmart, KPMG, and IBM. The goal of this program was to see how blockchain technology could be used to help all key players in a supply chain communicate and reach DSCSA compliance.

Before discussing the results of the pilot, it is important to develop a basic understanding of how blockchain works and what the benefits of implementation are. Blockchain is a database mechanism that allows information sharing within a business network. This database stores information in "blocks" that are linked together (Taghreed, 2019). Blockchain makes information sharing much more efficient than how information is shared in a traditional supply chain. Rather than having information flow from point A to point B, blockchain allows for information to be accessed by all parties at once. This speeds up reaction times and reduces the possibility of miscommunication. Figures 5 and 6 compare the structures of a traditional information loop, and an information loop that includes blockchain technology. The example used is that of a product recall and steps taken to manage the situation by each party after they are notified.

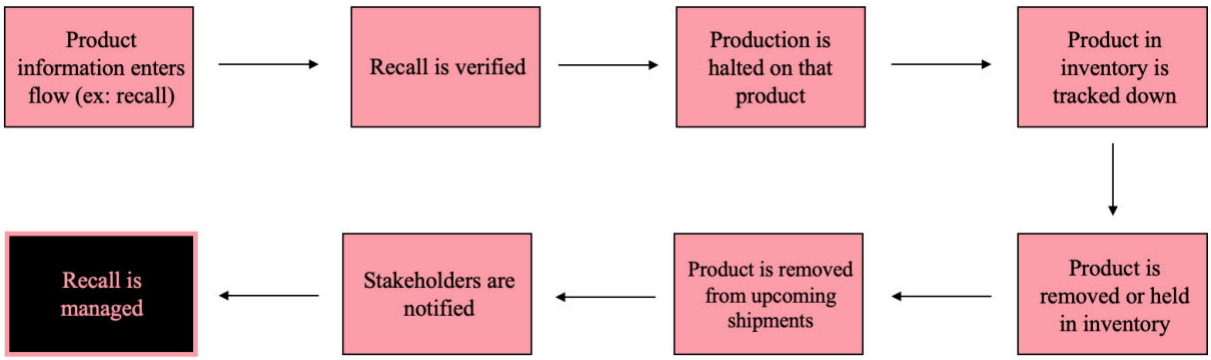

Figure 5: Traditional information and reaction flow of a product recall

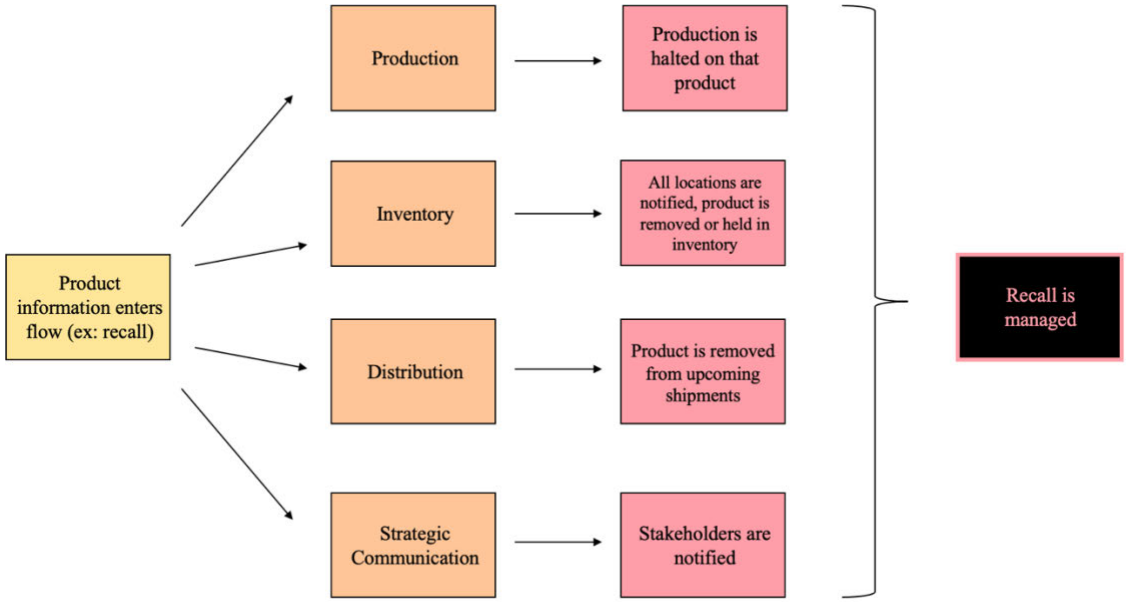

Figure 6: Information and reaction flow of a product recall with blockchain technology implemented

The results of the pilot program indicated that blockchain technology makes tracking and tracing medications through a supply chain more efficient, and allows organizations to have more of a unified view of a product's lifecycle (Chandran and Kristoffersen, 2020). Additionally, it was found that in the case of product recalls specifically, blockchain reduced the time it took to alert the supply chain from a few days to a few seconds. The way it does so is modeled previously in Figure 6.

While blockchain technology is more efficient and streamlines communication to make DSCSA compliance feasible for all parts of a supply chain, it is not an easy process to actually implement. If Company X would choose to pursue information sharing via blockchain, they would have to partner with a company such as IBM to get this system set up in alignment with their current technological infrastructure. This would likely increase IT costs significantly, but would help the company achieve their goal of reaching compliance and gaining better insight into how products are handled once they have departed the manufacturer's control.

Sub Chapter 4.3 – 3PL Analysis

The final sub-chapter of this analysis focuses on evaluating Company X's current RD 3PL partners and explores new entrants to the market. First, a S.W.O.T. analysis of Inmar, Sedgwick, Stericycle, and PharmaLink will be conducted. This will be followed by comparing the strengths and weaknesses of additional 3PLs Pharma Logistics, LogiCare3PL (a BioCare Company), PharmaReturns, Inc., and National Pharmaceutical Returns. Following this chapter will be a conclusion that includes recommendations and final thoughts.

Inmar

Inmar is an intelligence company based out of Winston-Salem, North Carolina. Inmar is considered the industry leader in pharmaceutical returns. They service 50,000 pharmacies nationwide and process eighty-five percent of U.S. returns (Inmar, 2024). They have a stellar reputation, as well as a focus on continuous technological development. Figure 7 identifies strengths, weaknesses, opportunities, and threats of Inmar.

Inmar			
Strengths	*Weaknesses*	*Opportunities*	*Threats*
The leader in pharmaceutical returns • Processes 85% of U.S. returns • Claims 99% accuracy • 85% of products received are destroyed	Process clarity • Claims to have very accurate reporting, but little information can be found on the returns process itself	Technology/Focus on Automation • Automated 2D Barcode Receiving System • One Touch Advantage® Inmar's Waste-to-Energy Program • generates 8 million kilowatt hours of energy	2023 DEA Suspension Order • How does this impact Inmar's reputation?

Strong Infrastructure in place to manage recalls Great reputation, contracted by the U.S. Department of Defense to manage the Pharmaceutical Reverse Distribution Program (PRDP)		from Rx and non-Rx returns being removed from the supply chain	

Figure 7: Inmar S.W.O.T. Analysis

Sedgwick

Sedgwick is a claims management service provider based out of Memphis, Tennessee. They have a focus on managing product recalls in the pharmaceutical and medical device industries (Sedgwick, 2024). Figure 8 identifies strengths, weaknesses, opportunities, and threats of Sedgwick.

Sedgwick			
Strengths	*Weaknesses*	*Opportunities*	*Threats*
Strong processes in place to manage drug recalls • Prescription • Over-the-Counter State-of-the-Art Security Segregated storage for recalled product	Limited scope compared to Inmar • Sedgwick focuses on product recalls vs returns in general	Developed recall strategies for the medical device industry Pharmaceutical recalls are spiking nationwide • 2022 surge	Lack of focus on product remediation does not meet the needs of Company X, especially when compared to returns leader Inmar

Figure 8: Sedgwick S.W.O.T. Analysis

Stericycle

Stericycle is a medical waste disposal and compliance company based out of Bannockburn, Illinois. The company has a focus on waste management rather than product remediation (Stericycle, 2024). Figure 9 identifies strengths, weaknesses, opportunities, and threats of Stericycle.

Stericycle			
Strengths	*Weaknesses*	*Opportunities*	*Threats*
Industry leader in Pharmaceutical Waste Management Manages over 40 million pounds of waste annually	Specializes in returns on an individual basis, not necessarily batch B2B but does not work directly with manufacturers	Experience with servicing pharmacies, health care facilities, and retailers Convenient, proven practices • MedDrop Collection Kiosks • Seal&Send Consumer Medication Mail Back • CsRx Controlled Substance Waste Service	Little interaction with manufacturers could lead to compliance issues Stericycle likely does not have the infrastructure to support the volume of returns necessary in this case

Figure 9: Stericycle S.W.O.T. Analysis

PharmaLink

PharmaLink is a pharmaceutical returns provider based out of Largo, Florida. They service hospitals, pharmacies, wholesalers, and manufacturers, facilitating returns and disposals for credit (PharmaLink, 2024). They also manage product recalls. Figure 10 identifies strengths, weaknesses, opportunities, and threats of PharmaLink.

PharmaLink			
Strengths	*Weaknesses*	*Opportunities*	*Threats*
Processes large volumes of returns and disposals for credit Services hospitals, pharmacies, wholesalers, and manufacturers Ability to manage product recalls	Little differentiation from Inmar Less advanced technology and tracking systems	Encore® Reporting Platform • Convenient tracking and analysis Relationship with TraceLink Would want to inquire about cost of service • Could PharmaLink provide similar services to Inmar for less?	Inmar provides essentially the same services, but is the industry leader with a better reputation

Figure 10: PharmaLink S.W.O.T. Analysis

After evaluating Company X's current RD 3PL partners, there are a few takeaways to be discussed. Inmar is far and above the leader in this industry. They process more returns than any other provider, have the best reputation, and are developing the most advanced technology. As Company X works to reach DSCSA compliance, it will be important to prioritize this relationship and leverage Inmar's advanced, automated track and trace system. Sedgwick and Stericycle are specialists in the areas of product recalls and pharmaceutical waste management. Both relationships are important to maintain, however they do not have the infrastructure in place to help Company X optimize compliance. The relationship with the most potential for growth is PharmaLink. PharmaLink offers services incredibly similar to Inmar, however it is a smaller operation with a weaker reputation. It would be interesting to compare the cost of service

between Inmar and PharmaLink to see if PharmaLink could provide the same service for less. Additionally, PharmaLink has a relationship with TraceLink. As discussed in Sub-chapter 4.1, TraceLink would be highly beneficial for Company X to explore, and they could potentially implement the data management system through their existing partnership with PharmaLink.

The final part of this analysis will take a look into RD 3PLs that Company X currently has no established relationships with. A comparison of the strengths and weaknesses of the following companies will be conducted: Pharma Logistics, LogiCare3PL (a BioCare Company), PharmaReturns, Inc., and National Pharmaceutical Returns. The goal of this evaluation is not to suggest one provider for Company X to work with, but to help provide a better understanding of the pharmaceutical returns market.

Pharma Logistics

Pharma Logistics is a returns provider based out of Libertyville, Illinois. They offer very similar services to that of Inmar and PharmaLink. The company provides reverse distribution services for the U.S. Department of Defense after winning a contract worth $45 million (Pharma Logistics, 2024). Figure 11 compares strengths and weaknesses of Pharma Logistics.

Pharma Logistics	
Strengths	*Weaknesses*
• "Clean. Comply. Collect" strategy • Box and Ship Program • Offers return services, drug take back program, and pharma waste support	• Smaller operation than Inmar • Weaker reputation than Inmar and PharmaLink

Figure 11: Pharma Logistics Strengths and Weaknesses Comparison

LogiCare3PL (a BioCare Company)

LogiCare3PL (a BioCare Company) is a third-party logistics provider that operates as a subset of BioCare which is a pharma manufacturer. The company is very new, but has locations across the United States (BioCare, 2024). Figure 12 compares strengths and weaknesses of LogiCare3PL.

LogiCare3PL (a BioCare Company)	
Strengths	*Weaknesses*
• Division of BioCare pharma manufacturer • Wide range of services provided	• Very young operation, launched in 2022 • Very limited industry experience

Figure 12: LogiCare3PL Strengths and Weaknesses Comparison

PharmaReturns, Inc.

PharmaReturns, Inc. is a returns processing group located north of Philadelphia, Pennsylvania in Montgomeryville. The company was established as an entity under CyberCore Systems, Inc. which is a software development corporation (PharmaReturns, 2024). Figure 13 compares strengths and weaknesses of PharmaReturns, Inc.

PharmaReturns, Inc.	
Strengths	*Weaknesses*
• Division of CyberCore Systems, Inc. • Proprietary software system IMPRS™ (Internet Managed Product Returns Solution)	• Very small, operates in one location outside of Philadelphia, PA • Outdated practices compared to competitors

Figure 13: PharmaReturns, Inc. Strengths and Weaknesses Comparison

National Pharmaceutical Returns

National Pharmaceutical Returns (NPR) is a pharmaceutical returns provider based out of Urbandale, Iowa. In addition to facilitating returns, NPR offers destruction and disposal, drug waste consulting, and holding and storage services (National Pharmaceutical Returns, 2024). Figure 14 compares strengths and weaknesses of National Pharmaceutical Returns.

National Pharmaceutical Returns	
Strengths	*Weaknesses*
• Offers batched and non-batched returns services • Accredited by the National Association of Boards of Pharmacy (NABP)	• Small company based out of Iowa • Little information available about returns credit

Figure 14: National Pharmaceutical Returns Strengths and Weaknesses Comparison

All four of the companies featured in this comparison have benefits and drawbacks. They all operate on a smaller scale than Company X's current RD 3PL partners, and most have outdated or limited technological capabilities as compared to industry leader, Inmar. Should Company X decide to explore any of these service providers, they should do so with specific goals in mind. Pharma Logistics has well-developed programs for individual returns and waste disposal. Of the four companies, they have the most potential for supporting Company X as they attempt to reach DSCSA compliance.

Chapter 5

Conclusion

The presented thesis intends to provide Company X with information to help develop a clearer view of the pharmaceutical returns industry. This was done by taking a deeper look at the serialization strategies of two competitors, Pfizer and Merck, as well as evaluating current RD 3PL partners and comparing the strengths and weaknesses of new entrants to the pharmaceutical returns market. All of this information is intended for Company X to use to extend an RFP. Key takeaways from the research indicate that competitors are heavily investing in technological development, and Company X should do the same to stay competitive. Whether that is outsourcing compliance technology through TraceLink or implementing blockchain to internal systems, swift action should be taken. Of these two options, TraceLink would be easier to implement as their existing relationship with PharmaLink could give Company X easy access to the platform. In addition to competitor strategies, an analysis of RD 3PL partners showed that Inmar is far and above the best service provider, but PharmaLink provides similar services and could do so for a lesser cost. In addition, there are other providers out there besides that which Company X is currently in business with.

Limitations encountered through the completion of the thesis surround limited knowledge of the industry before beginning the project, as well as a limited availability of resources dedicated to the topics. Additionally, communication with solely Company X and not directly with competitors or RD 3PL partners limited the scope of perspective.

Future research on this topic could entail a cost-benefit analysis of the TraceLink platform in comparison to Company X's current internal data management system. A deeper study of the benefits of blockchain could also be beneficial. The initial pilot does not provide

data over a long period of time, so a lengthier study could uncover more concrete benefits. Finally, a cost-benefit analysis of each RD 3PL partner Company X works with could be conducted with the goal of consolidating operations and optimizing partnerships.

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George Llado Former CIO and Independent Member of TraceLink's Board of Directors Alexion & Merck and Co., Llado, G., PharmD, M. R. C., Casey, M. R., Manager, R. D. S., Dunchack, R., Tyler Martinson Pharmacy Manager Sentara Health, Martinson, T., Simon Ellis Group Vice President and Leader of Global Supply Chain Strategies Practices IDC, & Ellis, S. (2024). *End-to-end supply chain orchestration with a single integration*. TraceLink. https://www.tracelink.com/

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Academic Vita

ANNA YANKANICH

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EDUCATION

The Pennsylvania State University | Schreyer Honors College — **University Park, PA**
Smeal College of Business | B.S. Supply Chain and Information Systems — *Class of 2024*
Smeal College of Business | Minor Entrepreneurship [redacted]

RELEVANT EXPERIENCE

Penn State University — **University Park, PA**
Sustainable Procurement Intern — *May 2023 – Aug 2023*

- Analyzed over $30 million in annual spending on Housing & Food Services equipment and supplies and evaluated current and potential vendors to offer solutions for a comprehensive sustainable purchasing strategy
- Researched, compiled, and presented reports on potential third party logistics partners to extend the life cycle and improve the end-of-life recycling for dining equipment and surplus inventory

Clark Associates, Inc. — **Lancaster, PA**
Supply Chain Intern (Procurement) — *Jun 2022 – Aug 2022*

- Established a new product category for offset smokers by analyzing internal and external search volume trends to identify areas of interest, and onboarding vendors with product lines that met the needs of customer demand
- Improved buying experience and increased profit by evaluating the user experience for a category with almost $900,000 in sales, making the website easier to navigate and creating exposure for items with a low volume of sales

Unilever — **University Park, PA**
Student Project Consultant — *Aug 2021 – Dec 2021*

- Collaborated with a group of supply chain peers and an employee mentor from Unilever to conduct research and present solutions to alleviate the COVID-19 pandemic impact on labor in the Ben & Jerry's sector of the company

LEADERSHIP & INVOLVEMENT

Penn State THON™ — **University Park, PA**
Merchandise Director — *Apr 2023 – Present*

- Maintained and strengthened relationships with vendors, managed inventory, and developed new products to earn a profit of over $155,000.00 in 2024 to benefit Four Diamonds at Penn State Health Children's Hospital
- Led a team of 22 captains and 50 committee members to oversee the continuous development, oversight, and daily operations of the THON Store, the online THON Store, and event sales leading up to and including THON Weekend

Alumni Engagement Director — *Apr 2022 – Apr 2023*

- Served as the primary liaison between 16,500 student volunteers and 25,000 alumni supporters of the world's largest student-run philanthropy, committed to enhancing the lives of children and families impacted by childhood cancer
- Managed a team of 15 captains and 120 committee members to facilitate fundraising initiatives associated with THON's donors and alumni, including corporate and individual messaging & solicitation, stewardship, and retention

Sapphire Leadership Academic Program — **University Park, PA**
Distinguished Member — *Aug 2020 – Present*

- Represented the top 5% of Smeal Students in an academic program with specialized curricula and faculty mentorship

Alpha Kappa Psi Co-Ed Professional Business Fraternity — **University Park, PA**
Active Member — *Sep 2021 – Present*

- Collaborated with an inductee class of 18 to orchestrate and host professional, philanthropic, social, and fundraising events for a brotherhood of 89 members to enhance brotherhood unity
- Developed professional, networking, and interviewing skills through brotherhood interviews, resume workshops, professional presentations, and information sessions with members of the fraternity

HONORS, SKILLS, AND INTERESTS

Honors: Dean's List (7/7), Sapphire Leadership Academic Program, Schreyer Honors Scholar
Skills: Microsoft Office Suite (Excel, PowerPoint, Teams, Word), Power BI, Tableau
Interests: Hiking, Taylor Swift, The British Royal Family, Travel (London, Costa Rica, Greece), Yoga