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Nearshoring and its potential impacts on the global supply chain: case study of retailing and manufacturing firms

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Nearshoring and its potential impacts on the global supply chain: case study of retailing and manufacturing firms

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Abstract: In recent years, a multitude of events have occurred to significantly test the resiliency of global supply chains. The largest impact were the effects and fallout of the COVID-19 pandemic which saw extreme variability introduced to all aspects of supply chain management including procurement, warehouse operations, transportation and sustainability initiatives. To best counteract potential foreseen and unforeseen circumstances, organisations have reevaluated their ideologies and examined how nearshoring operations can be advantageous to minimise challenges and perils to their business continuity. A scholarly examination of the principles surrounding nearshoring and its impacts on global supply chains. With context paid to two Pittsburgh, PA-area companies in the retail and manufacturing markets, practical application of these principles are examined with managerial implications addressed. Nearshoring will be recommended as an efficient route for companies to achieve streamlined operational approaches and their goals within while minimising their risk exposure and maximising perceived values.

Keywords: business case study; information technology; IT; manufacturing; nearshoring; offshoring; onshoring; operations; retail marketing and services; supply chain management; SCM.

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1 Introduction

1.1 Supply chains from a global perspective

As supply chain needs for businesses evolved over time, strategic decisions were made by management of a specific company on where best to domicile their manufacturing and production operations (Zhao and Lv, 2009; Ziliani, 2006). With each respective organisation identifying and recognising their own ideals, the act of nearshoring has become prevalent from a global perspective (ArlbØrn and Mikkelsen, 2014; Ashby, 2016; Slepnirov et al., 2013). Nearshoring can be defined as a strategic decision to outsource specific processes or services to countries within close proximity, typically those that share a border and are located within the same generalised region or time zone as the corporate headquarters or satellite company office depending upon the size of the organisation (Paksoy and Cavlak, 2011; Pettersson and Segerstedt, 2011; Pradhananga et al., 2011; Von Haartman, 2012). Onshoring can mean that the management team, developers, and manufacturing are located within the same country, while nearshoring can be interpreted as within the same continent. Each company will probably have a different desired result of the nearshoring business practice. but some main objectives are to leverage lower labour costs in another country while still preserving control over the production process and limiting business barriers, such as language and cultural differences (Bals et al., 2016; Barbieri et al., 2018; Bettiol et al., 2017; Haried and Ramamurthy, 2009). Some reasons may be eco-friendly or based on sustainability strategic initiatives (Blome et al., 2014; Busse et al., 2016; Chen et al., 2017; Chen and Chen. 2019).

1.2 Purpose of study

In this present research effort, two Pittsburgh, PA-area companies will be analysed as to how the nearshoring concept would provide an impact to their overall supply chain with specific emphasis placed on the procurement, warehouse management, transportation and sustainability verticals. A classical qualitative business case study approach (Yin, 2003) will be used. The historical aspect of the nearshoring concept will be considered in addition to the impacts of the COVID-19 pandemic on global supply chains (Patel et al., 2020) as advantages and disadvantages of repositioning warehouses at the present time are presented. Dick's Sporting Goods, a retail company in the sporting goods, apparel, footwear and outdoor equipment sector, will be profiled to show how this concept can prove advantageous to an industry leading retailer to best optimise their network and provide expediency to their consumers.

PPG will be analysed to see how nearshoring their operations can allow a manufacturer of a plethora of paints, coatings and specialty materials can leverage these benefits to improve operations in their area of expertise. Based upon these considerations and subsequent analysis, managerial implications will be considered for both Dick's Sporting Goods and PPG.

2 Background

2.1 Public perceptions of global offshoring

With today's consumers spreading news and reviews of businesses with social media, it is important as ever for firms to take this into account for their corporate actions. McDonald et al. (2011) considered public opinion involving business students at different levels of education to determine their opinion of company outsourcing. Many people believe that corporate outsourcing is a new concept, but in fact outsourcing has been going on since the 1960s with the apparel and textile manufacturing industries. More people know about the more recent outsourcing of information technology (IT), software design, technical support, telemarketing, call centres and back-office work (Logan, 2000).

As been exposed in much research efforts, there are many approaches to quantify the metrics process to determine if a firm's supply chain is moving in the right direction. Some are more directional or linear in their approach (i.e., SCOR and balanced scorecard), and some are more philosophic or multiple-tiered such as the Prism approach, while others are more strategic and less tactical (Melnik et al., 2000; Mintzberg, 1994; Trebilcock and Sandor, 2015). Most of these approaches include elements of *process and design capabilities* (i.e., up-to-date and capable products and process technologies to reduce the time required to develop new products); *quality and reliability* (i.e., product quality should consistently meet specified requirements); *cost* (i.e., total cost of ownership of unit price of the material, payment terms, cash discount, ordering cost, carrying cost, logistics costs, maintenance costs need to be controlled); *service* (i.e., good warranties and timely service); *capacity* (i.e., suppliers having the capacity to fill orders that may be irregular in size and scope); *location* (i.e., from traditional marketing, where I am coming from, suppliers needs to deal with the impacts of logistics, delivery lead times, transportation modalities, facilities management); *management capability* (i.e., professional ability to commit to continuous improvement and establishing better communications and overall relationships); and *financial condition and cost structures* (financial condition so that the ability to play does not generate disruptions in goods and services). In essence, any process worth measuring is work improving. Looking at the more qualitative measures or strategic issue-driven aspects is more insightful on the long-term. Developing a long-term relationship with a potential supplier, assuming that this supplier is critical to a firm's business, not just a routine transaction, then qualitative issues is more important for improving quality and processes for sustainable competitive advantages. Such qualitative measures require more soft skills to assure that all partners have the same mutual goals and common metrics that guide the relationship in a mutually beneficial manner (that is easier said than done). To get such joint cost-savings projects and new product-development efforts on a successful and firm footing requires skills typically not emphasised in more traditional commercial organisation. Hence, a relatively structured approach to problem-solving and supplier selection, via the use of a supplier scorecards may offer insights on whether onshoring, nearshoring, and/or offshoring combinations makes financial sense. Each company can prioritise their goals and use metrics that help ensure that they are maximising the value of any potential supplier-buyer match.

It has been shown that outsourcing practices are more common during economic recessions than in an economic boom (Daim et al., 2010; Durfee, 2004). Outsourcing has

been on a rise due to more firms increasing low-cost competition within the industry. Companies should also consider difficulties that can arise from outsourcing. Some common problems that exist when activities are outsourced include communication problems, cultural differences, and working norms (Lynn, 2002; MacInnis, 2003). One of the negatives associated with outsourcing is the US public's perception on the corporate practice. Some of these perceptions are brought into light by recent media highlighting the trend of outsourcing US jobs. Another area that the public has received negative responses to outsourcing is from politicians painting outsourcing as negative for the American people. It is easy for media and politicians to encourage negative opinion of outsourcing to the public based on distorted nationalistic perspectives.

Such research has illustrated that many in the general public are concerned with outsourcing as it relates to jobs and the impact on employment in the future. Outsourcing is not a new concept for businesses to consider as a way to cut costs. It has been around for quite a few years and started back in the 1950s. "The basic business idea of outsourcing is that if a firm does not specialize in a certain function it will be beneficial to transfer control of the function to a specialist organization that will be able to offer better cost and quality" [Clott, (2004), p.4]. Some of the reasons why outsourcing has become so popular with businesses are due to globalisation and new technology such as the internet has taken down the barriers of time and distance.

The long trend towards outsourcing was promoted by transferring as many non-core activities off their balance sheet as possible to increase corporate short-term profitability (Van Weele and Van Raaij, 2005; Viswanathan et al., 2007). Many manufacturers of products such as automobiles, toys, textiles, electronics, and semiconductors have been migrating offshore to remain price competitive (Bhurjee et al., 2018; Chaturvedi and Chakrabarti, 2018). Some of the advantages of offshoring include an array of goods that are available upon demand, promote the remove of domestically produced low-margin manufacturing and inventory assets, increased profitability, ROI, and EVA, which make their companies more attractive for potential shareholders. Some trends that are brought on by offshoring are that employees now have more temporary positions instead of just working for the same company throughout their careers are operational efficiencies are improved (Oey and Nofrimurti, 2018). Increased productivity may have caused workers to be more adaptable to changes within their job fields to maintain their competitive advantage (Smith and Krivacek, 2019; Sparks, 2010; Van Weele and Van Raaij, 2005). One of the biggest industries affected by outsourcing is the IT industry (Skipper, 2006). This has been mostly due to the high costs associated with expensive hardware and software. Most of these IT jobs have been outsourced to countries such as India where labour costs are much lower than in the USA. One of the newer industries being outsourced is the business process activities of business.

Defenders of global outsourcing often cite that outsourcing has merits that increase competitive advantage to firms that choose to outsource. Typically, increased in competitive advantages can be achieved through the area of concentration on core business development by firms, cost control, access to state-of-the-art technology, market discipline through greater transparency, and demand changes flexibility (Gottschalk and Solli-Saether, 2006). The core competency suggests companies strive for a demand-pull environment which is created by companies focusing on core competencies and outsourcing non-core competencies (Stanczyk et al., 2017).

2.2 Evolution of nearshoring and reshoring through repositioning warehouses

When looking at the historical context of nearshoring, it is important to first must understand supply chain evolution from a holistic view (Power et al., 2001; Rajapakshe et al., 2013). As technological advancements were introduced to the marketplace, such as railroads and automobiles as transportation vessels, nationalisation became a realistic plausibility and was sent into a forced acceleration due to war efforts. As supplies were needed in various parts of the world to support military troops, material handling standardisations became ubiquitous with one of which being the 20 ft and 40 ft shipping containers as are still used in the logistics and supply chain trades this to this day. These innovations allowed globalisation of the supply chain from an operational perspective which coupled with the rise of computers and subsequent software programmes to manage transportation, including, but not limited to warehouse management systems (WMSs), transportation management systems and enterprise resource planning systems. Table 1 illustrates some of the strategic elements between onshoring and nearshoring.

Table 1 Strategic elements of onshoring and nearshoring in terms of management, development, and manufacturing and/or service arrangements

<i>Type of arrangement</i>	<i>Basic location</i>	<i>Time zones</i>	<i>Transportation costs</i>	<i>Labour costs</i>	<i>Language and/or cultural differences</i>
Onshoring	Country/region	Few	Low	Varies	None or few
Nearshoring	Continent	Many	High	Varies	Many

Through the use of technology advancements in this software space, companies were able to diversify the location of their business processes and services, where cost of labour are significantly cheaper than the incumbent domicile (Vanchan et al., 2018; Zhai et al., 2016). While the concept took greater roots in the late 1990s, early examples of nearshoring are found as far back as 1965 when the Mexican Government established the Maquiladora programme. This in-bond programme allowed for duty free importation of the requisite parts needed for assembly or manufacturing of finished goods and was necessitated to industrialise portions of northern Mexico and to curtail migration to the USA. A Maquiladora is a manufacturing plant which is foreign owned, controlled or subcontracted that operates under special provisions related to customs and affirms any tangible goods created will be exported out of Mexico (Richford, 2022). These operations were successful and the programme escalated significantly once the North American Free Trade Agreement (NAFTA) was signed on December 17, 1992 by US President George Bush Sr., Canadian Prime Minister Brian Mulroney and Mexican President Carlos Salinas. Upon implementation at the beginning of 1994, NAFTA represented the world's largest free trade area, and as of 2016, the USA, Canada, and Mexico conducted business to the tune of producing US \$1.8 billion of trilateral trade each day. With Mexico being the third largest trading partner for companies within the USA, behind Canada and China, it is easy to see how Mexico continues to experience a trade surplus with the USA as the trade between these nations account for 39% of total NAFTA trade (White, 2016).

Sustaining performance and competitive advantage when a market or technology changes is a major challenge for any business. To mitigate the challenges, companies use repositioning (also known as nearshoring) as a strategy to gain a competitive advantage. Several factors such as competition, market environment, and consumer trends cause a

company to reposition. With any strategy, there are some advantages and disadvantages, and this will be reviewed with Mexico in mind in repositioning destination within the business case studies.

Nearshoring has advantages for a company and can have strategic benefits that would efficiently change their operation. Some of the main advantages of repositioning are labour costs, shorten supply chains, less of a time zone difference, cultural and linguistic similarities, and more control of their operation. Compared to the USA, destinations such as Mexico have continued to maintain lower labour costs. According to the Nearshore Company, Mexico's average wage in manufacturing was US \$2.80 per hour compared to US \$24.55 per hour domestically (Veselin, 2022). The COVID-19 pandemic hit the supply chain industry hard, and this led to companies evaluate their options (Harapko, 2023). Nearshoring operations closer to the USA allow companies to have more supply chain flexibility (Yi et al., 2011) and add a closer proximity aspect. This would shorten the supply chain, but also added a minimal time difference so operations and decision making could be done effectively and addressed in a timely manner. Being able to communicate is essential in any business and not having a language barrier is an advantage. English is the most widespread non-native language used in Mexico and would give a company wanting to nearshore an advantage.

As with advantages, there are disadvantages of nearshoring. Some of the main disadvantages of repositioning are costly, quality, security and communication. Relocating a warehouse is costly even if it is to a cheaper country (Purkayastha and Samad, 2014; Rilla and Squicciarini, 2011; Robinson and Hsieh, 2016). The relocating can be even more costly with the cheap labour as this will factor in production quality and could eventually hurt a company's reputation. Nearshoring could have a breach in a company's security and integrity as many of the workers would be employed from another country (Smith, 2022). For example, PPG Industries, which is studies in the case analysis section, would have to share their paint mixture recipes that made their products' reputation – a core competency that might be lost. When nearshoring, a company would need to look at the risk reward factor to protect their operations. Although communication is an advantage, it also plays a disadvantage in nearshoring. Different cultures communicate differently and what may be important to US citizens may not be important to other cultures, which may create unintended miscommunications and conflicts. Ultimately, it is much easier to communicate when it is with someone in the same building as compared to another country.

2.3 Informational needs of retail businesses

In both the retail and manufacturing business, many researchers (Aeron et al., 2010; Barra et al., 2010; Daim et al., 2010; Narasimhan and Nair, 2005; Patti, 2006) are interested in exploring the differences in information sharing versus information usage. There is little question that outsourcing is a major part of global competitive business environments. According to Palvia (2004), outsourcing is expected to be a US \$160 billion-dollar industry by 2005. Some of the main business activities that are being outsourced are IT, accounting, finance and human resources. When R&D is looked at more closely they are not as apt to outsource this function due to risks associated with outsourcing. Some of the most common risk associated with shared R&D is security risks that involve proprietor information being stolen. Reshoring has been cited as a common solution to control this issue (Mlody, 2016; Moradlou et al., 2017). Security traditionally

has been cited as a major concern of companies that choose to outsource and most companies prefer to outsource to companies that have both onshore and offshore functions (Martínez-Mora and Merino, 2014; Metters and Verma, 2008; Parker, 2022; Taylor, 2023). Certainly, a main reason organisations choose to outsource is to cut costs and to maintain a cost competitive advantage over rival firms within their industry (Kinkel and Maloca, 2009). Outsourcing allows companies to concentrate on their core competencies while they outsource activities that they do not have a competitive advantage over. Outsourcing can also help a manufacturer meet temporary product development needs without imposing a long-term commitment. Outsourcing “allows companies to access technological and process innovations when size and/or time constraints prevent them from establishing these capabilities in house” [Palvia, (2004), p.4]. The functions of outsourcing can be broken down even more to include on shore, near shore, off shore and far shore. Onshoring refers to outsourcing activities that are within the boundaries of the company’s country. Near shore is where functions are in a country in close proximity of the company’s country. Off shore includes countries such as West Europe who have similar culture. Far shore includes countries such as India, China and Russia.

Sener et al. (2019) reached out to most businesses that really had a retailer listing in Turkey and received feedback from a several 100 businesses. Their research illustrated the importance of information usage and not just receiving information as the key to success and improvement. It highlights the information sharing aspect, which is important in its own way but needs to go one step further and focus on the information usage. In global economies, there are continued importance on integration in all aspects within the supply chain. This integration includes the sharing of information so that businesses and the supply chain can remain competitive and meet customer demands. Information that is constantly being able to track live information is vital to any supply chain but how important is the information if it not being used or used properly?

Sener et al. (2019) wanted to draw attention to see if the usage of the information could improve things like performance and efficiency. If management are not utilising information properly then it would not be beneficial to collect of the data. It is important to keep in mind the difference between getting information and utilising that information. Hence, according to Sener et al. (2019), there are at least three key learning processes, which are information acquisition, analysing, interpreting/understanding of information. Ultimately, their research efforts wanted to determine when information is shared or used how does it affect efficiencies and performance. They found that there are really the two key drivers with any business decision. How is the business improving and creating a healthier bottom line by meeting our customers’ demands? Lastly, it found was very interesting that the study did find that the size of the organisation played a role in information shared and information used.

A central question remains, asked by many academics and practitioners in various forms, is what are the elements involved in a firm to strategically leverage its suppliers to gain a sustainable advantage? (Sharma and Sharma, 2018; Verma et al., 2018; Xu et al., 2018). Outsourcing professionals create can sustainable value with a service provider, but the difficulty comes in properly maintaining an accountable buyer-service provider relationship. These are the same questions that management may ask of its supplier partners in dealing with onshoring and nearshoring initiatives. Answers to this and other important questions may best be communicated through case studies, such as the current

case study, rather than theoretical and hypothetical research. Through the qualitative business case study methodology, many examples of how firms have successfully utilised their suppliers to transform their business and their industry. While it may seem that the benefits of a strategic value-based relationship are obvious, there are indeed many ways it can be structured. The purpose of Vitasek and Manrodt's (2012) research was to briefly describe five principles found in successful suppliers' relationships that were studied over seven years. The authors provided a synopsis of the associated ten elements that should be part of an outsourcing. Some of the major operational techniques of supply chain management (SCM) from the research. First, even though it is not directly discussed but integration upstream and downstream of the supply chain is absolutely necessary and key. As the global economy continues to change and adapt, it is important to not consider the supply chain elements as separate entities, but as a major and complex interconnected entity that is reliant on each other's success (Chiarini et al., 2018; Dharamdass and Fernando, 2018; Franceschini and Mastrogiacomio, 2018). Hence, collaboration, not just cooperating, and working together towards a common goal is a necessity and integration is major keys to dominating business in an industry (Chavez et al., 2016; Daim et al., 2010).

Different supply chain processes and how supply chain logistics can be a competitive advantage for firms are important strategic decisions to answer. In order to reach the goal of being lean and fix processes, Prajogo et al. (2016) built a research model. There are 232 Australian manufacturing firms that were used to analyse the framework. The author discusses how increasing competition requires firms to improve their internal operations while also focusing on integration of suppliers. SCM has extreme importance on firms' performance. Essentially, it is challenging to grow as a firm if their SCM is not optimal. Some of the external and internal aspects that go into operations are sourcing, logistics, production, and distribution of goods and services. The authors describe internal flows for firms as a 'black box', meaning it is something that is not examined nearly enough when improving processes. This article takes a deep dive into the 'black box' of internal controls and processes and how they can improve SCM.

3 Case studies

In this section, both Dick's Sporting Goods and PPG companies. Each company will begin with an overview or company profile, followed by discussion of their procurement concerns, warehouse operations, transportation and sustainability issues.

3.1 *Dick's Sporting Goods Company*

3.1.1 *Company profile*

Dick's Sporting Goods is a large outdoor equipment, apparel and footwear retailer headquartered in the greater Pittsburgh, PA area with over 700 retail stores across the country (Repko, 2021). Dick's Sporting Goods operational structure comprises a large chain of superstores which traces its origin to a bait-and-tackle shop started in Binghamton, NY back in 1948 by Richard (Dick) Stack. Before the conception of the business, Stack was working at an Army and Navy supply store when his manager crushed his dreams. The company strategically relocated its headquarters to Coraopolis,

PA, a western suburb of Pittsburgh, in 1994 because of the proximity to airports, national sports teams and a local population of outdoor enthusiasts. By the end of 1994, the store chain consisted of 22 stores in PA, CT, NY and MA. Fast forward to the present day and the store chain consists of approximately 785 locations across the USA. As a large retailer with a national reach, their procurement network must be able to keep up with the large number of stores and their vast product selection. Following the methodology of many other retailers, Dick's Sporting Goods operates with a hub-and-spoke type distribution strategy having utilising distribution centres (DCs) centrally located around geographical clusters of stores in different markets.

3.1.2 Procurement

As is common with large retail networks, Dick's Sporting Goods orders materials from suppliers all over the world to be fed into their DCs for processing and consolidation with material then distributed to their retail stores based on store demand. To start this process, an initial assessment of the potential value-added by about their suppliers needs to be completed. In the vast majority of their procurement network, Dick's Sporting Goods uses an approved vendor list as well as purchasing contracts with the bigger named brands. For instance, individualised contracts have been executed for footwear and other shoe products with large manufacturers including but not limited to industry titans such as Nike, Reebok, New Balance and Brooks.

Should the organisation make the decision to expand their product selection, or to allow lesser known brands into their portfolio of product offerings, a qualification of suppliers will commence by performing an onsite audit and having the supplier themselves complete documentation before entering into any agreements or placing purchasing orders. The suppliers are required to complete a vendor code of conduct form, which explicitly lists the qualities or conduct that Dick's Sporting Goods requires in a supplier. This partnership agreement included an acknowledgement of their anti-corruption policy as well as an acknowledgement of their goods advertising agreement. With these documents in place, an onsite audit and an adequate quote from the supplier, they can make their selection and start placing orders.

Armed with the historical sales data, material planners can create market specific forecast estimations to determine total quantities of their procurement orders. Oftentimes, the supplier base is offshore which translates to lower acquisition costs but comes with longer lead and transit times. When creating the forecast for the material, these lead times to manufacture items are taken into consideration as well as the transit times to meet the planned delivery date. To use some real-world examples, seasonal sporting goods or holiday items see their orders placed according to a launch date with baseball gear required to be procured in the late winter time frame given its playing season starts in the spring. Buyers will subsequently take lead time and transit time life cycle allocations into consideration to match these factors into their delivery date projection. Purchase order quantity is also calculated to meet the demand for the DCs who support regionalised stores as buyers will need to ensure they can cover forecasted demands. For example, buyers may separate job responsibility and functionality by region with personnel covering the East, Midwest, Rocky Mountains and West respectively with all placing orders to identical suppliers for the same materials but with different delivery destinations.

With the lead times and transit times being longer, and the demand for these items being seasonal meaning once the window of time has passed the demand for these items drops, buyers will order the full forecast of materials. The materials which cannot be held on hand within the stores will be held in the DCs for a small period of time. If leftover product still remains, a business decision is made but typically sees this overflow shipped to the stores as the season ends leaving the responsibility of selling the remaining items to the stores. The newsvendor model is a common practice used by Dick's Sporting Goods to calculate their order quantities for items and just-in-time (JIT) purchasing strategies are also employed to maintain lower inventory levels and reduce inventory holding costs.

3.1.3 Warehouse operations

With Dick's Sporting Goods being the largest sporting goods retailer domestically, operating over 700 stores across the USA, they are the predominant retail choice for consumers in the market. CEO Lauren Hobart has stated end consumers have taken up the active apparel and outdoor hobbies during the pandemic causing an increased demand for their products and finding creative solutions was paramount. In order to provide efficiency, company decided to invest in warehouse automation through Bastian Solutions to create a more expedient supply chain with the end goal to fulfil orders as quickly as possible. Some of the key technologies Dick's Sporting Goods invested in are automated order routing, picking devices to include robotics, camera label scanners, semi-auto tapers, put to light, automated pallet wrapping and various types of Hytrol conveyors. Prior to adapting to the new technology Dick's Sporting Goods DCs were processing around 2,000 orders a day. Once the new technology was phased in, Dick's Sporting Goods distribution warehouses were able to process 18,000 orders a day. The following sections is a review of some of the more unique technology used to accomplish this feat in their operation.

Exacta™ automated order routing is a smart conveyor routing system that allows a company to have a more dynamic operation than traditional warehouse conveyor systems. The web-based application communicates crucial information with the WMS, such as the weight, size and destination for any product. With this information, the conveyor system will auto sort and prove the concept the benefit of this warehouse automation will allow the company to complete more orders in a timely fashion. Dick's Sporting Goods Senior Vice President of Supply Chain George Giacobbe stated this advanced technology will assist with producing 12 million orders a year with all passing through their warehouse system (Dick's Sporting Goods Case Study, 2023).

Pick-to-light (PTL) is a picking technique Dick's Sporting Goods warehouses use to increase order fulfilment productivity and improve picking accuracy while being deployed in smaller picking areas or work zones of a warehouse. The pick to light software will identify specific SKUs to be selected based on the barcode affixed to each tote and container scanned. Based off this information, a digital screen will display the specific SKUs to be picked, the requisite quantity, as well as light illumination to indicate this order needs fulfilling. Once the items are picked, the associate would need to complete the picking by pressing the illuminated light to indicate the order has been fulfilled. PTL technology is useful as it essentially guides an employee through the picking process while increasing productivity and potential accuracy. Similar to the PTL are the put to light systems, which is for inventory purposes instead of order fulfilment. Put lights at put locations are illuminated when an associate scans the barcode of the tote

or container at their work zone displaying the amount to restock. The software for both PTL and put to light communicate live with the WMS thus providing accurate information and faster order cycle times.

Dick's Sporting Goods uses Cognex™ barcode readers throughout their operation armed with cameras whose functionality has the ability to decode image-based barcodes, including 1D and 2D, and one of the more difficult of barcodes direct-part mark (DPM). These types of readers allow the Dick's Sporting Goods warehousing operations to be flexible and amenable to vendors with different barcodes affixed to their material.

3.1.4 Transportation issues

Dick's Sporting Goods utilises a regionalised DC model and recently overhauled its operational processing to fulfil ecommerce orders in the same zone shipping model while they were in a pre-pandemic environment. Centralised e-commerce fulfilment had been done previously with the vast majority exiting their DC in Louisville, KY, which has since been removed from its real estate portfolio (Grill-Goodman, 2021). After opening a new DC in Conklin, New York back in 2018 to service their northeast stores, they now count five major DCs within their organisation with this new facility supplementing the incumbent locations located in Pittsburgh, PA, Atlanta, GA, Indianapolis, IN and Phoenix, AZ (Gilroy, 2019).

A COVID-19 pandemic impact to their business has been making a pivot to adjust to the way consumers expect their goods with expediency to rival other retailers whose platforms and value add propositions surround the ideal of home delivery. As a result, Dick's Sporting Goods realised getting their tangible goods ordered to the end consumer to match their competition is not only a prudent business decision but also helps improve their overall fiscal health by widening profit margins.

Hence, by moving their e-commerce fulfilment from regional DCs to the company managed brick-and-mortar stores, Dick's Sporting Goods identified a differentiator for themselves within the recreational equipment marketplace as they drive online orders toward curbside pickups thus further reducing total transportation costs for the organisation. In Q2, 2021, it was reported that 70% of online sales for Dick's Sporting Goods were fulfilled directly by the stores with the DCs covering the remainder (Leonard, 2021). These DC locations continue to serve as the main replenishment source for the stores with 90% of store inventory being distributed directly by company routed freight versus being routed by vendor partners. These moves are done via the full truckload, less than truckload and intermodal business units in the domestic marketplace.

3.1.5 Sustainability issues

As a leading retailer in the sporting goods space, Dick's Sporting Goods blazes the trail for all other companies as it relates to sustainability. A recent partnership with Packsize™ allows the organisation to right size their packaging on demand through technology, services and solutions to allow their online orders to be shipped in the appropriately shaped and sized corrugated boxes to minimise waste (BusinessWire, 2020). From a customer facing perspective, Dick's Sporting Goods sees this sustainable packaging as a way to scale their customer service needs while reducing packaging waste for an improvement to their overall customer experience. It has been quantified the pack

size system will use 26% less corrugated to optimise sustainable efficiencies while also reducing overall costs and environmental impacts from by product.

Their integration of automated technology also allows for warehouse personnel to scan one of their over 2,000 SKUs in order for the system to auto populate the right size and style of corrugated box and appropriate dunnage to help ensure the product is transported damage free to the end customer no matter the item. The organisation has also made a pledge to eradicate single use plastic bags from their brick and mortar stores point of sale by 2025 (PRNewswire, 2020). With these bags typically comprised of plastic derived from fossil fuel and often found as one of the top items improperly recycled, the focus has been made to meet a minimum threshold of 70% recycling rate for its stores and operations in addition to reducing their overall greenhouse gas emissions by 30% by 2030.

3.2 PPG Company

3.2.1 Company profile

PPG is a multi-national, multi-billion-dollar corporation focusing on architectural, industrial, aerospace and automotive coating solutions. PPG is also the manufacturer of the paint and coating products they sell, as well as many of the accessory products that accompany this industry.

3.2.2 Procurement

As a manufacturer, their procurement process starts out with purchasing raw materials, such as titanium dioxide, which is a material found within the earth that needs to be mined and processed before it can be used in paint coatings. The buyers for PPG are given a forecast of raw material needs for their respective factory which is built off years of historical sales data coming from their retail, industrial or automotive coating locations and sales reps. This forecast is then sent to the buyers who will go and procure the raw materials needed for the paint. At the same time, the sundries procurement team is looking to source raw materials for the line of sundry products that PPG also manufactures, which will include silicone for their caulking and sealant products. Yet, another group of buyers will be purchasing finished goods products that PPG also sells in their stores who are also looking at the usage of the colorant to determine what quantity of colorant they need to purchase for the retail stores.

Paint manufacturing procurement is part of the main business of the PPG coatings line, which encompasses the bulk of revenue for the company each year. At the beginning of the year, the planners will post a forecast for the raw materials needed for a particular manufacturing plant. This data comes from sales figures over the previous five years from the DCs and retail stores within their geographical coverage area. The forecast is then sent to the buyers, who will then create purchase orders with the brokers of the raw materials securing the demand after they are mined and processed which means that lead times can vary quite significantly. To that end, PPG will purchase the largest amount possible in a single order and store them on site at their manufacturing facility given the shelf life of these materials long enough to the point there is no risk of spoilage if properly stored. However, their manufacturing schedule is based off made to order runs of material as paint so, once it is manufactured, the material has a finite shelf life

according to PPG standards and practices of 18 months even though the actual product itself will perform long after this window. Adding additional safety stock amounts as needed based on low production from the suppliers or shipment losses. The specific products are then made with a cognisance to the fact PPG produces thousands of different paint products all of which have different ratios of raw materials needed.

Once the manufacturing is complete, the finished goods are then packaged and shipped to fill open DC orders. As the DCs receive the material, they are broken down into manageable sizes and shipped to the stores that have open orders for that product. At the retail store level, the store managers are responsible for placing replenishment orders from their local DC to restock their shelves. The retail computers are connected directly with the DCs order entry system via an EDI connection allowing the stores to view real time inventory levels, expected replenishment dates and also their truck schedule.

The second type of purchasing that is occurring parallel to the paint manufacturing is the sundries raw purchasing. This is a similar process to the paint; however, the strategy is slightly different based on the shelf life of the raw materials. Silicone in this case has a long shelf life, around 20 years, so in the case of these sundries the previously mentioned sales eligible shelf life of 18 months is not applicable. Raw materials are ordered in bulk and stored at the individual plant level with this being a mined and processed material the lead times and availability does vary.

The final part of this procurement network is the finished goods procurement. This category would include most of the other items you would see in a paint store to include brushes, rollers, ladders and other coatings that PPG does not manufacture like certain concrete coatings and glass coatings. This process is very similar to Dick's Sporting Goods procurement strategy as these items are purchased complete and shipped to the DCs before their final transit to the retail stores as needed. The procurement strategy for these is JIT whenever possible as the forecast for these is a little more stable. Another point to mention about this segment is the presence of finished goods that do not have a spot in the DCs or the made to order products. Stores can place orders directly with the suppliers to ship materials right to the store as needed in order to reduce the need for a forecast but also the need for warehouse planning since these products are not stored in the DCs.

3.2.3 Warehouse operations

Since the global pandemic, PPG CEO Michael McGarry noted challenges of raw material inflation and transportation costs affecting their supply chain. Raw material inflation would slow production rates due to lack of adequate resources and transportation costs would have PPG evaluating their warehouse and manufacturing strategies (PPG Warehouse Layout and Operations Design, 2023). PPG serves customers ranging from the everyday consumer at the entry level point all the way to large-scale companies such as those in the automotive industry. To offset the challenges, PPG has adapted various technology applications.

As a manufacturing company, PPG used many manufacturing processes such as paint mixing which lead to mistakes and lost batches. PPG scaled their operation to coincide with technology, specifically when using various types of specialty chemicals. Their technology was adapted not only for their manufacturing process but also their packaging process with Semco, a packaging and application system allowing PPG to safely store and transfer chemicals. According to PPG, this innovative package for specialty

chemicals saves up to 65% in chemical waste and 30% in process time, allowing packers to fulfil orders quicker (Chang, 2022).

3.2.4 Transportation issues

PPG Industries is comprised of seven different business units identified as aerospace, architectural coatings, automotive refinish, industrial coatings, marine and protective coatings, packaging coatings and specialty coatings and materials. Given the substantial amount of procurement needed to sustain business continuity for each of these units, autonomy for transportation decisions are allocated as low as an individual shipping location (PPG, 2023). The locations are bound by corporate oversight from their headquarters in Pittsburgh, PA on matters such as total spend and carrier procurement with all negotiated rate contracts loading into their Oracle transportation management system. Given the complexities of this supply chain, products are transported by all modes including but not limited to land, sea and air on a daily basis. As reported in the 2021 ESG Report from PPG (2022), they self-report approximately 85% of their transportation is done by truck over the road.

While the firm does own a fleet, primarily of sprinter vans for local delivery from their PPG Paints stores, the overwhelming majority of their transportation is done by outsourced asset-based transportation providers. Strict oversight is paid during the vetting process as each carrier must acknowledge and sign a boilerplate transportation agreement affirming they will meet specific key performance indicators to maintain partnership with PPG Industries and their respective business units.

3.2.5 Sustainability issues

PPG openly advises their mission is to protect and beautify the world and expound upon that ideology through their supplier sustainability policy. The corporate aim with the policy is to affirm the PPG expectations of their vendors to be fully compliant and “adhere to internationally recognized environmental, social and corporate governance standards.” In order to support vendor sustainability initiatives, PPG has partnered with EcoVadis to be central repository to ensure they have the most critical processes, tools and resources to maintain minimum threshold practices throughout their global supply chain. The EcoVadis partnership allows PPG to easily review scorecards of their suppliers and audit appropriately to benchmark progress as they track that their goals and mission are being met as it is their desire to have suppliers as committed to sustainability practices as their own. As proof of concept, PPG announced five of their facilities in Ohio received award-winning recognition from local councils in the environmental health and safety performance categories. Part of this recognition is due in part to a paint recycling process to allow unused material to be collected from production to be repurposed as new raw material rather than be liquidated as waste. They, too, have an initiative to drive plastic waste from their production process and to reinforce recycling efforts within their facilities in addition to continuous improvement on spill kits to become more unilaterally available within their facilities.

4 Managerial implications

Some of issues or problems showcased in this case study are how firms focus on external improvements rather than internal when trying to improve their SCM. Prajogo et al. (2016) defined inbound supply chain processes and lean production as “The extent to which inbound inter-organizational processes are seamless and closely coordinated.” As assumed in this study, lean production processes are defined in terms of the extent to which internal operations are in line with lean production processes and principles, specifically JIT and total quality control (TQC) principles. The operations management discussed in this article focuses on internal/inbound controls, and how being lean can improve this. The findings of the research were that supply chain integration does not predict how a firm will perform competitively. Integration of SCM needs to be both external and internal. Having integration in SCM can create a streamline of accessible information and improved process. Further, it can also help firms become lean. The research shows the factors that go into competitive performance. They are: organisational size, supply chain integration, lean production and inbound supply performance. Thus, the management/decision technique is to focus on inbound supply performance and becoming lean in order to gain a competitive advantage. As discussed in this case study, when compiling the specific items that are go into the scales of the research, which are; supply logistics integration, lean production processes, inbound supply performance, and competitive performance, needs to be carefully analysed.

As with any decision of this type, the management of the company must consider the ROI of this investment. As mentioned above, the advantages of nearshoring are reduced labour, shorter supply chains and labour force similarities to name a few and coupled with these aspects are the cost calculations to address. For instance, one must consider not only the monetary cost of the project but also any delays or slowdowns in their normal business operations. In addition to these factors, they must also consider the increase to their operating costs but adding a new facility, new taxes, hiring a new labour force, management team for the location and compare all of that to the increase in profit, if any, as well as weigh that against the lower risk they would now have in their supply chain. A common comparison or rationalisation in the manufacturing world in relation to procurement is calculate the losses from a line down, and compare it to a slightly higher material cost. The same type of comparison or rationalisation would need to be made in this decision as well, as illustrated in Table 2.

Table 2 Vantagepoints of SCM for firms under this business case study

<i>Firms/SCM concepts</i>	<i>Dicks Sporting Goods</i>	<i>PPG Industries</i>
Modern/updated warehouse	✓	✓
Quick cycle times	✓	✓
Global distribution	✗	✓
Online order/in-store pickup	✓	✓
Nearshoring	✗	✗
Offshoring	✗	✓

5 Conclusions

5.1 General implications

By implementing the nearshoring strategy, these companies can leverage proximity as they look to obtain or produce their goods in an environment closer to their domestic operations. They can also see a significant impact their investments by saving time through reduced lead times on the procurement aspect and money via lower transportation costs due to miles travelled and mode differential. Dick's Sporting Goods and PPG can also lean into their sustainability initiatives by promoting their initiatives which helped to decrease overall carbon emissions by having their product travel a shorter distance through its life cycle from raw material origin to end user.

5.2 Directions for future research

The COVID-19 pandemic had significant supply chain disruptions and it negatively still impacts the supply chain for both of these companies, as well as others. However, with the growth of the logistics industry as inflation and supply chain disruptions become more manageable, management of these organisations may consider that the logistics and transportation sector, in particular, will move from cost to profit centres (Hanson, 2020; Smith, 2022, 2023a, 2023b). For Dick's Sporting Goods, the transit lines for the ocean shipments were extremely delayed resulting in late shipments of goods, losses of ships on the water, higher expedite fees and lower product availability from their vendors. PPG has seen similar issues as the raw materials used to manufacture the paint are mined and processed. As COVID-related lockdowns occurred all over the world, the mines would be shut down for extended periods of time resulting in a very large backlog of orders for the materials. Mining, unlike manufacturing, has a cap on capacity therefore the effects of loss are larger and felt for longer. In addition to the effects of the global pandemic on transit, and overseas production both companies felt the impact here at home. With less in store shopping traffic at standalone retail locations, both organisations saw lower sales numbers than previous years and had labour availability negatively impacted by quarantining or shutdowns leaving manufacturing plants and warehouses empty.

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