Building an Intermodal Logistics Network

Bridging the Gaps in Communication and Technology

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Abstract

This paper delves into the global logistics market with an eye on technological advancements and the future of the industry. Expanding across all modes of transportation, a review of historical progress and current market situations reveals what lies ahead for the industry and what obstacles exist moving forward. A proposed network solution is examined via a case study involving two international logistics providers as a means of exploring potential resolutions to existing and forthcoming challenges in the industry. The proposal focuses on an intermodal logistics model that integrates all modes of transportation into a centralized network accessible by both users and suppliers, alike. Across a global landscape, this study outlines the lack of communication and information sharing that adversely affects the industry's ability to keep pace from a technological perspective.

Keywords: 3PL, freight, intermodal, international, logistics, network

1. Introduction

For decades, we have witnessed technology grow at an incredible rate in our everyday lives, and the business world has been transformed in many ways. Technological advancements throughout the industrial sector have had significant impacts on cost structures, process efficiency and, maybe most important, customer expectations. Concepts such as automated manufacturing machinery, bar coding, and just-in-time inventory are only a few examples of how the industry has evolved. They have changed the workplace and created cost effectiveness and efficiencies; it is now imperative for all markets, and the organizations within them, to keep pace.

In the industrial sector, the most notable technological developments have taken place in the manufacturing and communication aspects of the market. As processes become further automated and information is more readily available, the expectations of everyone from suppliers to end consumers have changed. The logistics industry has been privy to some of the technological benefits, and has given rise to the question of how this sector will take the next steps in order to keep pace with the speed at which the supply chain is becoming accustomed to.

In order to determine an appropriate strategy, a first step of importance is to determine what technological changes have affected the logistics industry, both directly and indirectly. It is then necessary to examine how this sector has dealt with changing expectations in the market place as it pertains to information flow, response times, international trade, communication challenges, environmental concerns and speed of delivery. The major problem facing the logistics sector is: what are the next steps and/or advances available, and when are we likely to see them develop? As this paper explores potential solutions and the obstacles/challenges in the current market, we begin to unveil an environment where significant change could prove difficult.

2. Review of Literature

The logistics industry features several major avenues for transportation: ocean, air, rail, road and, to a much lesser extent, pipelines. The existing research data outlines many of the major issues faced by each method, but offers little in solutions to a unified and cohesive, interconnected relationship.

2.1 An Overview

Container trade, representing 90% of worldwide cargo (Harris, Schroer, Anderson, & Moeller, 2010), is most often routed through a port system using ocean travel. Although slow moving, a large vessel can transport substantial

shipments long distances, especially overseas, at a very low cost. An environmentally friendly solution to capacity and mobility issues, it is expected that by 2020, the current level of ocean transport will double (Katsioloudis, 2009). This sector of the industry, however, faces issues with port capacity and throughput as well as idle containers, reducing ship turnaround time; it creates a concern for any sustainable growth (Katsioloudis, 2009).

The air cargo industry is a $200 billion sector that is growing rapidly, increasing the pressure on airline schedules, loading plan generation and carrier benchmarking (Lau, Choy, Lau, Tsui, & Choy, 2004). Much like ocean travel, air travel can deal with large containers on dedicated aircrafts for quicker, albeit more expensive, delivery. The limits in regards to size and frequency, however, are far more substantial. Smaller items can travel more frequently as parts of regular airline travel, but offer restrictions on size and routing.

The railroad industry has existed for centuries, remaining an efficient means of transportation as it continues to play a large role in the logistics sector. Some of the major advantages include cost, speed, reliability, capability, capacity and flexibility (Lang, 2011). While it lacks the ability to deliver to a customer's front door, freight trains are an efficient means of moving bulk items in a cost-effective manner (Joborn, Crainic, Gendreau, Holmberg, & Lundgren, 2004). Heavily regulated by the government, and with technology influencing the infrastructure to accommodate higher speeds and more traffic, the future is bright for this enduring avenue.

Road travel is the most commonly recognized mode, as it is the most visible, and therefore frequently used. That being said, this mode has a number of significant restrictions in terms of distance and speed, not to mention several outstanding societal concerns such as environmental impact and the congestion of general traffic. As such, the ideal logistics model uses this mode as type of "last resort" to ship product to its endpoint once all other avenues have been exhausted.

A more particular mode of transportation, freight pipelines makes up an infrastructure that is seldom used aside from very specific applications. It represents an innovative means of transport that would require significant investment and development (Egbunike & Potter, 2011). While examples of this obscure alternative exist in Europe, largely ignored, it does provide a transport model that alleviates concerns about speed, cost, environmental impact and traffic congestion. However, it represents a capital-intensive concept that lacks the appropriate research and information to be developed without significant commitment to adoption (Aoyama & Ratick, 2007).

An assessment of recent technological influences in the logistics industry shows a progress that has lagged behind the rest of the industrial market. Since the mid to late 20th century, the industrial sector has seen technology and automation change the face of manufacturing, production and servicing. Advanced machinery and robotics have led to faster production times, reducing the need for stocking and spawning concepts such as 'just in time' inventory. The logistics industry has been affected indirectly, but is now seeing more direct applications of technological advancements. Transportation Management Systems (TMS) have reduced the number of manual processes by increasing automation and removing waste from the supply chain (Anonymous, 2013).

Radio Frequency Identification (RFID) technology has provided benefits such as track-and-trace capabilities, offering real time information during the delivery process (Chen, Chen, & Hsu, 2013). An extension of this technology, video tracking has been instituted for air travel as another means of reliable tracking in real conditions (García, Pérez, Berlanga, & Molina, 2007).

From a warehousing perspective, technology surrounding automated lift-truck movements has been explored for material handling, aiming to reduce the cost and inefficiencies associated with manual labour and to better align the internal and external transportation providers (Balint, 2013). While still in the stages of infancy, this type of technology could go a long way in reducing overheads and unnecessary costs, although the price of such automation is very likely a loss in jobs for this sector.

As the industry has experienced these effects, customer expectations have also evolved with the changing technology, demanding quicker delivery times at reduced costs while maintaining a standard level of service. Customers are also now requiring a means to track and trace a shipment from departure to destination, allowing for continuous follow-up (Iveroth & Bengtsson, 2013). As such, this type of technology is becoming standard in the industry.

To increase customer value, it is imperative that "trading partners use e-business technology to ensure visibility over the entire supply chain" (Ramachandran & Tiwari, 2001). The development of Intelligent Transportation Systems (ITS) has facilitated an infrastructure which brings together technologies, electronics, telecommunications, computing hardware, positioning systems and data processing for sophisticated planning and operations (Crainic et al., 2009).

Organizations within the industry are able to gather information, determine what is useful and implement it into practices for inventory control, warehousing and cross-consolidation purposes. Having this information readily available reduces costs, increases response time and improves communication and planning, helping to enable the globalization and development of the logistics industry.

The rapid exchange of data (EDI) (Crainic et al., 2009) through the electronic linkages creates an opportunity within the logistics environment; the development of "a globally integrated framework realising a synergy between previously isolated systems". Advantages of such a system include reduction in manual entry, improved speed and accuracy of transactions, lower communication costs and a simplification of planning.

2.2 The Intermodal Framework

Intermodal logistics concerns the movement of freight over multiple modes of transportation with the ultimate goal being delivery in the most effective and efficient manner, in terms of both cost and time.

"Logistics engineering has been exposed to intense impacts from the development of information and communication technology, especially computer networks, mobile and wireless applications, and electronic commerce" (Vasiljevic, 2013, p. 38), creating an opportunity to establish relationships between suppliers, shippers, logistics providers along with all production and service enterprises.

The design of an intermodal framework serves many purposes in today's market as it works to achieve goals and solves some of the issues that the industry currently faces. It aims to manage shipments on a global scale, within a reasonable time and at a competitive cost, while being restricted by existing infrastructure, location of transfer points and cost structure (Ishfaq & Sox, 2010). The performance of this framework would be based upon the same metrics supporting customer demand: cost, frequency, time, reliability, flexibility, safety and security.

The growing recognition that supply chains must create a connection between commodity, transport, traffic and infrastructure, comes from the identification of issues resulting from a number of different policies and structures (Roorda, Cavalcante, Mccabe, & Kwan, 2009). Some of these concerns include reducing the increase in public roadway congestion, synchronizing schedules, determining the appropriate transport mode and minimizing the number of empty return trips (Truschkin & Elbert, 2013). The proper organization of these elements has significant influence on the cost of providing logistics services.

Freight transport demand is derived from decisions in production location, sourcing, marketing, sales, warehousing and transportation management (Tavasszy, Ruijgrok, & Davydenko, 2012). Costs of trade have decreased as Government regulations have improved along with information and communication technology. The globalization of production has become more prominent as factors such as labour costs, specialization and differentiation and material availability have played more prominent roles in decision making.

The pressure for efficiency and effectiveness stem from the goals to provide quality service and products at a reduced cost. Mass individualization is a product of the reduction in shipment sizes, increase in shipment frequencies and the customization of goods, leading organizations to seek economies of scale through innovation and collaboration. Regional distribution centres have become a popular means of controlling inventory, introducing concepts such as cross-docking, flex-order production and rapid fulfilment depots.

Any model must also consider the reverse flows necessitated by recalls, returns and warranty claims. The closed-loop supply chain (CLSC) model considers all aspects of the design and operation of the supply chain network for the purpose of minimizing cost while satisfying the desired service level (Zarandi, Sisakht, & Davari, 2011).

Any centralization of services in search for economies of scales would require a collaborative hub network as a link to the different modes of transport (Groothedde, Ruijgrok, & Tavasszy, 2005). It would combine the flows of different shipment methods at a high frequency with fast and cost efficient processes (Groothedde et al., 2005). While this may require, at times, an increase in distance traveled or extra handling, the large volume of shipments through one facility would reduce total cost. Some of the challenges include determining linkages between these hubs and the associated routing flows through the network.

It has also been suggested that the investment in transportation or logistic hubs could help in accelerating economic development in respective areas throughout North America, promoting job creation and economic stimulus (Heuvel et al., 2013). Any intermodal model would determine optimal locations for such hubs, as key components for the network infrastructure (Caris, Macharis, & Janssens, 2008).

While the need for this type of a network has been oft identified, issues of 'trust' remain. Relationships and information shared are limited by obligational relationships and different agreements, both formal and informal.

While the combined industry goals of cost minimization and efficiency maximization are unified, information sharing on interfirm, intraindustry and interindustry levels remains an impediment (Aoyama & Ratick, 2007). A solution where relationships can evolve from 'competitive' and 'hierarchal' to 'cooperative' remains at large, an area for further investigation. Improving the supply chain efficiency is dependent on the transparency of this information.

The proper combination of logistics activities with a properly designed intermodal framework can result in a streamlined flow of transportation with shared costs and savings that can be passed on to the end consumer. However, this requires shared information and collaboration to avoid unnecessary costs and conflicts in scheduling (Tavasszy et al., 2012). The challenge remains in finding partners who share mutual interests and are willing to invest collaboratively, under a model that combines the best interests of all participants; a multi-stage framework which links the supply and demand at all levels.

3. A Case Study: Exploratory Approach

In order to determine an appropriate network design for intermodal logistics, it is necessary to fill in the gaps in communication. Developing an industry appropriate model requires a detailed design of all the interworking components within the logistics industry and how they can interact in a single network. Due to the advanced technology available, this platform would most likely be web-based making data input, communication and information sharing simple and fast.

This model would act as a centralized hub for all related activities in the logistics industry, acting as a fundamental core for both suppliers and customers alike (Figure 1). Suppliers would be able to input data and share information that would be pertinent in routing, dispatching and consolidating service, feeding the network hub from the top down.

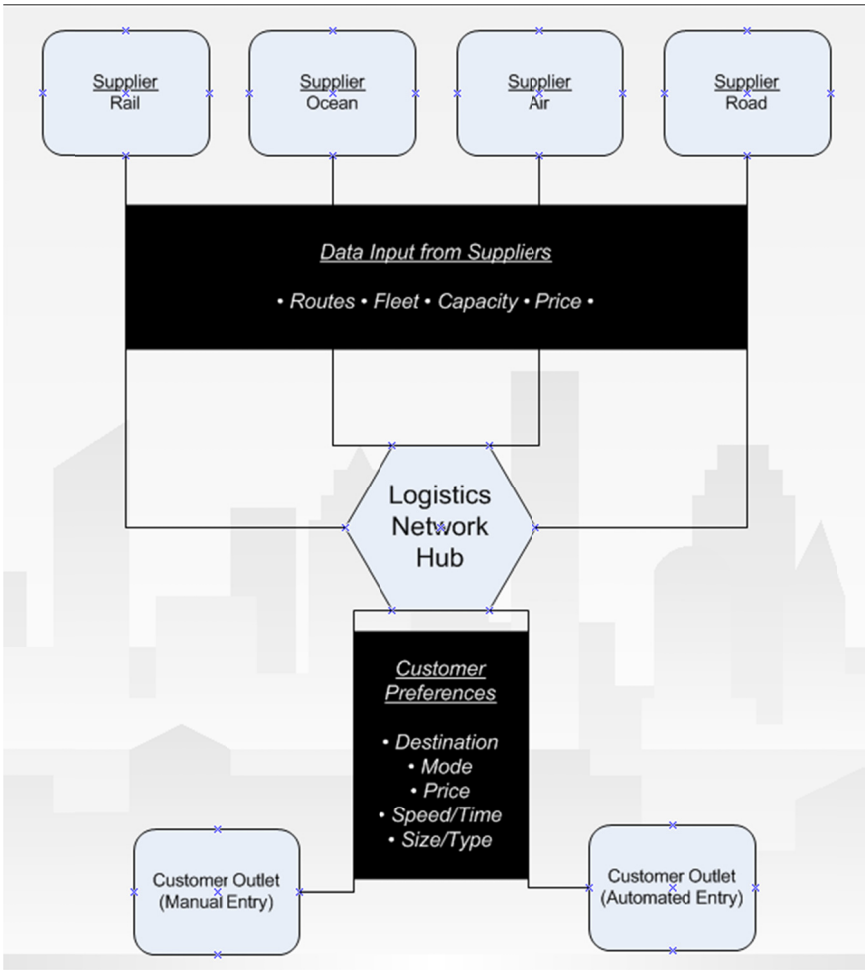

Figure 1

Customers could use the very same information to determine optimal logistic solutions based on their decided parameters, which would include cost, time/speed, reliability, flexibility, safety/security and possible mode preference. The customer requests would pull from the network hub, completing the cycle of information.

3.1 Methodological Process

The data gathering was done in two steps. In order to gain a general overview of how companies were approaching the issue, a 15-fixed-alternative question questionnaire was developed and sent online to a few significant international organizations in the logistics sector. The purpose was to get a feel from a few experts in regards to the restrictions, barriers and hesitation firms in the industry have in sharing information. The two main goals were to determine the types of relationships between logistics providers and gather thoughts/opinion on information sharing in the industry, specifically regarding regulatory standards and sanctioning. The results of the questionnaire would be aimed at determining the types of relationships and situations that lead to such guarded data.

On the strength of the information gathered from the initial survey, a second semi-structured questionnaire was developed around more specific issues regarding mostly self-regulation, regulations, standards, relationships and obstacles within the logistics industry. This supplementary questionnaire was administered verbally to each of the two respondents so as to elicit a conversation and more in-depth responses to key questions and objectives. Although both chosen respondents are similar in service offering within the industry, each was selected from a different international region (Canada and China) to explore if any differences existed between the two nations on a logistical level.

4. Research Findings and Analysis

Developing an industry appropriate model requires a detailed design of all the interworking components within the logistics industry and how they can interact in a single network. Customers could use the very same information to determine optimal logistic solutions based on their decided parameters, which would include cost, time/speed, reliability, flexibility, safety/security and possible mode preference. The customer requests would pull from the network hub, completing the cycle of information.

Initial responses did reveal some key information that could prove useful in further efforts. All respondents were of the intermodal variety, with the distribution of usage closely resembling what was expected: a high reliance on road transportation for end user delivery, a close mix between rail and ocean for significant distances and little use of air travel, likely attributable to higher costs and size restrictions.

Table 1. Key findings from data collected (affirmative %)

International shipping is significant part of operations	70%
Third party relationships under formal contract	60%
Would not participate in proposed Logistics Network	60%
Current regulations/standards deemed ‘Adequate’	75%

One of the main goals, as previously stated, was to determine the type of relationships that existed between providers. As a result of the global service area, all but one of the respondents acknowledged the use of third party logistics (3PL) providers to help facilitate their shipping requirements. A review of what phases are most important in usage of 3PL firms revealed a remarkable split between all five service aspects, with a slight lean towards service speed and price. None of the respondents admitted to intentionally avoid the use of any particular provider, as there is still a desire or necessity to seek competitive alternatives.

The questionnaire also revealed that dispatching operations are typically a mix between automated functions and monitoring/planning done manually, and that this information is not shared publicly, unless required by a contracted agreement with a particular customer. Respondents admitted that there is appeal in both the ability to track shipment over multiple modes of transportation through one system, as well as the potential opportunities that may arise from exposure to the global market.

In the second phase of the study, the first interviewee was a Canadian logistics provider, with primary operations residing in Northern Ontario. Initially specializing in road transportation, the supplier has seen operations expand to

rail and ocean logistics, most significantly the former. The respondent is heavily involved in international shipping as a means of responding to customer needs in the mining industry, which is significant in this particular region.

The respondent from Shanghai, China specifically deals with the shipping of industrial products for the mining industry. Many of these products manufactured in China come with significant cost efficiencies to customers in other countries and the shipping of these goods, which becomes an intrinsic element of said cost, is important to make this business feasible.

4.1 Third Party Relationships

The Canadian supplier utilizes third party logistics on a basis deemed 'casual', typically relying on 2-5 specific providers for its requirements, citing service speed, reliability and price as its most important criteria. The supplier stated that they never use a brokerage firm, and are "self-sufficient" in sourcing out their requirements because they have the ability and time to do so. It is interesting to note that none of their sourced logistics are contracted, and that providers are chosen based on availability and meeting of requirements (i.e. equipment, training, etc.), and less so based on price. While the supplier stated a preference for "familiar" providers, the primary factor was "who can do it first and/or fastest", with an emphasis on providing the best service to its customer (end user).

On the topic of tracking shipments, the supplier indicated that they only monitor or check in on particular shipments if there are any issues or concerns that arise. Otherwise, they "trust the process" as an extension of utilizing providers that are established vendors in the industry.

Intermodal service, utilizing road, rail and ocean, is necessary to facilitate its international shipping requirements, as a large portion of their operation entails shipping to both North and South America. As such, third party logistics providers are a large part of the Chinese suppliers' operations, typically using between 2-5 different firms. The nature of choosing 3PL providers is deemed "competitive" and generally based on price and speed which, again, are key elements of ensuring cost efficiency and customer satisfaction.

The means of which the provider selects its 3PL suppliers is much more formal than that of the Canadian organization, especially when dealing with new territories. The provider will elicit reference checks through multiple sources before understanding the cost structure, so as to cover off the primary elements of their concern (service level and price). Although they may "prequalify" several providers, they prefer to work with one strategic partner wherever possible. Some of their international shipping is already contracted with providers that have been consistent with "good services and reasonable prices" while also offering more of a "one-stop service" helping with customs brokerage and sometimes warehousing. In this way, the provider has set up some informal distribution centres in high-volume areas.

The provider is heavily interested in tracking freight and has personnel within the organization that will periodically monitor progress on each of its current shipments. The provider believes that logistics is "mainly consolidation works which means communication and information are very important". The provider believes that the greatest cost is in the "expectation of risk" and therefore tracking information is important for each provider's competitiveness.

Even though many third party relationships in the logistics sector are contracted, it is very rare to see any that are exclusive. This highlights the need for flexibility when responding to particular requirements and doing so in a timely manner, but it also showcases the contracted prices/terms to not preclude a search for competitive alternatives. The nature of the relationships is exhaustive and perpetually changing. It is near impossible to rule the use or participation of any one supplier if the requirements dictate necessity and, therefore, the competitive dynamics of these relationships give insight towards the hesitation in any information sharing.

4.2 Regulations and Information Sharing

For both suppliers that were queried, routing and dispatch functions were handled internally, with manual entry and monitoring done through systems which automates functions such as customer inquiries and billing, therefore none of the information is shared publicly or with any of the involved providers.

The Canadian supplier was 'somewhat comfortable' with information sharing within the industry but admitted that industry standards and regulations need improvement and noted that the reluctance comes from a desire from providers to "remain competitive" by not sharing their costs or processes. When initially approached about the proposed logistics network hub, the respondent was interested and suggested that they would consider participating in such a concept, showing an interest in the opportunities that could arise by being exposed internationally.

Conversely, the Chinese respondent believed that industry standards for information sharing are adequate, however, they are "somewhat uncomfortable" with it and would not be interested in participating in a concept such as the

proposed logistics network. While they found appeal in tracking shipments in one system across multiple modes of transportation, their major desire was for "some sort of index" for "service level assessment with global network (coverage)".

The divergent responses are indicative of the global conflict that plagues the logistics industry; there is recognition of a need for better information, but a hesitation to participate in any sharing for fear of the implications. While current regulations and standards seem to adequately protect parties under the current structure, there is no appropriate support system to take the next steps in this endeavour; this remains the largest stumbling block in industry progress.

4.3 Communication Challenges

The Canadian supplier noted that, while 75% of their logistics services are road-based, the rail (20%) and ocean (5%) segments have been growing significantly over the last several years due, in large part, to the increased requirements for shipping international products. Interestingly enough, when ranking the modes of transportation that are most difficult to organize, ocean and rail ranked first and second, respectively. The supplier acknowledged that some of this was due to being relatively new to each mode, but also cited many challenges that exist within both the ocean and rail transport models.

The rail industry in Canada was described as being "largely monopolized" through the Canadian Pacific and Canadian National railways and the supplier noted that this presents its own challenges, including the availability of particular rail cars and the unpredictability of weather effects. In addition to that, a lack of communication is stated to be the greatest obstacle in dealing with this mode of transportation. Avenues of communication are restricted by the size and unionized structure of the named providers, and communication with logistics providers is often neglected. This Canadian logistics provider stated that it leaves them with a "lack of control", effecting service levels to their customers as well as potential surcharges related to demurrage and unnecessary delays.

Due to the large volume of international shipments the Chinese provider deals with, 54% of their operations involves the use of ocean transportation, with 3% rail and 43% road facilitating direct delivery to the end users. As such, it is of little surprise that the provider listed ocean as the most difficult mode of transportation to organize, followed by rail and road, respectively.

The provider describes the ocean transport industry as "high fluctuating which is determined by market demand and very difficult to predict". Furthermore, the provider stated that much of the logistical decision making is made by the ocean provider's judgment with little consideration or communication with other parties. In addition to the mode of ocean transportation, the respondent also cited similar difficulties with rail service as they are operated "by a monopoly".

That being said, the ocean mode is vital to their operation because it is the most cost effective. To mitigate some of the scheduling issues beyond the ocean freight, the provider has enlisted some ocean companies to help facilitate the in-land transportation, to help keep them closer to the operations as the shipment moves further away from them, physically.

The issue of 'communication' is very much an extension of the information sharing concerns in the industry, but stem from different complications. Regardless of their source, the lack of proper communication is both a frustrating obstacle for logistics providers as well as a hindrance to providing the necessary level of customer service they strive for. As physical proximity becomes more distant, control wanes if the levels of communication are not strong, and this is an issue that is largely prevalent when dealing with international shipping.

4.4 International Shipping

As it relates to the ocean transport industry, the Canadian supplier has recognized a bit of a "learning curve" as they have navigated through the complex requirements related to this particular mode. Scheduling is far more rigid and the documentation required for customs, including often unknown duties and taxes, makes this mode particularly difficult to manage.

On the contrary, the road transport aspect of the supplier's logistical operations is deemed the most valuable, citing the benefits of local coverage, hours of operation and costs savings which highlight a "greater level of control" that the supplier is more comfortable with.

The conversation then moved to the topic of international shipping where the provider began to discuss the challenges, in particular, with the ocean transport industry. Most specifically, the concept of international shipping standards and documentation were discussed, with the provider detailing that they appear to differ amongst

international regions and stating a desire for "one set of standards for all international shipping". Two specific examples were referenced.

The first was in regards to the first international shipment the company did where product was being shipped from Canada to Cuba. Knowing that they were dealing with a principally difficult nation, the provider knew that there would be challenges involved, but was shocked at the lack of resources available for reference. Unaware of the shipping standards and documentation required, the provider stated that they had hoped for a more central reference to draw from for information, but were unable to find one. While the project was eventually successful, it required much "trial and error" when it came to paperwork, much of which was determined in speaking with numerous different suppliers and parties involved in the process.

More recently, the provider was tasked with shipping some material from Canada to Norway for a major mining conglomerate. This particular project required the use of road, rail and ocean transport before it was handed off to the end user. The documentation for this particular project was made difficult by the fact that the product being moved was deemed hazardous material, but the provider cited many other challenges that arose during the process.

Communication was difficult due to language barriers and time differences, but also due to the sheer number of providers involved in the process. Container scheduling was extremely difficult because it was being managed by several different parties, according to the provider, and an unexpected trucker strike in Southern Ontario during the project presented a very unique challenge with the combination of all these elements leading to unexpected costs. In summation, the complexity of the project, the number of parties involved and the communication issues associated made the endeavour far more difficult than initially expected.

With many years of experience, the Chinese company was far more proficient in international shipping, but did discuss some difficulties they have had along the way. For example, they referenced a particular air shipment that passed through the Unites States of America (Miami, Florida) that wound up experiencing "patent issues" and was significantly delayed, leading the provider to avoid air travel altogether.

Another example of international shipping encounters was discussed regarding a shipment to Brazil that was shipped under DDP terms (shipper is responsible for all charges associated with the freight). After the weight of the product/container was deemed inaccurate, a significant delay resulted and the cost of such was based on a percentage value of the goods being shipped, which was substantial. This particular incident has led the company to revisit the terms under which it ships.

While the respondent feels that the international standards are "generally OK" for transportation, they are complex and only become more clear with experience. When asked about governing bodies for logistics, the respondent referenced the different types of governments and how this would make it difficult. Citing countries with agreements for free trade versus those that are far more restrictive, a large chasm exists in bridging the gap between the regulations of certain nations.

The challenges associated with international shipping are not unsurprising. Cultural differences and language barriers lead to gaps in communication. Large distances to be travelled across various modes of transportation lead to varying degrees of control. However, global trade renders international logistics a necessity and, because the logistics process doesn't end until a product is delivered to an end user, the aforementioned challenges will remain unless a better way to communicate information is discovered.

4.5 Proposed Logistics Network

When speaking about the potential logistics network hub, specifically in reference to international regulations and documentation, the Canadian provider prompted concerns regarding the type of governing body that would be required to oversee this type of model. Citing "so many different standards", the provider concluded that it would be very time consuming and difficult to put together a singular body that would have to be "a United Nations-style" organization in order to satisfy all international interests.

In addition to concerns regarding a central governing body, the provider had many other thoughts and considerations towards a potential logistics network hub. They openly discussed the form or participation, whether it be an annual membership or a transactional-based charge. While they agreed that an on-line format would be most effective for the basics workings of the network, they also opined for "real time customer service" (be it via phone or web-chat) to be able to deal with immediate issues, one that would be available in all languages and cover all time zone differences.

This customer service aspect would include providing users with "templates" for international shipping documentations, suggesting sourcing options and tracking empty returns for potential opportunities with the provider, citing the importance of closed-loop supply chains. Acting almost as an international "central dispatch", this service would act as the aforementioned reference for all users needing assistance with the myriad of difficulties that international shipping can pose.

In terms of challenges not addressed by the logistics network model, the provider wondered if having a single governing body overseeing international shipping would also help in regulating, hedging or otherwise normalizing the fluctuating costs of fuel, which they referenced as one of the greatest challenges in the industry. It remains to be seen if this would be possible, but is an interesting take on additional functions that could be provided by such a design.

The Chinese provider also discussed how much the logistics industry is affected by the general economic situation and how having a governing body to help mitigate the associated risks would be beneficial. They detail the difference between "regular logistics", where the emphasis is on cost and "on time" delivery, and "project logistics" where risk avoidance and planning/management are more critical.

While noting that "logistics is a largely regional service business where economical management radius should be considered", if these individual operations "could be consolidated as a global network and the network can operate in an efficient way, cost and service can be competitive in the market".

The existing logistical technology has helped advance the industry, highlighted by the existence of RFID and EDI systems which are principal elements of shipment tracking and information sharing, but the next steps are truly unclear. Despite the fact that the physical and technical capabilities are in existence and available, while concepts such as the proposed logistics network have been bandied about, there is no clear indication that the industry will move in that direction. There are a number of key concerns that exist before development of such a model can be seriously construed and manifested in a workable way.

Of these remaining issues, communication and information sharing are at the forefront of what plagues the industry's development. As evidenced by the data in this research, there are various barriers which restrict clear and timely communication in order to better facilitate logistical operations including language barriers, time zone differences and documentation standards amongst others.

The proposed logistic network would have to be significantly developed to provide assistance in this regard. Where there is a definite desire to have a singular point of reference for the aforementioned gaps in the logistical chain, especially when it comes to international shipping, the organization of such a service aid would be substantial. It is made increasingly difficult by obstacles including the monopolization of certain modes of transportation and the differences in standards and policies across nations that have dissimilar trade agreements (or a lack thereof). These complications create a greater distance between logistics providers and end users and remove elements of control from all parties involved.

In terms of control, what is prevalent in an industry where trust and security are paramount is that providers and suppliers lack a reasonable comfort level to allow for seamless operation on a consistent basis. Logistics providers want to remain close to the operations despite the fact that, by the very nature of all shipments, they physically move farther away from said provider as they move along the supply chain. A clearer understanding of terms and conditions, better shipment tracking and general transparency into the operations of all involved parties could go a long way in improving these industry deficiencies, but the only way to do so is to improve communication. The industry already suffers from a general distrust, or discomfort, when it comes to information sharing and that remains the largest obstacle in the development of any type of logistics network model. Any such design must have certain levels of security, safety and confidentiality that protect all users, to have any kind of success. Without establishing this level of trust and comfort it will be difficult to attract users to such a program.

5. Implications

In the end, the most important element of the industry, as it is with almost all industries, is customer service. Be it with regular day-to-day logistics, or any type of "project logistics", providers need to be able to have control over the process to provide the proper level of service. Planning, management, issue resolution and the avoidance of unnecessary delays and costs can only be accomplished through an inner working within the logistics system where communication between all involved parties are prioritized.

Whether or not these types of issues can be resolved by a centralized hub or reference network remains to be seen, but further development would be necessary. Many questions remain unanswered and would need to be addressed:

- How can real-time customer service be offered to logistics providers, accurately and in a timely manner, and across an international level?
- How would such a design overcome the challenges of language barriers, time zone differences and differing regulations across nations?
- Is it possible to have a single governing body with unified regulations and standards that would bridge the gap between some significant policy differences?

While many of these questions remain unanswered, this research has been able to clarify some of the parameters with which any type of logistics network would have to be built upon. There are many logistics providers that would have a use for such a system and, with international trade such a prominent fixture of every industry, there is a vital logistical significance. Almost all providers in the logistics industry are involved, to some degree, in the chain of events involved in international shipping. That means that, other than small local-based providers, the mass majority of logistics providers across all modes, worldwide, would have some interest and/or use for this type of a network.

While so few relationships in this industry appear to be exclusive, and contracted relationships are based predominantly on price, this type of network would be an ideal complement to the nature of this competitive industry when it comes to sourcing amongst third party providers. Although obviously voluntary, participation in this type of model would not be restrictive to any logistics suppliers provided they be comfortable with the level of information sharing that is required to facilitate optimal operations within the industry.

With the reluctance to divulge specific information across the industry, it would be vital to ensure that all information sharing is done on a strictly confidential basis; however, having this appropriately monitored and governed remains an outlying challenge and remains the greatest source of discomfort and reluctance amongst logistics providers alike. Putting that level of information and power into the hands of one governing body would require a confidence that may be extremely difficult to perpetuate between the number of countries and nations with largely differing polices, values and standards.

Through this research, the general feeling interpreted is that, despite sometimes difficult to understand and navigate through, industry standards and regulations are fairly similar with only minor variances existing between certain nations. It's not so much the case that regulations would not permit such a network design, but how significant those differences are, and how one would go about resolving them, remains an issue without a clear resolution.

6. Conclusions

This paper has explored the logistics industry, how it has evolved, where it currently stands and where it has to go next. The difficulty to obtain a wide net of information is indicative of an industry that struggles with information sharing and adequate communication. Further inquisitions with two major international logistics suppliers provided greater insight into these concerns and the challenges with international shipping.

While a framework for a potential centralized logistics network hub was discussed, the gap in making such a project feasible remains substantial. This study has helped to identify some of those challenges while presenting areas where improvement may help in overcoming them.

Despite the significant challenges facing the logistics industry, be it in taking the next step in technology or otherwise, the key elements of the service and the aspects of any designed network remain consistent. In the midst of logistical difficulties with scheduling, communication and avoiding unnecessary costs and delays, the overall goal of all logistics providers will forever be the delivery to customers in a timely and cost effective manner.

Whether or not there is a logistics network platform for which to allow providers to accomplish this goal in a more efficient manner represents one of the industry's greatest challenges. What remains is a necessity to break barriers in language and translation, bridge gaps in communication and open avenues of information sharing within the industry; not unlike societal challenges we, as a global community, continue to overcome, and the opportunity for the logistics industry is similarly extant.

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