## HORIZONTAL COLLABORATION IN A DISTRIBUTION NETWORK

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#### **Executive Summary**

The members of the North American Association of Utility Distributors (NAAUD) are experiencing waste in their prospective supply chains specifically in the link between supplier and distributor. This waste is generated in part by less than optimum service guality from third party logistics providers. Service guality concerns include damaged shipments, lost shipments, and late deliveries, as well as inadequate problem resolution. Furthermore, the carriers have been operating at or near capacity and reserve their limited capacity for their most profitable accounts, limiting availability and resulting in shipment delays. Various strategies and methods to address these problems were studied during a thorough literature review. The literature review centered around topics such as vertical and horizontal collaboration, guality management, logistics service quality and others. This information was used and synthesized with data from other industries, from the members of NAAUD, from surveys, and from best practices presented by Texas A&M University's Master of Industrial Distribution coursework. The data was analyzed using qualitative methods to identify trends and root causes, and statistical analysis methods to identify key drivers of various elements of service quality. This measurement and analysis were used to develop a solution set that aims to improve and control the business processes around selecting and managing third party logistics providers. This Lean Six Sigma approach yields several solutions and controls. These solutions include developing preferred regional carriers as supply chain partners and leveraging the existing association to collaborate vertically and horizontally to reduce the dependence on LTL carriers and increase the use of full truck loads. In addition, shared dashboards and common KPI are developed to monitor performance

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and provide a means of continuous improvement. Lastly, the introduction of periodic business reviews is introduced to provide closed loop feedback. In addition to the solutions, a detailed implementation plan is provided with a twelve-month target for completion. The collective value of these solutions is estimated to be cost savings between \$100k and \$300k per hundred million dollars shipped, with little initial investment. Other, less tangible benefits include increased revenue due to improved customer satisfaction, improved employee experience and engagement, and improved supply chain resiliency.

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## HORIZONTAL COLLABORATION IN A DISTRIBUTION NETWORK Background Information and Purpose North American Association of Utility Distributors

The North American Association of Utility Distributors (NAAUD) is an association of leading regional electric utility distributors that serve the electric utility industry with products and supply chain services. The association was formed in the mid to late 1980's to share information and pool resources between the original five members. The NAAUD is now comprised of thirteen distributors and over thirty manufacturers all serving the electric utility vertical. Collectively, the distributor members of the NAAUD have over 230 locations across North America and carry over \$440 million in inventory (*North American Association of Utility Distributors*. 2022).

These distributors and their manufacturer partners rely on a vast distribution network that includes third party logistics (3PL) providers to meet the needs of their customers. The 3PL providers are experiencing strong demand with manufacturers recovering from supply chain disruptions and a tight labor market, especially concerning drivers (Schulz, 2022). This demand is demonstrated in the form of higher prices, as well as reduced availability. A sampling of seven Less Than Truckload (LTL) providers illustrates the rate increase from the first quarter of 2022 vs. the first quarter of 2021 (Schulz, 2022).





#### **Transportation Demand**

The transportation industry is not experiencing this demand problem due to the recent pandemic. The problems with capacity restraints and rising demand date back to 2014 as documented by several trade and academic publications (Comerford, 2015; Jindel, 2014). Prior to this, the industry had been recovering from the 2008 recession with many carriers barely generating enough cash to continue to operate (Jindel, 2014). As demand continued to fluctuate, carriers generally chose to raise prices and improve their operating margins when able as opposed to investing in capacity. The demand surge in late 2016 and early 2017 yielded very similar results. Carriers chose operating margin over capacity increases (Cassidy, 2017). The pandemic affected transportation in 2020 and had profound effects, but for our purposes here it is sufficient to note that there was not a significant capacity increase from the beginning of the pandemic until now, even though there was additional increase in demand. Currently a realignment of existing capacity is underway as opposed to an expansion (Cassidy, 2022b). Capacity

remains a concern of many shippers, as shown by a study performed by Peerless Media (Berman, 2022). Even with a recent decrease in demand, capacity is decreasing as well and at a greater rate (Cassidy, 2022a).

# Which best describes your current experiences securing LTL capacity?





## Service Concerns

This out of balance economic system leads to additional problems beyond price for the NAAUD and their manufacturer partners. As the logistics providers reallocate their finite resources to the most profitable contracts and bids, shipment delays occur with a negative effect on customer service (Boone & Manrodt, 2022). This problem is exacerbated by other challenges as well. Thomas Kelly from Wesco, an NAAUD member, explained that the tight labor market goes beyond drivers, to also include warehouse workers. The labor shortage and high turnover rate amongst entry level workers results in many errors, lost packages, and damages (Kelly, 2022). A survey from the 31st Annual Study of Logistics and Transportation Trends confirms the difficulty 3PL providers face when filling positions.



**Difficulty Filling full-time positions** 

Source: 31st Annual Study of Logistics and Transportation Trends

### Figure 3 Hiring Difficulty (Boone & Manrodt, 2022)

All these problems eventually affect the customer and employee experience. The negative effect potentially results in revenue loss with associated profits due to customer churn caused by loss of trust, in addition to the costs associated with replacement orders.

#### Purpose

This project aims to mitigate the effects on revenue, profit, customer churn and employee dissatisfaction by investigating the associated business processes and the relationships with regional 3PL providers. A thorough literature review was conducted including a review of available information from other industries. In addition, interviews and/or surveys with members of the NAAUD and their manufacturer partners to gain greater insight into the problem and potential solutions were conducted. After analysis, updated business processes are proposed to reduce the dependance on and/or improve the performance of 3PL providers. These updated processes include projected ROI associated and recommended KPI.

#### Literature Review

The logistics providers that serve the members of the NAAUD add value to the supply chain by providing services that are outside the capabilities of the manufacturers or distributors. This review will focus on quality from both an enterprise and network perspective and then collaborative measures, vertical and horizontal. Cooperation amongst non-serial firms can result in the formation of a supply network consisting of vertical and horizontal collaboration (Naesens et al., 2009). The NAAUD is in effect a horizontally collaborative supply network, consisting of many individual supply chains.

#### Logistics Quality

The concept of quality has been long studied and well documented. Logistics quality has been defined in varying degrees of complexity. Many have used the ideas introduced by Parasuraman et al, (1985), known as the PZB model. The PZB model is supported by the idea that service quality can be measured using a customer's

expectation of service in comparison to their perception of the service (Parasuraman et al., 1985). Kersten and Koch (2010) use this as a building block to measure the effectiveness of quality management on service quality and business success. Their findings suggest that quality



**Determinants of Perceived Service Quality** 

*Figure 4 Perceived Service Quality (Parasuraman et al., 1985)* 

management does positively affect service quality in logistics services (Kersten & Koch, 2010). Restuputri et al. (2021) bridge logistics service quality to customer satisfaction during pandemic conditions using Kansei engineering. Their study breaks down logistics service quality into three distinct variables. These variables, quality of staff service, quality of operational service, and quality of technical service, lead to customer loyalty and satisfaction (Restuputri et al., 2021). Gajewska and Grigoroudis (2015) evaluate different elements of logistics service in relation to customer satisfaction. There findings demonstrate a high correlation between faultiness, completeness and timeliness of



deliveries and customer satisfaction (Gajewska & Grigoroudis, 2015). These factors of logistics service resulted from analysis of ten quality features from an initial collection of thirteen logistic service features (Lisińska-Kuśnierz & Gajewska, 2014).

This research collectively suggests that there is a positive

Figure 5 Elements of Service Quality (Gajewska & Grigoroudis, 2015)

relationship between quality management and service quality and there is a positive relationship between service quality and customer satisfaction. This leads to the idea that effective quality management can lead to improved customer satisfaction. This assertion is supported by Talib et al. (2011) in their study of Total Quality Management (TQM) and Supply Chain Management (SCM). In this study they were able to narrow the major TQM and SCM practices to six each and establish that the most cited practices found in both were top-management commitment and customer focus (Talib et al., 2011). Purwanto (2019) established a link between leadership and work culture with the successful implementation of ISO 9001:1015 quality management standards. This research concluded that these two attributes had a significant influence on quality management implementation (Purwanto, 2019). Carpi et al. (2017) identify management engagement and senior leadership as key components of performance management systems that result in organizations that "become formidable competitive machines" (Carpi et al., 2017). The introduction of leadership capabilities to TQM as well as SCM performance suggest that the selection of supply chain partners that possess strong leadership commitment and customer focus would ultimately have a positive effect on customer satisfaction through improved quality management practices.

#### **Performance Management and Supply Chain Management**

Quality can not only be assessed and managed at an intraorganizational level but also at an interorganizational level. Using relationships to manage quality as well as other aspects in the supply chain can be viewed as supply chain management. Using the concept of resource-based theory (RBT), a firm's competitive performance is based in the firm's internal resources and external resources within their relational network (Prajogo et al., 2016). This theory is also applied to relationships or "linkages", which are defined as "connections that a firm creates with critical entities of its supply chain to manage the flow and/or quality of inputs from suppliers into the firm". These supply chain linkages can be viewed as resources that the firm can use to assist in obtaining competitive advantage (Rungtusanatham et al., 2003). There are five steps of a logistics performance management system in a supply chain. These steps are selecting metrics, defining metrics, setting targets, measuring, and analyzing/acting (Forslund & Jonsson, 2007). These links of performance management and supply chain management can lead to higher levels of cooperation, or vertical collaboration within the supply chain.

#### **Vertical Collaboration**

Quality can only be managed in the terms of a supply chain through collaboration between the various players. Managing quality, or performance management is a key component of supply chain management. Lack of knowledge, trust and collaboration are obstacles in the implementation of logistics performance management between retailers and suppliers (Forslund, 2014). Data management, business process management and collaboration issues are challenges to developing a common performance management system in a supply chain (Papakiriakopoulos & Pramatari, 2010). Poor communication, incongruent business goals, incongruent values and expectations, cultural differences and lack of mutual trust are all examples of risk, internal to the supply chain (Thorne & Quinn, 2016). The level of collaboration is a common variable to many aspects of supply chain management. Knowledge transfer becomes possible when moving from adversarial to cooperative relations. This movement is facilitated by trust (Squire et al., 2009). Collaboration, supported by trust, can lead to successful supplier-buyer relationships. The top two factors, rated independently by buyers and suppliers, for establishing successful partnerships are information sharing and top-management support and conversely, the top reason that relationships fail is poor communication (Ellram, 1995).



#### Figure 6 Formation of Partnerships (Lambert et al., 1996)

Partnerships are also described as key supplier relationships where the two parties share a significant level of business process integration (Lambert et al., 1996). Key supplier relationship management has been shown to provide benefit through collaborative relationships across many industries (Teller et al., 2016). In addition to the ability to improve performance through vertical collaboration, firms in the NAAUD have formed a base for capitalizing on the benefits of horizontal collaboration.

#### Horizontal Collaboration

The concept of horizontal collaboration between supply chains is a more recent and less documented strategy than the vertical collaboration discussed thus far (Pan et al., 2019). Much of the current horizontal collaboration work is centered around logistics firms, though there is a movement toward research on horizontal collaboration to decrease risk and improve resiliency of supply chains in the wake of the recent pandemic (Alzate et al., 2022). Horizontal collaboration can include information sharing

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and joint activities toward mutual objectives and incentives including improved customer service (Lotfi & Larmour, 2021). Growth can be supported through truck capacity utilization and reduction of empty miles using horizontal collaboration (Cruijssen, Franciscus, 2006; Cruijssen, Frans et al., 2007). Relational governance is a key factor to align goals and craft common strategies using horizontal collaboration (Cheng et al., 2010). There are many benefits to collaboration with adjacent supply chains.

This review has shown that quality can be positively affected by quality management strategies with top-management support and customer focus. These strategies can be applied not only to individual firms, but also to supply chains through supply chain management objectives. There are five actions required to manage quality at an interorganizational level, selecting metrics, defining metrics, setting targets, measuring, and analyzing/acting. These tactics require the firms to collaborate as partners to achieve competitive advantage. The most prevalent success factors for these partnerships are information sharing and top-management support. Collectively, these business process and partnerships can be improved through appropriate governance mechanisms that fairly distribute risks and rewards (Thorne & Quinn, 2016; Wang, 2007). Also, firms can benefit from horizontal collaboration with appropriate governance and trust. As a supply network, the members of the NAAUD are in position to capitalize on both vertical and horizontal collaborative measures.

#### Methodology

The methodology used for this analysis begins with the collection of several different data sets from a variety of sources, as well as information and best practices from academic and trade publications. This data is then synchronized and analyzed using both qualitative and quantitative methods. The analysis, in turn, is then scrutinized using key learnings from the literature review as well as various texts and learnings from the Master of Industrial Distribution program at Texas A&M. This leads to the application of best practices developed through numerous research consortia at the Thomas and Joan Read Center for Distribution Research and Education of Texas A&M's College of Engineering and best practices from other industries or from other companies within the electric utility distribution industry. This process is finalized by development of new and/or updated business processes and/or tools to improve the performance of logistics providers within the supply chains that make up the NAAUD, ultimately adding value though improved efficiency.

#### **Data Collection**

The initial phase of data and information collection is summarized in the literature review. This data and information were collected from numerous scholarly and trade journals, periodicals, and academic writings. The next phase is a sequence of interviews conducted with a variety of representatives of members of the NAAUD, including manufacturers and distributors. Representatives from industries outside the NAAUD are also interviewed including a public retail organization, a private oil and gas refining company and a public equipment rental company. Efforts to gain a diverse and unique set of perspectives from a variety of industries' representatives ideally provide innovative ideas and best practices for use in the electric utility distribution vertical. The data collected includes methodologies for the successful implementation and/or management of programs to improve quality from third-party service suppliers to include logistics suppliers.

In addition to collecting the results of the various interviews, surveys are distributed to the members of NAAUD including manufacturers and distributors of various sizes to collect data. This data is related to the use of and satisfaction with services provided to the members by 3PL providers, and geographical and size information for the respondent companies. This data is used to segment the provided services and align with the expectations of the users. The surveys enlist a combination of exploratory, descriptive, and casual components to assist in a thorough analysis.

Internal data from members' enterprise resource planning systems is also collected. This data is extremely useful for the analysis but does have some limitations. NAAUD, as mentioned earlier, is comprised of many different companies, both public and private. These companies do not use the same systems, nor collect the same data. Also, while the companies do represent a horizontally collaborative association on one level, they do also compete with one another on many levels which introduces some concerns with data security and sharing. This being noted, this data is used and compiled on a very siloed basis primarily for the creation of generalized survey questions which allow for consistently structured data capture.

#### Analysis Methodology

Much of the data collected is used for a qualitative analysis of the current business process and methods. The interview data collected is comprised from diverse sources both in size and industry participation as well as varying positions in the supply chain. This diversity adds a great deal of complexity to a quantitative analysis and would provide little value for the purposes here. This data, like the internal data collected from some of the members, is used to form and structure the survey questions and understand best practices from other industries and from the members themselves. The surveys are used to collect additional, structured data that is used as a part of quantitative descriptive and casual analysis methods to identify trends and dependencies. The survey was distributed to all members of the NAAUD; it provides a wholistic view of information from the NAAUD, as opposed to a representative sample.

#### Analysis Application

The final analysis, after synchronization with best practices from inside and outside the industry, leads to the development of new or updated business processes used to effectively manage and improve the performance of various aspects of the logistics functions within the supply chains that make up NAAUD. These processes are scalable to fit the various sized enterprises represented. They include suggested data to capture, methods to measure performance, key performance indicators, and methods to share horizontally or vertically. This process of data capture, analysis, and synchronization to a final, usable business process is visually represented in figure 7.

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Figure 7 Information Flows and Project Methodology

#### Analysis

#### Interviews

A series of interviews were conducted with members of NAAUD as well as with individuals from other industries. These industries included retail, oil and gas, restaurant supply, and equipment rental. The interviews were both formal and informal and included some structured and some unstructured questions dependent upon the parties involved. The purpose of these interviews was to gain insight into the current practices within the NAAUD as well as to gain insight into the methods and procedures used by other industries to manage logistics performance by 3PL providers. The data was analyzed using qualitative methods to identify similarities and trends and establish best practices used to improve service quality in supply chains that included 3PL providers. Qualitative analysis is well suited for this study. In a work authored by Azungah (2018), the guote, "a major strength of gualitative research is in getting at the processes that led to the outcomes, processes that experimental and survey research are often poor at identifying" (Maxwell, 2013), is used to explain the application of qualitative research methods. This correlates with this study, particularly considering the small sample sizes and subsequent limitations of quantitative analysis. Using this type of analysis involves understanding the data set to understand the "how" and the "why" (Azungah, 2018).

In addition, the approach used to analyze the interview data was inductive in nature and considered latent content analysis, where data is collected and studied to look for commonalities that eventually lead to a conclusion (Kleinheksel et al., 2020). This analysis involves the coding of the data multiple times and forming categories and sub-categories to establish themes and reach conclusions as shown in figure 8.



#### Figure 8 Inductive Content Analysis

To complete the analysis of the interviews, the external industry interviews were bucketed, and the internal interviews were bucketed. The buckets were analyzed individually and collectively to identify similarities and differences and provide a basis for process updates.

#### Internal Interview Data

The analysis of interviews completed with members of NAAUD showed a consistent level of dissatisfaction with current service levels of 3PL providers, particularly with LTL carriers. This dissatisfaction is derived from the ill effects of these processes on customer satisfaction, efficiency, and profitability. All interviewed agreed that poor service quality led to waste in the supply chain, and that an improvement in service levels would benefit all participants.

Several factors of logistics service quality were discussed during the interviews. Damages, lost items, timeliness, and cost were raised as components of service quality lacking in the current state. Though there were some similarities in these categories mentioned by the participants, there was no identifiable trend as to the importance of each factor relative to the others. The other consistent elements mentioned were the lack of a reliable point of contact at the supplier, and the difficulty in problem resolution or escalation. The internal interviews were conducted with both distributor and manufacturer members of NAAUD.

#### **External Interview Data**

Analysis of the data from participants external to NAAUD revealed a several commonalities with respect to the selection and performance management of logistics services provided by 3PLs. In addition to the two broad categories of selection and performance management, there were additional similarities in sub-categories geographical/departmental selection, shared dashboards, periodic business reviews and information sharing.

#### Selection

Review of the interview data showed that the selection of service providers, including 3PLs, included both national and regional providers. The methods used for selection amongst interviewees were similar and included a service level vs. cost analysis. In addition, all the external participants had national account status with a/multiple provider(s) as well as relationships with regional providers. This tiered approach was designed for flexibility and efficiency. The relationships were initiated in a variety of ways showing no common theme.

#### Performance management

The common approaches discovered in the analysis regarding performance included several methods of performance management. Each of those interviewed enlisted the use of data capture to create dashboards that visually represented various data points. In most cases, these dashboards were shared and updated in real time. The data points were measures of performance against agreed upon standards. Common data points included on-time, intact and damage free deliveries. In addition to these performance measurements, total cost was measured consistently. The other common aspect of performance measurement was periodic business reviews. These reviews, though common amongst the participants, included several different formats and various frequency.

#### Information Sharing

Interview participants commonly expressed the need for the sharing of information and data to improve supply chain efficiency. The specific types of data shared were vastly different form industry to industry, but there were some commonalities. Service levels, current budget, current business outlook and current contact information were common shared information. In addition, all interviewed shared information regarding corporate social responsibility (CSR), and some participated in joint CSR ventures. This activity led to improved relational status as reported by the participants.

#### Surveys

A survey was conducted with the members of NAAUD to gather additional,

structured data. The survey was crafted using data collected from both internal and external interviews as well as internal data from NAAUD members. The primary purpose of the survey was to establish relative importance of the drivers of logistics service quality from both the manufacturer and distributor ler



#### Figure 9 Survey Participants

both the manufacturer and distributor lenses. In addition, the survey attempted to gather data relative to the ability to make contact and resolve problems with logistics providers. The survey was created and analyzed using software licensed by Qualtrics. The anonymous survey link was distributed to all members of NAAUD. Of the 42 surveys distributed, 33 were completed and analyzed including 11 distributor members and 22 manufacturer members. The survey was created so that the manufacturers responded from the shippers' point of view, and the distributors responded from the receivers' point

Q4 - My company could better serve customers if there were fewer outbound shipping problems.



Figure 10 Shippers' View on Service

Q16 - My company could better serve customers if there were





of view. This was intentional to isolate the data to the movement of goods and information between the manufacturer and the distributor.

The results indicate that both shippers and receivers perceive shipping problems to be detractors to customer service and to profitability. This result indicates that vertical collaboration between the manufacturer and distributor to improve service quality provided by outside carriers could benefit both parties. The results also indicate that a greater percentage of distributors identify these trends than do manufacturers. This suggests that horizontal collaboration between distributors could lead to favorable results. There are

respondents that do not observe the above results which indicates that the problems with service could be regionally specific and/or carrier specific. This information can prove valuable for the identification of carriers, or quality management practices that yield a higher level of service.

The effect of shipping problems on profitability is reflected in the responses to another survey question. Analysis of this perspective show similar results, and it is possible to infer that shipping problems do result in diminished profitability in terms of time loss and direct expenditures, based on

the responses to this survey.

The next analysis concerns the various aspects of service quality and their relative importance. The respondents ranked the components of quality on a scale of 1-4, one being the most important and 4 being the least important. The results of this analysis provide some insight into the primary drivers for the dissatisfaction from each of the parties' point of view. This information provides the basis for establishing the framework for relationships with carriers. The results of the





Figure 13 Shippers' Profit





Figure 12 Receivers' Profit

## survey ranking the four elements of service quality by the manufacturers and the

## distributors follow.

Q13 - Concerning outbound shipments using outside carriers, rank the following it...

Field	Min	Max	Mean	Standard Deviation	Variance	Responses	Sum
Damage free	1.00	4.00	1.77	0.79	0.63	22	39.00
On time	1.00	4.00	2.23	1.04	1.08	22	49.00
Complete	1.00	4.00	2.77	0.95	0.90	22	61.00
Least expensive	1.00	4.00	3.23	1.08	1.18	22	71.00

#### Table 1 Shippers' Rankings

Q25 - Concerning inbound shipments using outside carriers, rank the following ite...

Field	Min	Max	Mean	Standard Deviation	Variance	Responses	Sum
Complete	1.00	4.00	1.91	0.90	0.81	11	21.00
Damage free	1.00	3.00	2.09	0.79	0.63	11	23.00
On time	1.00	4.00	2.18	1.03	1.06	11	24.00
Least expensive	3.00	4.00	3.82	0.39	0.15	11	42.00

#### Table 2 Receivers' Rankings

As shown, damage free ranks as the first and second most important consideration for manufacturers and distributors respectively, with standard deviations that indicate a degree of consistency from the individual responders. Analyzing the groups individually shows that the distributor group is fairly aligned in their rankings with standard deviations <1.0 for the positioning of 3 out of the 4 items. Also, the distributor group are significantly aligned around price as the last consideration. The manufacturer group's responses collectively demonstrate that damage free is the primary consideration, with moderate alignment.

Next, the components of service quality were analyzed as drivers of each groups ability to provide customer service. The regression analysis of the shipper group shows that the primary driver to "My company could provide better customer service if there were fewer outbound shipping problems" is "Outbound shipments that arrive incomplete are a problem for my company". This is also demonstrated by a positive correlation



between the questions. The four variables also cumulatively explain a moderate proportion of "My company could provide better customer service if there were fewer outbound shipping problems". Analyzing the same information from the receivers'

#### Figure 14 Shippers' Correlation

lens shows that the two groups agree as to the most relevant cause of diminished customer service. There is a strong positive correlation between, "My company could provide better customer service if there were fewer inbound shipping problems" and "Inbound shipments that arrive incomplete are a problem for my company". The regression analysis here shows the same as the primary driver of "My company could provide better customer service if there were fewer outbound shipping problems", and

#### Input Variables

elative Importance	Standardized Coefficient	P-Value
62.1%	0.373773436	0.279372
23.9%	0.229411341	0.497755
9.4%	0.203737919	0.661333
4.6%	0.063931401	0.935131
e	lative Importance 62.1% 23.9% 9.4% 4.6%	Itative Importance         Standardized Coefficient           62.1%         0.373773436           23.9%         0.229411341           9.4%         0.203737919           4.6%         0.063931401

**Output Variable** 

Q16: My company could better serve customers if there were fewer inbound shipping problems.

#### Table 3 Receivers' Service Regression

the four variables explain a moderate proportion of the customer service concerns. In

reviewing the two perspectives collectively, there is a connection between the elements

of logistics service quality and customer service. Also, incomplete orders are the primary driver of customer service concerns from a logistics service quality standpoint.

Reviewing the components of service quality with the question concerning profitability is the next analysis. This analysis shows that incomplete orders are the primary driver from the shippers' perspective on loss of profitability, though the results are less conclusive than those concerning service. The other drivers individually are not statistically relevant to the profitability in the shippers' view. The drivers cumulatively

#### Input Variables

Variable	Relative Importance	Standardized Coefficient	P-Value
Q9: Outbound shipments that arrive incomplete are a problem for my company.	58.4%	0.240677613	0.220495
Q11: Damaged outbound shipments via a carrier are a problem for my company.	19.3%	0.128705469	0.686738
Q12: Carrier shipping expense is a problem for my company.	16.1%	0.112621293	0.808946
${\tt Q10: Outbound shipments that arrive late via a carrier are a problem for my company.}$	6.3%	-0.024341675	0.562698

Output Variable

Q5: Outbound shipping problems cause lost time and money for my company.

#### Table 4 Shippers' Profit Regression

explain a low proportion of "Outbound shipping problems cause lost time and money for my company". Analysis of the receivers' view of the components of service quality on their profitability show a more tightly aligned relationship. The drivers cumulatively explain a moderate proportion of the groups view on the effect on profitability. Review of the regression from the receivers' view shows that incomplete orders are also the primary driver of profitability loss. Late shipments, carrier expense, and damaged shipments individually do not have statistically significant relation with profitability. This primary driver is strongly correlated with "Inbound shipping problems cause lost time



Figure 15 Receivers' Profit Correlation

moderate proportion of receivers' responses.

and money for my company". Viewing the results of the groups collectively, incomplete orders is the primary driver of diminished profitability. The four elements of logistics customer service explain a low proportion of responses from the shippers' view and a

Further analysis of the surveys shows that there is a strong positive correlation between easily contacting a person at a carrier and getting problems resolved. This correlation is viewed in both groups and leads to the conclusion that ease of contact leads to higher rates of problem resolution for both the shipper and receiver.

Lastly, over 68% of shippers collect an adequate amount of data about problem



shipments while only 36% of receivers do the same. This indicates the receivers' perception of logistics performance issues could be partially explained by the lack of data capture. The lack of historical data reduces their ability to make a business case in favor of service improvements.

Figure 16 Receivers' Data

#### **Recommended Solutions**

#### **Supply Chain Partners**

The first recommendation to improve the quality of logistics services provided by 3PLs for the members of the NAAUD is to leverage the current association to establish regional carriers of choice. This solution incorporates both vertical and horizontal collaborative measures to improve the position of the members of NAAUD in the supply chain, thereby improving their ability to influence 3PLs to improve service. Acting as a cohesive group, the individual regions can designate carriers as first options. This action will increase the portion and amount of business with the carrier that members of the NAAUD represent, improving their position in negotiations for service improvements. In terms of resiliency, the collective size of these accounts will represent greater gross margin for the carriers, adding incentive for continued service through any disruption that could occur. This improved resiliency could prove extremely important for future carrier supply disruptions.

In addition to sharing information for the purposes of selecting and managing carriers of choice, in some instances members of NAAUD can leverage the association to reduce demand on LTL carriers. With additional communication and alignment of order cycles, distributor members can combine orders into quantities sufficient to achieve full truck loads from a manufacturer destined for a region. Milk runs would then be used to deliver the goods inside the geographical area. This solution reduces demand and dependance on LTL carriers while achieving greater scale and efficiency by utilizing FTLs. Also, this solution provides for less handling of goods by reducing loading and unloading occurrences. This reduction in handling should result in fewer

#### HORIZONTAL COLLABORATION IN A DISTRIBUTION NETWORK

damages and lost items, fewer late deliveries, and decreased cost. This solution will also provide improved resiliency measures as it increases the logistics supplier base to include FTL in addition to LTL carriers, adding an additional method for shipment.

The introduction of these solutions is the framework to build better relationships with the 3PLs that service the NAAUD. Ultimately, the goal will be to invite the carriers of choice to become supply chain partners, with additional responsibilities and benefits. NAUUD could leverage the scale and capabilities of these providers to improve the overall efficiency of their supply chains. This could lead to the carriers becoming associate members of NAAUD, further cementing the relationship.

#### **Key Performance Indicators**

The next recommendation would be to capture and maintain consistent data to measure the performance of the service suppliers. Based on the interview data and survey results, data capture should include information about missing items, damaged items, late deliveries, and cost. In addition, data capture should include total orders received. This information can be used to establish the Key Performance Indicator (KPI), Perfect Orders. After deliberation amongst the members of NAAUD, a target should be set for Perfect Orders, and the carriers of choice performance should be measured against the target. This will help evaluate their performance and determine which of the individual factors warrant additional strategy. Best practices from other industries include a shared dashboard, visible to the supplier, carrier, and distributor that updates frequently (real-time preferred) visually representing the performance criteria and KPI. This solution would provide useful to NAAUD as well, allowing for ease in identification and resolution of issues.

#### **Business Reviews**

After the selection of regional carriers of choice and the implementation of KPI to monitor performance, the next solution recommended solution is to schedule and conduct business reviews. These reviews should include the shippers, carriers, and distributors. The purpose of the review is to analyze performances over the prior time period, establish root causes for any service concerns, and propose solutions. In addition to problem resolution, best practices and proposals for the application of any new/additional strategies to enhance overall efficiency of the supply chain should be discussed. Also, any changes to data collection or performance metrics should be discussed during the review.

These meetings should also be used to share additional information. This could include business forecasts, business strategy, and/or anticipated obstacles for the next time period. In addition, these meeting were used to share information concerning Corporate Social Responsibility (CSR) initiatives by other industries. Sharing this information was noted as strengthening the relationships between the parties.

The frequency of the reviews should be conducted at least annually and by region for the respective parties. The meetings could be added to the agenda of the annual meeting already in place for NAAUD with the addition of the carrier partners. Best practices from other industries included an increase in the frequency of the reviews as dictated by business needs. This recommendation is advised but will depend on the available time resources for the involved parties.

#### Implementation

The implementation strategy is composed with the assumption that all the recommended solutions are to be initiated. This is not a requirement as the solutions are largely independent and could be adopted on an individual basis. This plan is designed for the strategic introduction of solutions as building blocks to achieve a desired future state that includes the introduction of preferred carriers to the NAAUD as associate members.

The first step in implementation will be the establishment of geographic regions amongst the members of the NAAUD. This should be completed by the board with input from the distributor members. This input will be vital to the success of the program as this will form the basis for horizontal collaboration necessary for success. The region boundaries need not be rigid, some fluidity is preferred to better align with shippers and carriers. In addition, it may be advisable to form sub-regions to align all parties. After the formation of the agreed upon regions, a regional champion should be designated for each. This champion will facilitate the communication within the region and serve as the primary point of contact for the remainder of the implementation initiatives.

The next phase is the selection of the initial carriers of choice by region. This selection should include input from the distributor members and the associate members of NAAUD. The input of the associate members is critical as it establishes the basis for the vertical collaboration necessary for success of the initiative. This will likely require a sequence of meetings to introduce the concept, establish potential milk run routes, align order cycles, evaluate possible carriers to invite, and establish sub-regions. Brief, virtual meetings are advisable to work through these steps, including only necessary

participants for each element. This phase will likely be the most complex and time consuming of all steps involved in solution implementation. Milk runs and FTLs will not be practical solutions in many, if not most instances. In these instances, the LTL carriers of choice are selected as preferred service providers.

The selection of the LTL carriers of choice should include an assessment of their current performance against the elements of logistics service quality. In addition, these carriers should understand that their performance will be measured against complete, undamaged, and timely categories as well as cost. In addition, carriers of choice should be required to provide a Point of Contact (POC). This POC will serve as the primary contact if problems arise with any shipments. The POC will route the contact to the appropriate department for swift resolution. This POC is a critical component as there is a direct correlation between a POC and problem resolution. The number of carriers will be determined by the needs of the regions and sub-regions and may include a few or many carriers. The list should be published so that all members of NAAUD may use the information when selecting carriers and should choose preferred carriers if possible.

After the carriers have been selected and published, the next phase is data collection. The elements of the key performance indicator Perfect Orders should be captured. These elements include shipper, carrier, completeness, damages, timeliness, and total orders. It is preferred that this data be output to a common dashboard, though this adds a level of complexity. At a minimum, it should be maintained at a branch level and be shared with all parties frequently. Cost will also be captured and maintained though likely not be shared for a variety of reasons. During this timeframe, the Perfect Order target should be established. This KPI would be the number of orders shipped

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and received without any issues as a percentage of the total orders. Given the survey results indicate that completeness was the primary driver of customer service and profitability concerns by both the shipper and receiver, completeness should be weighted by a factor of two. This will provide incentive to address this element more vigorously. The next element, damages, noted as primarily and secondarily most important by the two groups should be weighted by a factor of one and one-half. The last element, timeliness, should be weighted by a factor of one. Best practices would include a shared dashboard with drill down capabilities to drill by origin, carrier, destination, service element, etc. This would require some consistency in data capture format and result in additional complexity; however, this capability would allow for the timelier identification of trends and pain points to reach root causes and form solutions.

The next phase in implementation is the formation of a periodic review process. A cost-conscious approach is to schedule time during the annual NAAUD meeting and invite the carriers of choice to participate in the reviews while the other parties are already assembled. The review should include prior period performance and general business review. A best practice is for each participating party to perform a brief Strengths, Weaknesses, Opportunities, and Threats (SWOT) assessment prior to the meeting. This prepares all to speak about the supply chain and share information. In addition, there should be time scheduled for open dialogue between the parties. This time could be used for joint CSR venture planning or other pertinent information sharing. This plan is presented in the form of a GANTT chart which follows. The timeframes associated are fluid, as there is no time critical component, and the solutions can be introduced selectively or aggregately. The chart is intended to introduce a logical

sequence of events with the assumption that all solutions are to be implemented and follows the same cadence as this implementation plan.

Feedback Loop	Update Targets (plus 1 yr)	Annual Reviews (plus 1 yr)	Measure Results	Determine Targets	Collect Data	Select Carriers	Choose Champions	Determine Regions	
									Month 1
									Month 2
									Month 3
									Month 4
									Month 5
									Month 6
									Month 7
									Month 8
									Month 9
						Ongoing fram	Cerriers of Ci     KPI     Annual Reive	Legend	Month 10
						rework	ws holice		Month 11
									Month 12

Figure 17 Timeline

#### **Return on Investment**

The return for the successful implementation of the proposed solutions is several-fold. Ultimately, these solutions are designed to improve the efficiencies of the various supply chains of NAAUD by eliminating waste, while simultaneously improving end-customer experience. The reduction of waste in will result in lower cumulative shipping costs for the supply chain from a total cost of ownership (TCO) approach. The reduction in costs associated with replacement orders for missing or damaged items is the primary source of savings. These savings will be distributed throughout the supply chain between shipper, carrier, distributor and customer through normal methods and negotiation tactics. Given the diversity in business processes and systems currently employed, as well as usual fluctuations in the market, the immediate cumulative return will be extremely difficult to quantify. Estimations for a quantitative cost savings are derived from interview data from members of NAAUD as well as an independent distributor of restaurant equipment and supplies. Costs associated with problem shipments were conservatively estimated by the interviewees to fall in the range of 1% to 3% of the value of total products shipped. Given this data, we derive \$1M to \$3M in waste per \$100M shipped. The solutions here are expected to reduce problem shipments by 10% in the year following complete implementation. This equates to a savings of \$100k to \$300k per \$100M shipped in the first year.

The recommendation is for these solutions to be measured using the data collected. The implementation of the KPI, Perfect Orders, will allow for the measurement, over time, of the solutions. An example data collection sheet, data set,

and dashboard are included in appendices 1, 2, and 3. The example calculations and dashboard present the KPI using the previously discussed weights for completeness (Short) and damages (Damaged).

For firms that are currently capturing and using data related to problem orders, the ability to measure the effectiveness of the proposed solutions can begin immediately. These firms can serve as pilot organizations to refine and adjust businesses processes based on early results. Periodic communications between these organizations and the board are advised to assist in advancement of the solutions to the general population of NAAUD, especially those without baseline data. This will also assist in the creation of a closed-loop feedback system, and a means for continuous improvement, through additional refinement and updates.

End-user customer satisfaction should be measured at a branch or firm level to determine the effectiveness of these solutions. This measurement will take place using the current methods employed by the various members. The diversity in systems and processes limits a collective evaluation from this perspective, but individual results can be measured. Customer experience is measured in many ways such as existing account revenue growth, churn rate, survey results and informal feedback. These measurements and others are used extensively by the firms that make up NAAUD, and this diversity is useful in providing alternative views of the effectiveness of the solutions and recommendations for refinement and further improvements.

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## Appendix 1

Appendix 1 Example Dashboard

## HORIZONTAL COLLABORATION IN A DISTRIBUTION NETWORK

## Appendix 2

	Carrier Jim		Carrier Shirl	ey		Carrier Bob	Γ
Good	6	Good	10		Good	9	
Damaged	2	Damaged	0		Damaged	1	Γ
Short	2	Short	1		Short	1	Γ
Late	2	Late	1		Late	1	Γ
Total	12	Total	12		Total	12	F
							F
25.00%		75.00%			62 50%		
25.0070		73.0070			02.3070		ľ
	One		Two			Three	-
Good	8	Good	6		Good	11	
Damaged	1	Damaged	2		Damaged	0	
Short	3	Short	1		Short	0	Γ
Late	0	Late	3		Late	1	
Total	12	Total	12		Total	12	-
37.50%		33.33%			91.67%		1

Appendix 2 Example Data Set

## HORIZONTAL COLLABORATION IN A DISTRIBUTION NETWORK

## Appendix 3

		Date	Status	Carrier	•	Shipper	
		4/29/2	3 Good	Jim		One	
		4/29/2	3 Good	Shirley		One	
		4/29/2	3 Damaged	Bob		One	
		4/29/2	3 Short	Jim		One	
		4/29/2	3 Short	Shirley		One	
		4/29/2	3 Good	Bob		One	
		4/29/2	3 Good	Jim		One	
		4/29/2	3 Good	Shirley		One	
Status 🛛 💌		4/29/2	3 Good	Bob		One	
		4/29/2	3 Short	Jim		One	
Good		4/29/2	3 Good	Shirley		One	
Damaged		4/29/2	3 Good	Bob		One	
Short		4/29/2	3 Damaged	Jim		Two	
Late		4/29/2	3 Good	Shirley		Two	
		4/29/2	3 Short	Bob		Two	
Carrier 🛛 💌	Shipper 💌	4/29/2	3 Late	Jim		Two	
		4/29/2	3 Late	Shirley		Two	
Jim	One	4/29/2	3 Late	Bob		Two	
Shirley	Two	4/29/2	3 Damaged	Jim		Two	
Bob	Three	4/29/2	3 Good	Shirley		Two	
Wanda	Four	4/29/2	3 Good	Bob		Two	
Jill	Five	4/30/2	3 Good	Jim		Two	
Jose	Six	4/30/2	3 Good	Shirley		Two	
Ted	Seven	4/30/2	3 Good	Bob		Two	
Linda	Eight	4/30/2	3 Late	Jim		Three	
Luke	Nine	4/30/2	3 Good	Shirley		Three	
Kayla	Ten	4/30/2	3 Good	Bob		Three	
		4/30/2	3 Good	Jim		Three	
		4/30/2	3 Good	Shirley		Three	
		4/30/2	3 Good	Bob		Three	
		4/30/2	3 Good	Jim		Three	
		4/30/2	3 Good	Shirley		Three	
		4/30/2	3 Good	Bob		Three	
		4/30/2	3 Good	Jim		Three	
		4/30/2	3 Good	Shirley		Three	
		4/30/2	3 Good	Roh		Throp	

Appendix 3 Example Data Collection