



Center for Railway
Research and Education
Broad College of Business
MICHIGAN STATE UNIVERSITY

THE FUTURE
OF RAIL SERIES

Rail Optimization White Paper

Carrier/Shipper/Investor Relationships

Creating a **win, win, win** outcome
for all stakeholders

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SHIPPER
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In This White Paper

This paper, based on initial primary research conducted by MSU and Maine Pointe, discusses current carrier, shipper and investor stakeholder perspectives.

It explores criteria and objectives such as planning, technology, information, open bi/multi-lateral communication, end-to-end supply chain visibility, preparedness, long-term trust and value creation. The hypothesis is that, despite substantial changes in the supply chain and transportation landscape, alignment between carriers, shippers and the investment community remains dysfunctional, and is not set up for 21st Century transportation needs. To gain initial insights into these issues, MSU and Maine Pointe conducted a focus group study and over 20 interviews with carriers, shippers, and the investor/analyst community. This paper provides a summary and analysis of the research findings and presents insights on how key stakeholders can create value by collaborating to drive win-win-win scenarios to the mutual benefit of all involved. It concludes with further research topics identified during the study.





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Executive Summary

There are significant carrier and shipper imbalances across corporate North America's transportation network. Unpredictable economic growth, a shortage of truck drivers, increases in environmental restrictions and reduced capacity across North America's truck and rail network are hitting shipper costs, margins, delivery times and inventory carrying costs.

In the trucking sector, a recent surge in mandatory regulatory compliance combined with a chronic shortage of drivers and high rates of turnover, pushed up freight costs. For shippers, the problem on the railroads is just as acute. Class 1 railroads have, in recent years, stored locomotives, reduced numbers of rail cars, furloughed crews and laid-off support staff, while lengthening trains to lower expenses and improve operating margins. They have also felt the pain from earlier track and network reductions. As a result, there is insufficient slack left in the system to cope with an uptick in demand or increasingly unpredictable weather situations. This is further aggravated by the fact that railroads have little incentive to build extra capacity or invest in new technology, such funding coming from revenue.

Shippers are unwilling to commit to long-term contracts as new oil pipelines, such as Keystone, are set to come online. In addition, the carriers have no incentive to change because they've enjoyed multiyear rate increases thanks to a lack of long-term commitment from the shippers. This is having a cumulative effect across all transportation modes. It all paints an uncertain picture for carriers, shippers and investors, as demand outstrips supply, the Amazon effect takes a grip, and autonomous vehicle technology waits in the wings.

Given these significant challenges, this paper has been positioned to help understand the different needs and value drivers of key stakeholders (shippers, carriers and investors) and provide practical insights to help shape change and deliver a long-lasting, positive impact for all those associated with the rail and transportation industry.

We engaged with the following key stakeholders for this paper to gain insights on the challenges and needs they face.

- Carriers - e.g. Class 1, shortline, and regional railroads
- Shippers/customers - e.g. organizations consigning and receiving materials and goods using rail, road, truck, ocean & barge
- Investors e.g. analysts and investors in rail and transportation services

The goal being to provide sign posts to creating economic profit and value creation through a win-win-win scenario for all stakeholders involved in rail.





Background – The Imperative for Change

Recent years have seen bold patterns of economic growth, decline in traditional rail freight traffic, and increase in road/rail intermodal traffic. This has taken place against an efficiency backdrop of improved asset utilization, operating ratio and shareholder returns for railroad companies, especially the Class 1 railroads. However, railroad shippers, suppliers and investors remain concerned. The rail industry's investment in infrastructure, motive power availability and manpower, to name but three elements of the complex railway ecosystem, has shown major swings. Output metrics, with one major exception, have barely improved (and in some cases fallen) over time. Carload journey times remain much as they were 20, 50, or more years ago. Increases in unit and manifest train length have possibly contributed to recent network congestion. Intermodal trains have taken on the guise of express freight, adding to the complexity of operations. At the same time, trucking rates increased due to driver shortages and regulatory changes – an opportunity for modal shift in favor of railways.

Looking forwards, the US Department of Transportation expects freight tonnage across all modes to grow almost 40% by the year 2045. Congestion on our highways cannot cope with this additional volume, so rail and other modes will have to step up and create extra capacity.

Communication & Relationship Challenges

A communication challenge over the years between the shipper and carrier has become much deeper, to the point of becoming highly dysfunctional in the past five to seven years. Carriers have experienced a financial golden age on the back of the shipper community. Wall Street and the financial analysts have rewarded carriers for driving down their Operating Ratio (OR) on the “cost” side, but they themselves have become sceptical over this as the sole KPI. On the shipper side, we have seen a journey from anger to disgust to silent acceptance

and almost a desperation to find any alternate mode to avoid dealing with rail carriers. That is why we consider this to be a rich topic for research.

“Carriers have experienced a financial golden age on the back of the shipper community.”

Data-driven analytics and decision making, stemming from technologies and improvements enabled largely by Positive Train Control (PTC) implementation should give the rail industry a platform for service improvement, better information, planning and preparedness. Disruptive technologies applied to freight transportation, such as semi-autonomous truck platooning, will significantly alter the cost structure underpinning modal choice for some freight traffic. This will eat into currently profitable longer-distance revenue streams for the railroads.



Research has shown that successful supply chains are carefully integrated and orchestrated to provide outcomes valued by end consumers and intermediate customers. Railroads have demonstrated their capability to deliver at the right cost, yet there is considerable reticence towards forging relationships based on open communication, visibility of data, and underpinned by long term trust and value creation.



The purpose of this applied (and academic) research is to identify drivers of successful relationships between railroads, shippers, customers, suppliers, and also between the long-distance, heavy-haul Class 1 networks and their Class II and Class III shortline partners who are focusing on improving the first and last mile experience for their customers.

A key outcome will be identification of transformational change in the way multilateral relationships are developed and maintained to the benefit of all stakeholders.

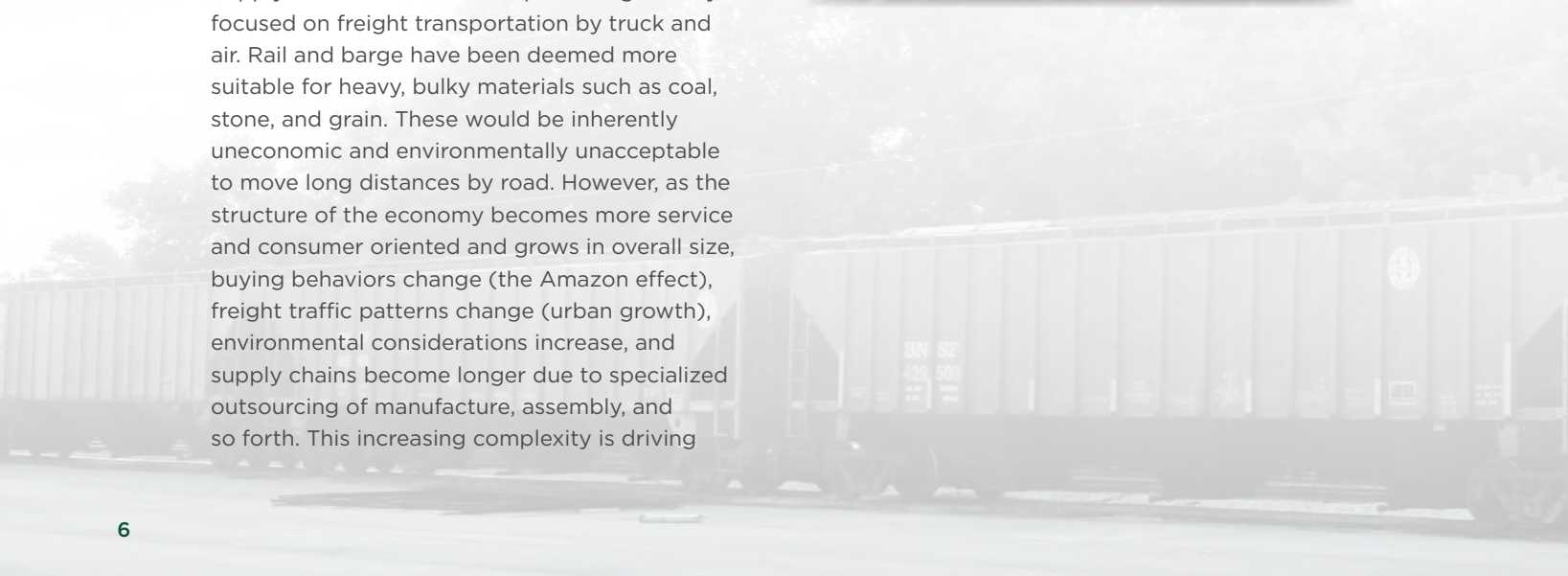


Assessing the Current State of Integrated Supply Chains Involving Movement by Rail

Supply chain research of the past has generally focused on freight transportation by truck and air. Rail and barge have been deemed more suitable for heavy, bulky materials such as coal, stone, and grain. These would be inherently uneconomic and environmentally unacceptable to move long distances by road. However, as the structure of the economy becomes more service and consumer oriented and grows in overall size, buying behaviors change (the Amazon effect), freight traffic patterns change (urban growth), environmental considerations increase, and supply chains become longer due to specialized outsourcing of manufacture, assembly, and so forth. This increasing complexity is driving

the need for a more effective and efficient transportation system capable of addressing 21st Century needs. Effectiveness can be construed as meeting outcomes required by intermediate customers and final consumers throughout a supply chain. Efficiency is the ability to impact operational metrics such as on-time performance, achieving cost targets, and resource allocation.

“Supply chain research of the past has generally focused on freight transportation by truck and air.”





The Goals of the Research Program

The goal of this program is to provide sign posts to creating economic profit and value creation through win-win-win scenarios for all stakeholders involved in rail. More specifically it aims to:

- Have a **long-lasting impact** on the rail and transportation industry and the key stakeholders involved
- Amount to a transformational **change in the way multilateral relationships are established, developed and maintained**
- **Provide thought leadership that stimulates the industry to wake up and take note**, so we can embark on a major applied and academic research project

- **Embark with a deliberate scope and scale that may include a series of further studies that are beneficial to all stakeholders**

Cross-stakeholder collaboration and involvement is key to success, driving credibility, objectivity, and independence.



Research Approach

To identify the issues and perspectives for this program, three distinct communities were selected for initial exploration through workshop and informal discussions. The shipper/customer community is very extensive and has been approached through the North American Rail Shippers Association (NARS) meetings and local targeted meetings as well as telephone interviews. A broad swath of different commodity and finished goods firms have been included. Future study is required to build on initial research and apply academic rigor to enable modeling and detailed statistical analysis in order to draw reliable conclusions.

A second group of research subjects has been the railroads themselves. A meeting was held with several Class 1 railroads in Chicago, IL. Six of the seven Class 1s interchange in Chicago. Historically, Chicago has been critical to the growth of transcontinental rail traffic yet, when Chicago encounters a problem with rail congestion, the impact is felt across the whole of North America. Several improvements have been successfully implemented to increase velocity

through Chicago and reduce dwell times in the city's terminals and yards.

“Financial analysts and investors specializing in railroads are critical to the rail industry as they help channel private investment to enable growth.”

A third group of research subjects will be approached using this white paper to stimulate discussion: Financial analysts and investors specializing in railroads are critical to the rail industry as they help channel private investment to enable growth.

The identity of all organizations and individuals contributing to this paper and succeeding research publications will be kept anonymous to maintain both competitive advantage and compliance with anti-trust legislation.



The Shippers' Perspective

If we look at this study from an end-to-end supply chain perspective, we need to start with the customer point of view. Those customers being the shippers who use rail, road, truck, air, ocean and barge as modes of getting their raw materials and products to market.



Initial Findings

In our research talking to shippers who use rail, several member companies of the North American Rail Shippers Association (NARS) commented that rail service has been less than the quality they expect, with the implication that service from other modes, especially road and air, is better. Local firms in Michigan, Michigan based companies with operations in other states and countries, and associations representing agricultural products (e.g. corn and potatoes) frequently comment that rail service is slow, unpredictable, inflexible, and hard to work with. This affects the cash flow and financial performance of those organizations, and adversely impacts their downstream customers' inventory holding costs.

During our discussions with this community the key themes raised were:

1. Quality (Reliability and Variance)

2. Communication

3. Flexibility

4. Power

5. Growth

6. Cost

1. Quality (reliability and variance)

Shippers and customers have long said their ability to run their businesses efficiently and effectively relies upon supply chains ensuring the right materials will be in the right places at the right times and for the right costs. Transportation has always been a variable with less direct control than manufacture. Shippers commented that the service they receive from the railroads is unreliable, especially for carload traffic as distinct from unit trains. The end-to-end journey time between the same points can fluctuate, sometimes for good reason, but most times shippers reported that there was no good reason made known. The net result is that customers hold additional safety stock, thereby tying up capital needlessly. Most shippers we talked with said the fact that rail was slower than road was not the real problem. They could plan for longer transportation times, but could not plan for unreliability and variance without incurring additional cost.

“Shippers and customers have long said their ability to run their businesses efficiently and effectively relies upon supply chains ensuring the right materials will be in the right places at the right times and for the right costs.”

2. Communication

Examples were given where good communication with local railroad employees had been built up over time. A few shippers reported their customers received notification of inbound consignments from local yardmasters and, in one instance, went so far as to say they were asked to prioritize the specific loads so the most time-sensitive would be delivered in the optimal position on the train for switching to an unloading position. Shippers reported that the implementation of Precision Scheduled Railroading (PSR), which should improve reliability over time,



had led to a breakdown of communications due to yards being closed and staff reduced or transferred elsewhere without appropriate new communication channels being established.

Others stated they wished to have the same sort of information on their consignments throughout the journey as when ordering on-line from Amazon. Class 1 railroads provide various web-based services that are claimed to do this, but customers reported the system is out of kilter with actuality and is untrustworthy. The railroads are working to improve accuracy and visibility for shippers to remove any surprises.

3. Flexibility

Shippers reported that the railroads lack the ability to be resourceful to overcome some issues which cause unexpected delays. Neither do they communicate the impact of those issues upon expected delivery dates/times. One instance was reported where a shipper was running out of on-site storage for an agricultural product and would need to turn consignments away. The railroad responded that they did not have empty cars available in the right place to meet their service commitment. The shipper was then told cars had been located, would be delivered “Friday afternoon” and collected full on Sunday afternoon. This necessitated the shipper to bring staff in on overtime on Saturday and Sunday to load the cars. The same shipper said the opposite was often the case – loaded cars would sit blocking their load facility for days while empty cars were on hand but could not be loaded until the full cars were removed.

Another shipper of a different commodity receives 100% of its multiple raw materials by rail, shipped from several different origins. They told us when all works well it is good, but they have regular crisis items that will stop production within a day or two. The firm’s client requires its materials “just in time” to be processed for its major customers in the automotive and other industries. Rail has been considered for outbound deliveries but is not used at all because of its very unpredictable delivery performance, hence it all goes by road, exacerbating the problem railroads

face balancing empty car movements and availability.

4. Power

Shippers believe a few large railroad customers get preferential treatment, while the majority are left without real support. One even said transcontinental routes are so concerned with unit and intermodal trains’ performance that they were considering trucking to a transloading facility operated by a regional railroad where reliability of empty cars and on-time dispatch was better, even though total cost would increase. When questioned further, they indicated they felt the power in their arms-length relationship with the Class 1s that served their plants, rested 100% with the railroads. This was contrasted with their trucking suppliers, who were clearly willing to aggressively compete for their business and did not act as though they had all the power in the relationship.

“Shippers believe a few large railroad customers get preferential treatment, while the majority are left without real support.”



Shippers also explained that they often feel intimidated by the large railroads when it comes to contract negotiations. One commented that the railroads’ deep pockets allowed them to frequently



use attorneys, whereas the shipper did not have the financial wherewithal to do the same. The prohibitive cost of taking a claim to the Surface Transportation Board was also felt to operate in the railways' favor against the plethora of small shippers that exist.



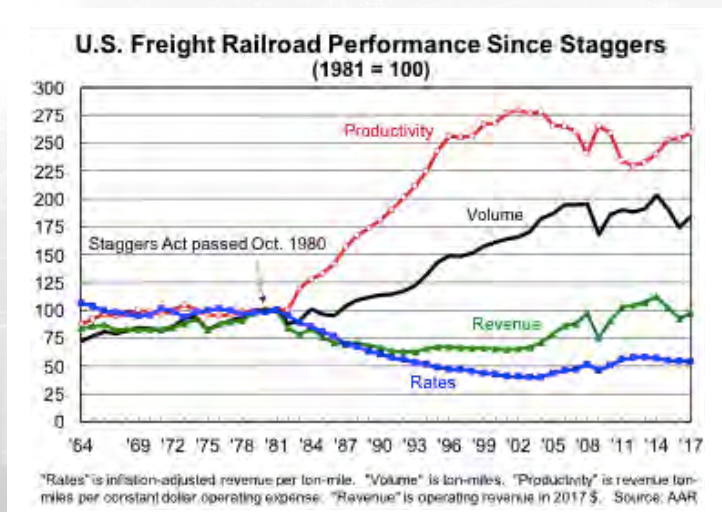
5. Growth

Shippers reported that in order to grow their businesses, they needed cooperation from suppliers, and that includes their carriers. Many reported shortlines and regional railroads were much more attuned to this need, seeing themselves as an integral part of the local economy and therefore more willing to explore different approaches to support growth. Shippers were of the opinion that these carriers were more willing to come up with creative solutions such as transloading and more flexible service frequencies.

Shippers also reported that railroads need to work with them to optimize intermodal freight. The capital costs to develop intermodal loading and unloading for containers prohibit small, low throughput yards being developed. The result is truck drayage and feeder services, often up to 125 miles one-way, which causes more road congestion on the highway and at large intermodal terminals. Shippers wonder why railroads insist upon relatively high volumes of intermodal traffic before they can start service. Some shippers' volume will never reach that level and thus they remain committed to road haulage.

6. Cost

Shippers also commented that they think the railroads make excessive profits from their business. This aligns with the economists' case that North American freight railways are a good example of a virtual monopoly. Many shippers do not have a choice of which railroad to use as their origin and destination pairs may be served by a single railroad with no alternate carrier. That could be a good argument against further rationalization, consolidation and mergers (or even abandonments) except that since the passing of the Staggers Act in 1980 which deregulated railway tariffs, average rail rates have fallen 46% in constant dollar terms.





Freight railroads are a major part of the supply chain for many products, yet an apparent lack of integrated behavior or relationships was found to exist between the railroads and their shippers/customers, other than in a small number of limited cases. For the most part, those cases have been treated as commercially sensitive and, as a result, have not been well documented.

Supply chain management leading practices indicate total supply chain performance improves for all firms in the chain when relationships are well established and managed with open, quick, reliable communication to enable sharing of strategic and operational plans, data and performance. The authors decided to research this with a goal of identifying whether examples of good or best practice exist and whether they could be shared to raise supply chain performance across the board.

It is vital to note that railways are vertically integrated; they own, maintain and operate their own costly infrastructure. All other transportation modes enjoy varying degrees of federal and state support for their infrastructure. Currently, major railroads spend an average 19% of revenue on capital expenditures, six times more than the average U.S. manufacturer. (Source: Association of American Railroads)

“It is vital to note that railways are vertically integrated; they own, maintain and operate their own costly infrastructure.”

Their Story So Far

Railways as we know them have existed for almost 200 years. Throughout that period, railways, and the railroad companies that operate them, have been undergoing continuous modernization and improvement. In addition, the economies they helped create, and now support, have matured, bringing about significant change in the regulations affecting how railroads deal with their customers (shippers and receivers), suppliers, and other

railroads. Today, North American railways span a network of over 140,000 miles, operated by over 600 companies.

Most recently, we have experienced a renaissance of the freight railroads serving North America, stimulated by passing of the Staggers Rail Act (1980) which gave railroads the financial freedom to charge market rates, generate profits, and invest in modernizing their infrastructure. A significant current trend is towards a new operating environment led by the late E. Hunter Harrison and titled, Precision Scheduled Railroad (PSR).



The first three Class 1 railroads to adopt PSR had great success in improving asset and labor efficiencies, thereby significantly reducing their Operating Ratio (OR), which appeals to Wall St. However, this was not achieved painlessly. Customer service declined. Staff reductions and high turnover added to the problems. Current implementations of PSR are being attempted in ways to avoid such dramatic and harmful customer service effects. Results from the early adopters continue to improve yet reflect the difficulty of balancing inward-facing cost objectives with outward-facing customer service. One of the seven Class 1 railroads is yet to adopt PSR publicly as an operating model but is employing several similar techniques and performing well across most dimensions.



The Rail Carriers' Perspective

At the same time, opportunities present themselves for the railroads, and the railway system, to apply new technology to improve many aspects of their operation. Safety, always a top priority in the high risk, dangerous, and unforgiving railway environment, can be improved by computer-based systems tied to communications technologies and satellite positioning systems to help reduce collisions. The Internet of Things (IOT) combines sensors to indicate infrastructure and mechanical conditions in close to real time, to improve maintenance practices and costs while increasing track and rolling stock (railcars and locomotives) availability.



Railways are a complex ecosystem. They continually manage trade-offs between motive power, rolling stock, infrastructure, control (signaling), mixed traffic (carload, unit train, intermodal and passenger), talent, and finance. Their goal is to sustain their business within safety, regulation, environmental, economic and financial constraints, while safely serving their customers and fulfilling stakeholder (including employees) requirements.

Currently in North America, about one third of all freight ton-miles is moved by rail. This proportion is in decline as the structure of the economy changes from manufacturing to services. Key commodities (historically the railroads' cash cows) have been heavy, bulky goods such as coal, most often moved in unit trains of a single commodity. Some 87% of every automobile sold in the U.S. makes all or part of its delivery journey by rail.

Today's consumer-driven economy with its global reach has created new trade patterns. Railways have seen steady growth in intermodal (container) traffic. Rail haulage rates have been gradually increasing, partly due to (short term?) driver shortages and 2018 truck driver hours regulation reducing the supply of that mode's availability. Adoption of automated/ autonomous truck operation, especially highway platooning, will be a serious challenge for railways.

“Today's consumer-driven economy with its global reach has created new trade patterns.”

Yet railways have operated automated, driverless passenger trains since the late 1960s. Freight has dabbled in specific short dedicated automated lines. With a guided, dedicated right of way, trains should be easier to automate than cars and trucks on mixed traffic, congested roads and highways.

Matt Rose, Executive Chairman of BNSF Railway, speaking at the Midwest Association of Rail Shippers conference in January 2019, said railroads must be able to achieve the same level of automation as trucks and harness the resultant productivity improvements, otherwise, “we'll lose more traffic to the highway.”

Adopting new technology should give railways the same advantages it gives to other modes of transportation – efficiency improvements, cost and price reductions, and greater customer satisfaction.

The U.S. Department of Transportation expects total freight demand to grow 37% by 2040 and predicts an increase in rail freight demand of 88% by 2035, due to increased road congestion. For the rail network, if improvements are not made right away, this could lead to stagnation through congestion.

Key Take Away

With margins high and the industry close to tipping point, carriers need to act now to enhance shipper relationships. As major shifts continue to take place in consumer, lifestyle, technology and mobility, the



transportation industry needs to transform itself to harness the power of digitalization. This “Amazon effect” means bulk carriers need to invest in new technologies and business models and develop the agility to respond to changing shipper and client demands. The keyword for success in this scenario is flexibility.

Initial Findings

During our discussions with this community the key themes raised were:

1. Resilience

2. Velocity and Dwell

3. Fluidity

4. Safety

5. Environmental

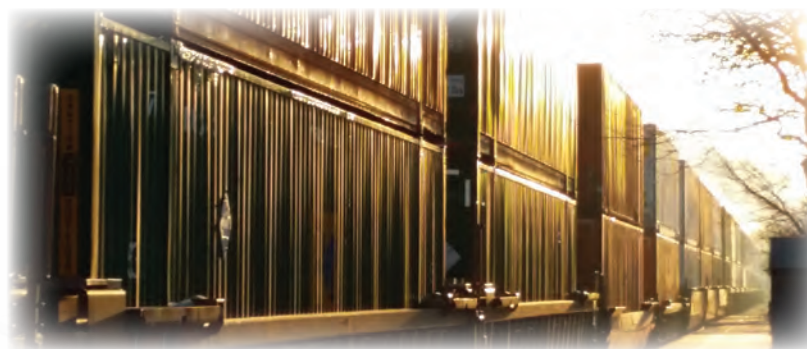
6. Resources

1. Resilience

Railroads are reinvesting a considerable proportion of revenue into equipment and infrastructure. Track is being doubled, or tripled in some cases, passing sidings are being lengthened and built new. Locomotives are being replaced with the latest generation of lower-emission technology and computerized systems based on the Internet of Things (IoT) to improve efficiency and performance. Failsafe signaling systems, combined with Positive Train Control (PTC), reduce the chance of collisions or other accidents. These improvements will allow railways to respond faster and more accurately to deal with service disruptions. However, many items remain outside the railroads’ control. For example, railroad crossings at grade – a major source of collisions and fatalities. Trespassing is also leading to more fatalities on the railroads’ right of way. Both of these cause a stoppage of rail traffic which has knock-on effects on planned locomotive and crew availability as well as on-time performance.

The incidence of infrastructure problems leading to slow orders (speed restrictions) and preventive maintenance of bridges, track, and other structures are vastly improving thanks to the use of modern technology, from wayside detectors of defects on

railcars that could cause a derailment, to the use of drones to inspect bridges, viaducts, trestles and other structures not easily or safely accessible in the past. Track condition monitoring, which has for the most part been carried out by frequently scheduled human inspection, is both slow and potentially dangerous. New, fast-moving detection and condition monitoring equipment can identify problems quicker and more accurately than was possible by eye alone. This not only helps prevent a catastrophic failure, it facilitates better planned replacement or heavy maintenance of track components that wear out over time.



2. Velocity & Dwell

Amongst other operating changes, the introduction of Precision Scheduled Railroading (PSR) brings to North American freight railways a philosophy that high density passenger railways have used – the timetable. It remains to be seen whether the financial benefits from the whole PSR package will allow reallocation of costs to enable further technology-assisted improvements involving shorter, faster trains (possibly with single person crews and enhanced safety systems beyond PTC) to be made. The ultimate would be to emulate very high intensity metro rail systems with the adoption of “virtual block” working enabled by Communication Based Train Control (CBTC) instead of the current fixed block system, which is seen as a capacity constraint. It is important to note that only one Class 1 railroad has indicated an intention to implement PTC across its whole network rather than just the legally-mandated trackage.



Railroads today still do not emulate the speeds of the best express passenger trains of their so-called heydays. The burden of passenger trains has been partially moved from the freight railroads by the creation of the National Railroad Passenger Corporation under its trade name of Amtrak. However, passenger trains still run on track owned by freight railroads for inter-city and commuter services. This mix of different trains is a massive operating headache for the railways. In Chicago for example, freight traffic is curfewed during the morning and evening weekday rush hours. Passenger and freight grade separation and redesign of certain choke points to improve velocity and reduce dwell for freight trains is under way thanks to the Chicago Region Environmental and Transportation Efficiency Program (CREATE). This public-private partnership (PPP) initiative, amounting to some \$3.2 billion, has been very successful, albeit slow and, some would say, ponderous in alleviating passenger and freight railroad conflicts such as crossings at grade with flyovers and other network improvements.



CREATE (www.createprogram.org) is noteworthy for its multimodal collaborative and cooperative approach to the problem, involving many competing Class 1 railroads. It also helped establish the Chicago Transportation Coordination Office (CTCO), which is a very effective real-time communication and operational management network for the railroads in Chicago. A new generation of technology now enables rail traffic controllers to have visibility of

trains heading towards Chicago in the level of detail they need to act to preserve network fluidity.

3. Fluidity

Fluidity through the North American rail network is key. A stoppage in any one place will have consequences elsewhere. A problem in Chicago for instance, can be felt across the whole network very quickly. This can be seen in railcar (non)availability as well as train movement. CTCO (see above) is being enhanced by a whole new level of data providing information on train consist, locomotive health, crew status etc. The Chicago Integrated Operations Center (CIROC), opened in December 2015, is enabling sharing of this information openly. This is a big change from recent behaviors best described as selfishly possessive information ownership.

“Fluidity through the North American rail network is key.”

Similar shared visibility to essential information in other key choke points (St. Louis, Memphis, New Orleans etc.) could vastly improve performance of the whole North American rail network.

4. Safety

Safety is a given. Railroads' safety culture is very strong, though getting to today's position has been costly in terms of life, limb, and capital. Railways move heavy and dangerous goods - 99.999% of all hazardous material moved by rail reaches its destination without a release caused by an incident (source: Association of American Railroads). It remains a potentially very dangerous environment for its staff and for any member of the public foolhardy enough to put themselves at risk through unauthorized access (i.e. trespass). Safe movement of shippers' goods is a natural extension of the safety culture applied to people.

Government regulation has a role here. Maintaining safety while allowing railroads to expeditiously develop, test, demonstrate, and implement new technologies and working practices will be critical to railroads' future competitiveness. Complex, slow and sometimes restrictive processes to



approve innovation will need to be carefully eased. Railroads, unions and the Federal Railroad Administration (FRA) need to approach these issues as opportunities and find a way to enable early, safe adoption without compromising safety.

5. Environmental

Steel wheel on steel rail is a very efficient, low-resistance form of movement. U.S. freight railroads, on average, move one ton of freight 479 miles per gallon of fuel (source: Association of American Railroads). At the same time, the U.S. Environmental Protection Agency data show freight rail accounting for only 0.6% of total U.S. greenhouse gas emissions and only 2.0% of the transportation-related sources, while accounting for well over one third of intercity freight ton miles. One freight train keeps several hundred trucks off the nation's congested and crumbling highway system.

Unfortunately, the public and legislators' perceptions are different. They see trains largely as a hindrance or a nuisance. Public complaints about noise (horns at grade crossings to warn motorists and pedestrians) disturb peoples' sleep. Long, slow trains at grade crossings cause delays to road users, and so on. The railways need to find ways to raise the public's perception of what they do, how they do it safely, and what the economic impact of the railways really is.

“The railways need to find ways to raise the public's perception of what they do”

6. Resources

Precision Scheduled Railroading (PSR) includes a focus on “sweating the assets” - a good business principle based around the ability to forecast demand and thereby right size capacity. Initial PSR implementation focused too heavily on removing infrastructure redundancy. Double-track lines were reduced to single tracks with passing sidings based on capacity needs at the time. As railways in other parts of the world have found, demand is increasing as the global economy grows. This

capacity problem is expensive to fix but is being addressed by major Capital Expense Capex plans. However, it is not a single-faceted problem. Unused or under-used track is a potential issue. It needs regular examination to ensure its condition is good whenever required. Inspection costs money.

“Unused or under-used track is a potential issue. It needs regular examination.”

Labor resources are not perfectly flexible. Several times in the last two decades, periods of downturn in rail traffic have led to lay-offs and furloughs of train crews. Not all are able or willing to return when traffic picks up again. Recruiting and training a new conductor or engineer takes time and is expensive. The working conditions don't suit everyone. PSR should begin to create a possibility for a better work-life balance with regularly scheduled trains, rather than 24/7/365 on-call status as in the past.





The Investors' / Analysts' Perspective

The third stakeholder group critical to this research is that of analyst and investor community who are crucial to ongoing funding of and investment into the North American integrated transportation system. Understanding their drivers and perspectives is critical to aligning the needs of all key stakeholders behind the common goal of building a 21st Century digital and integrated transportation for the future.

“There are dangers with driving for lower and lower OR numbers in isolation.”

In our research talking to investors and analysts we found that the railroads, especially Class 1s, and the larger regional or conglomerate railroads, are very focused on performing to rigorous financial standards set by Wall Street. Quarterly results are closely followed by the investor community and statements made by the railroads in their earnings reports are often taken as indicators of economic performance. Traffic carried by the railroads is seen as a significant pointer to the overall state of the economy.

There are dangers with driving for lower and lower OR numbers in isolation. For example, deferred maintenance can adversely affect safety and velocity. Reduced staffing and locomotive availability can impact ability to serve customers. It can also act against growth by failing to encourage investment in new business that may be profitable yet increase the OR. We have heard this comment from short lines representing first and last-mile customers who find it is becoming harder to persuade their Class 1 partners to handle increased business. Thus, a short-term metric is impacting long-term growth and turning away traffic from developing businesses to competing modes.

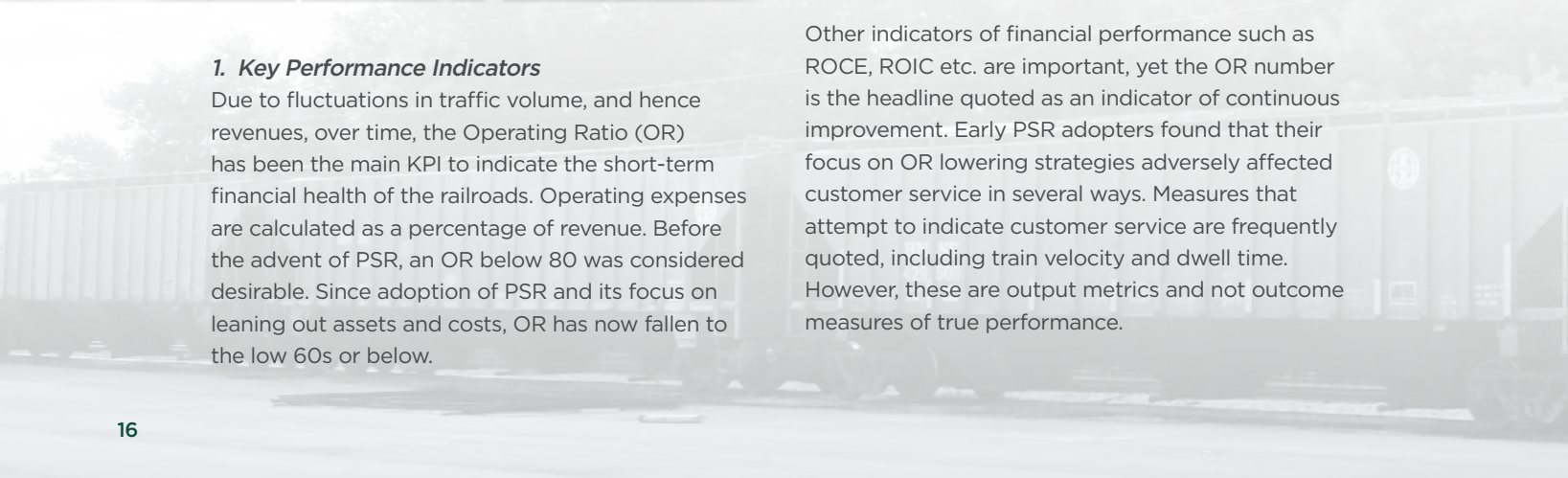
A railroad with revenue of \$1,000 and operating expenses of \$500, produces an operating ratio of 50% and an operating profit of \$500. By increasing operating expenses by \$400 to attract new business that boosts revenue to \$1,500, the railroad increases operating profit from \$500 to \$600 even though the operating ratio has climbed to 60%. – (Source: *Railway Age* February 11, 2019 – Frank Wilner).

“Early PSR adopters found that their focus on OR lowering strategies adversely affected customer service in several ways.”

Other indicators of financial performance such as ROCE, ROIC etc. are important, yet the OR number is the headline quoted as an indicator of continuous improvement. Early PSR adopters found that their focus on OR lowering strategies adversely affected customer service in several ways. Measures that attempt to indicate customer service are frequently quoted, including train velocity and dwell time. However, these are output metrics and not outcome measures of true performance.

1. Key Performance Indicators

Due to fluctuations in traffic volume, and hence revenues, over time, the Operating Ratio (OR) has been the main KPI to indicate the short-term financial health of the railroads. Operating expenses are calculated as a percentage of revenue. Before the advent of PSR, an OR below 80 was considered desirable. Since adoption of PSR and its focus on leaning out assets and costs, OR has now fallen to the low 60s or below.





2. Future Performance Measures

Supply chain management theory and practice indicates that, since the customer pays the bills, their needs must be met. Currently, no freight railroad in North America is known to publish any metric that truly records customer satisfaction over time. A simple example may be on-time-delivery (OTD). A consignment sent from origination point A to destination point D, may interchange between railroads at points B and C. In fact, before hitting the railway terminal at point A, and after reaching the destination terminal at point D, road transport to/from a factory or warehouse may also be necessary. The railroads are good at having data on railcar movement, loads and manifests. They are also good at interchange between railroads for reasons of financial accounting and hazardous material tracking. All that data is output data and does not reflect whether the consignment reached the recipient's destination on-time, late or even early as against promise.

“No freight railroad in North America is known to publish any metric that truly records customer satisfaction over time.”

A mix of different measures, some quantitative and others qualitative, is required to present a

true picture of how customers view performance. The source data is available for the quantitative measures, but perception data needs to be established for the qualitative measures. This will be a follow-up part of the research. Ideally, a standard set of measures that transcend different transportation modes can be found thereby enabling the railroads themselves to compare performance and perception against their competing modes.

“A mix of different measures, some quantitative and others qualitative, are required to present a true picture of how customers view performance.”





Case Study: A Win-Win Scenario that Drove Mutual Value

A multibillion-dollar manufacturer of nylon needed to make a dramatic shift in its products and the markets it served in response to market changes. The work conducted by Maine Pointe, a global supply chain and operations consulting firm involved in this research, to resolve these challenges mirrors many of the issues identified in this research. More specifically the company was engaged to work with the manufacturer and its rail, road and ocean carriers. As a result of an in-depth analysis, the solution involved implementing a radical new way of approaching the market place with a reconfigured distribution network built on strong collaborative relationships.

As a result of the engagement, carriers benefited from an 80% growth in volumes and a 22% margin enhancement. The nylon shipper transformed its procurement and logistics operations to improve product transit times from 7-12 days to less than 24 hours. This enabled the company to grow from \$1.8bn to \$4bn within two years. Not only that, the shipper was able to reduce working capital by \$30M annually.

This would never have happened without a new, facilitated approach to creating a win-win partnership between the CEO of the shipper and the CEO of the carrier.

“Using a more innovative collaborative approach to stakeholder engagement has the potential to unlock billions of dollars in value for carriers, shippers and investors across North America.”

Key Topics Identified for Further Research

The study findings from these key stakeholders identified eight key strategic and operational topics for detailed analysis in the next phase of this research. That phase will include surveys, interviews and recording good practices that can be broadly shared and repeated. In order to avoid anti-trust issues, we will only report findings in total and any examples will be made anonymous.

These include:

1. **Communication & Collaboration – The Essential Ingredient in Relationship Management**
2. **First and Last Mile – Your Problem, Not Mine!**
3. **Operating Ratio – The Right Measure of Financial Performance?**
4. **Precision Scheduled Railroading – The Golden Fleece?**
5. **Long, Heavy Trains – Low Cost or a Recipe for Congestion?**
6. **Intermodal Trains – Today’s Priority Express Trains?**
7. **Single Car Traffic – An Expensive, Inefficient Necessary Evil?**
8. **Automation – How Rail may Defeat Trucking**





Conclusions

Need for Collaboration, Integration, and Alignment to Drive Mutual Value

These initial findings point to three fundamental things carriers and shippers should do. First, it's imperative that shipper and carrier executives start driving collaboration and improving relationships. The objective to create win-win partnerships that address the pressures and demands of both parties. This level setting helps facilitate partnerships that drive cost savings, margin improvement and growth for all entities. Carrier senior executives need to be convinced of the soundness of a shipper's business strategy before committing scarce capacity in a controlled price environment for an extended period. Meanwhile, carriers need dependable volume alongside timely and consistent performance, with a planning horizon to control costs. Secondly, carriers and shippers need to evaluate their current buy-make-move-fulfill supply chain to eliminate bottlenecks, enhance throughput, and optimize the size of shipments. The goal is to improve cost, cash, growth, and share price performance. Finally, these partnerships and improvement programs must be put into practice across the carrier's organization. This involves driving enhancements, change, and collaboration right across the end-to-end supply chain from the client's client, to the shipper, through to the carrier and its supply base. This approach is called Total Value Optimization™.



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Why Michigan State University (MSU) & Maine Pointe?

MSU is consistently ranked as the #1 undergraduate and graduate school for supply chain management education and recruitment. MSU is also home to a long-established Railway Management educational program. MSU's Eli Broad College of Business is home to the Center for Railway Research and Education. The Center focuses on the management of all aspects of the complex railway ecosystem from infrastructure to motive power, safety to talent, financing to rolling stock and technology to control systems for both passenger and freight railways. The synergy of these two world-class areas of expertise is unique.

Aligning with Maine Pointe, a specialist supply chain and operations consulting firm that has helped over 100 shippers and carriers optimize their relationships for mutual gain, is key to this research. Combining MSU's leading academic research capabilities with Maine Pointe's on-the-ground implementation expertise, fueled by collaboration with key rail and transportation stakeholders will drive long lasting results-driven change across rail, logistics and the end-to-end supply chain. SGS, the world's leading inspection, verification, testing and certification company, is a majority stakeholder in Maine Pointe. With more than 97,000 employees, SGS operates a network of over 2,600 offices and laboratories around the world, and is recognized as the global benchmark for quality and integrity. Together, the complimentary capabilities of the two companies effectively drive greater value to organizations, transforming supply chains into a competitive advantage on a global scale.

www.broad.msu.edu/railway-center
www.maineporte.com

To become involved in the next stage of this research, and be kept aware of updates to this white paper and future publications, please contact either:

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