Innovations in Transportation Roundtable: Impact of New Technologies

Summary Report

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Executive Summary

On October 6, 2016, shippers, carriers, brokers, and technology firms engaged in a highly interactive roundtable to discuss innovations that may potentially disrupt the freight transportation industry. The first of four discussion sessions considered the "Uberization" of freight transportation. Uber-like freight matching services could reduce freight costs and improve asset utilization while automating much of the process. Participants discussed the importance of density, research on pricing behavior, and the evolving role of transportation brokers, assessing which portions of the transportation industry were most applicable to the Uber model. Driverless trucks could radically change the economics of long-haul trucking in conjunction with Uber-like services or in traditional fleets. A major open issue was whether autonomous trucks needed a new type of control tower to 1) manage driverless trucks, 2) remotely pilot trucks that need some human control, or 3) help match freight to these trucks.

Second, the group discussed trends in Transportation Management Systems (TMS), such as how the cloud model for deployment has shortened implementation times and how companies are starting to integrate their planning and execution sides for a convergence of short-term and long-term activities. Participants also discussed blockchain (a cryptographic technology) that could provide a global standard backbone for recording and managing B2B transactions, including transportation events. Despite the appeal of standardized communications, some participants feared that blockchain would not address the business needs that compel non-standardized communications.

Third, participants discussed the effects of mobile computing and tracking on transportation. Perhaps the biggest forthcoming change is a US government mandate for ELDs (Electronic Logging Devices) on trucks, which holds the promise of real-time visibility – like FlightAware for trucks – and may extend this kind of visibility and control over the broader, fragmented carrier base.

Throughout the day, many of the discussions revealed deeper business issues by which data and technology create value through better business decisions and actions. Real-time data lets a company react to problems faster than ever before, and mobile technology lets them quickly implement those corrections. But the ultimate goal is to avoid the problems in the first place, such as by using machine learning to foresee when a shipment is going to be late, even before it leaves the dock. Several companies reported implementing proactive changes before disruptions hit. In theory, machine learning could enable TMS and other management systems to have self-tuning algorithms to adapt as the business, customers, or suppliers change. "Synchromodality," was a vision of integrated multimodal transportation systems that optimize and coordinate the movement of freight over time.

At the end of the day, several participants hoped that the discussions begun at the roundtable could continue for standardizing technology to enable better freight matching, better sharing of real-time data, and better management of exceptions that span supply chain partner boundaries.

Digital Freight Matching

The dramatic rise of Uber for matching ride-seekers with private-citizen ride providers has led to predictions for the "Uberization" of many industries, including freight transportation. The rise of sharing-economy services such as Uber and AirBnB show the potential for both increasing the utilization of assets but also disrupting the business models of traditional providers such as taxis and hotels. Although at least 27 firms (and hundreds in China) are vying to become the "Uber of trucking," research suggests that none have achieved this goal yet. The roundtable began with an overview from representatives of two transportation brokers and a market researcher in the logistics space about this potential disruption in the freight industry and the general issue of freight matching.

Uberization

The potential to use technology to more efficiently match freight with trucks predates Uber by decades. The dot-com boom in the late 1990s saw the rise of more than 100 different freight exchanges, although few of these load-posting sites survived. Since then, technology has advanced and proliferated: 87% of the US population has Internet access and 67% have smartphones. The ubiquity of mobile technology with GPS, in particular, enables the kind of automatic, location-aware software required to easily match riders to cars or freight to trucks. These technologies create transparency of both supply and demand. Furthermore, the rise of the "sharing economy" and "freelance economy" primed both individuals and companies to participate in online, app-mediated transactions. Finally, the growth of Amazon and other e-commerce retailers added volume and stress to freight transportation systems, especially in the last mile.

Shippers as well as carriers spoke of ongoing pressures for higher precision and speed as well as the ever-present drive to minimize costs. Many companies are trying to drive down inventories, increase availability, and create flexibility to handle fluctuations in supply and demand. Improving the responsiveness and utilization of transportation assets would support cost, speed, and precision goals. In the case of transportation, companies face three categories of friction: iterative negotiation processes, multi-party coordination, and inefficient non-centralized communications. Uber-like services are trying to reduce these frictions and automate tasks such as driver payments, document delivery, location and status notification, visibility, and dispatch.

Density Begets Liquidity Begets Timely Low-Cost Matches

The core economics of freight matching depends on the density of available trucks (dots) and available freight (origin-destination lines). A higher density of dots brings numerous advantages to shippers: a lower lowest bid, less delay before pickup, and a lower chance of having an inbound empty truck. Similarly, a higher density of lines brings numerous advantages to carriers: shorter deadhead travel to the next load, higher utilization within hours-of-service constraints, better chance of a favorable route direction, and higher chance of a cost-insensitive load. Density creates market liquidity in which both sides of the transaction can quickly find favorable deals. Yet these same network effects imply that all would-be freight matching startups face a chicken-and-egg problem in attracting a sufficient scale of carriers to attract shippers and enough shippers to attract carriers. If a freight matching startup can't achieve sufficient and balanced density, the startup may be forced to pivot to provide some other logistics services, such as freight tracking.

Evolving Brokerage

Whereas large asset-based carriers may be the equivalent to taxicab companies in the Uber analogy, brokers are the nearest incumbent competitors to Uber-like on-demand freight matching services. For example, one broker at the roundtable helps broker millions truckloads a year to thousands of carriers on behalf of tens of thousands of customers. Discussions at the roundtable highlighted how different companies use on-demand freight as well as why they might choose other transportation procurement strategies. These discussions may provide insights into the markets where Uber-like firms might operate, as well as the challenges they might face.

The biggest issue is that B2B is different from B2C. Unlike Uber or Lyft for passenger travel, in which consumers usually have sporadic, unpredictable needs for transportation to a wide variety of relatively close-by destinations, shippers often have very repeatable freight flows within well-established longer-haul lanes between manufacturing sites, distribution centers, and retail networks. Shippers tend to value guaranteed availability and the reliable scheduling of trucking to support their manufacturing strategies, goals for on-shelf-availability, cross-docking, and the ever-shortening delivery expectations for e-commerce. Well-understood annual cycles of freight volume motivate shippers to pre-arrange sufficient carrier capacity months in advance at fixed rates. Managing labor in distribution facilities also depends on managing freight flows. Cost pressures make shippers loath to expose themselves to surge pricing, especially if they know that holiday surges are quite predictable. For that reason, shippers tend to develop transportation strategies that combine a mix of dedicated fleets, long-term contracts with specific carriers, and brokered or spot capacity.

Market research shows that large shippers tend to use brokers differently than small and medium-sized companies do. Larger shippers typically use brokers for seasonal surges and to augment carrier relationships. Smaller shippers will use brokers for a greater fraction of their total volume. The larger companies at the roundtable also used very large numbers of brokers -- up to 150 -- to access all the capacity they needed. Although most of the brokered volume might go through a small fraction of the brokers, the smaller brokers help the companies access regional carriers. At least one retailer shipper is starting to use more brokers as a way to "Uber-ize" its freight and exploit spare freight capacity that's available at lower costs.

Yet all of these transportation practices may say more about operating in a pre-smartphone world than the strategies that evolve in the current and future technology environment. The current practices with Transportation Management Systems (TMS) and routing guides may be the result of a lack of liquidity, poor transparency, and doubts that trucks will always show up as needed. If shippers knew that their TMS could send a request to a freight matching app and a truck would always show up exactly 30 minutes later, strategies might change. But until the system has the liquidity to guarantee availability at a predictable price, shippers will continue to use their existing strategies for managing transportation.

Brokers have also changed over the years. Although the traditional view of brokerage is one of costly, labor-intensive phone tag as the broker tries to find a willing carrier, the industry has done much to accelerate this process and eliminate friction. At one broker, the productivity of carrier representatives has doubled in the last five years through the combined use of automation, EDI, the web, warm call lists, relationship building, and suggestion-making algorithms. IT integration with both carriers and shippers helps brokers automate the process, (although roundtable participants commented that this automation still has a long way to go in ways that no Uber or IT system can readily fix). Pre-qualification of carriers by brokers or shippers was identified as a hurdle but also seen as an aid to other business processes, such as billing.

Some brokers have expanded their business services beyond simple on-demand matching of freight to trucks. These added services elucidate the needs of shippers and carriers beyond freight matching. For example, shippers' desires to have extremely predictable freight capacity available at predictable costs have motivated some brokers to offer capacity on more predictable terms – guaranteeing future rates. That is, the broker is acting more like a contract carrier for the shipper by aggregating the capacity of many smaller carriers into one larger virtual carrier. Brokers have also created services for carriers, such as apps that help small carriers manage their fleets. Some brokers offer other 3PL, 4PL, and managed IT services. Managing a shipper's TMS may help the shipper reduce its freight volume -- which isn't good for the brokerage side of the business -- but the brokers' rationale is that they'd rather disrupt their own business than have someone else do it.

The Price Is Right (Or Is It)?

Some of the frictions in transportation come from the relationships between shippers and carriers and the opacity of the system to the participants. One carrier noted that the customer-supplier relationship in transportation isn't like most other supplier business relationships. The shipper and carrier might negotiate a contract, but in most cases the contract only defines contingencies rather than certainties. The shipper might or might not offer a certain volume of freight to the carrier, and the carrier might or might not accept those loads. Neither side can depend on the specific volumes of business. At some level, the future volume of loads is opaque the carrier, and the future availability of capacity is opaque to the shipper. In fact, these are also often opaque to themselves!

Research comparing the pricing behavior of large brokers and owner-operators found that smaller carriers were less insightful about pricing. This may be an issue of visibility and density. Smaller carriers may not see as much of the market in which prices can change seasonably, daily, and even hourly. Smaller carriers may be less aware of these gyrations and thus accept lower rates than they might have gotten. Yet one rationale for creating a large freight matching service is to increase liquidity, which will dampen price volatility.

The group talked about the role of the procurement department in transportation, which varies from company to company. One shipper reported terrible results when procurement took over freight. Procurement emphasized getting the lowest possible cost, and the transport people could not make the procurement people understand the service needs at the plant level. Execution was horrible. Both first-carrier acceptance and on-time deliveries dropped. Other companies mentioned issues for creating a balance between good rates and good services, such as educating procurement on the limits of economies of scale, the need to maintain relationships with service providers, and using feedback from operations to adjust procurement.

Challenges: No Standard Unit of Trade

A key prerequisite for density is interchangeability -- that any truck (or carrier) can transport any load of freight. Such a standard unit of trade enables shippers and carriers to quickly agree on a simple price for a simple commodity. Although freight volumes might be measures in a standard unit of ton-miles, not all tons, nor all miles, are created equal. The participants discussed the conditions under which freight is not just like a seat for ride.

Obstacles to Density: The Devil's in the Differences

An Uber-like service creates density through commodification -- that any rider is likely to be satisfied by any driver and that any driver is willing and able to take any rider. Factors that make the service seeker or asset providers different in significant ways will significantly reduce density and liquidity. Perhaps the most significant complications to the matching of freight to trucks come from wide variations in shippers' requirements on any of three dimensions.

The first dimension is the physical (or regulatory) requirements of carriers due to the nature of the freight itself. Several companies had freight that was classified as hazardous material, which can include obvious materials such as industrial chemicals but can also include consumer products such as cleansers, food ingredients, and electronic products containing lithium ion batteries. This category of freight demands special handling by a restricted set of qualified carriers. Other companies mentioned specialized freight due to fragility, high-value, food safety, or temperature tolerances. These specific types of freight restrict these loads to certain carriers, certain kinds of trailers, or affect how the load is handled. As one shipper put it, there's easy freight and hard freight.

These specialized loads may be less amenable to on-demand freight matching services. For example, a food company avoids brokers due to food safety concerns. On the flipside, a specialized carrier of high-value cargo similarly eschews brokers. This carrier only works directly with shippers. Those shippers want to carefully audit the carrier, see how the trailer is configured, and more intensively track each shipment for security purposes. Yet specialized transportation might still be Uberized in some cases. For example, uShip wants to become the Uber of awkward or unusual deliveries such as cars, boats, pianos, and cows.

The second dimension disrupting commodification was shipper-specific service requirements. These instructions may define when and where the drivers need to go and how they are to pick-up and deliver the load. Freight entails different services, such as pick-and-drop versus live loading-and-unloading. In some cases, the requirements might be quite complicated in that they involve multiple pickups or multiple drops. These special service requirements can affect a carrier's willingness to take the load. But the more important effects on the matching service are in how these requirements are managed by the matching service, communicated to potential carriers, communicated to the specific driver taking the load, and performed reliably by the chosen driver.

EDI Won't Die

The third factor is shipper-specific information needs and definitions. Although, in theory, EDI is a standard, in practice, different shippers assign their own specific meanings to the data fields. Each shipper has different information needs, such as internal reference numbers, which they have shoe-horned into the EDI document structure. Yet this lack of true standardization implies that one of the large brokers must employ 130 people just to handle the EDI mapping needs of shippers. Another carriernoted that it needs a team of two or three people just to onboard each new shipper. And a large carrier reported that 97% of EDI messages require some kind of manual intervention. A large carrier saw technology adoption as a constant struggle that has not improved in ten years. They called it "chasing rabbits" with all the hassles of mapping to different carriers, dealing with mismatched invoices, and ensuring carriers got paid.

A large part of the challenge to moving to better, standardized systems lies in the total inertia of the industry. At a different industry conference, a large retailer said they overheard criticism of their company and others who still use EDI. "If only 'X' and 'Y' would stop using EDI we could move on" was the complaint. Yet this retailer would love nothing more that to get beyond EDI. But the retailer felt that carriers weren't ready for a new post-EDI solution, and the retailer did not want to suffer through some piecemeal changeover that fragmented its supply base. Furthermore, this company did not want to put out its own app to replace EDI and force carriers to use it because that would defeat the goal of improving liquidity. One possible solution, suggested by a technology provider, was the use of carrier portals that could handle some of these onboarding complications and create a cleaner, more standardized interface to a shipper's TMS.

Some participants were quite skeptical that standardization was even possible based on these experiences with EDI and prior attempts (such as the Voluntary Interindustry Commerce Solution or VICS initative) to standardize bills of lading. Although everyone loves the concept of standardization, each company wants that standard to reflect their specific needs. And if the standard does not encompass the business needs of every shipper and carrier, then those shippers and carriers will either resist adoption of the standard or corrupt the standard by adding non-standard elements in their business processes, interfaces, and information flows. The industry's current lack of standardization may reflect intentional business decisions for strategic advantage rather than correctable accidents of technical adoptions and implementation.

Fragmentation of Carriers

For shippers and even for brokers, the fragmentation of the carrier base poses a challenge for carrier qualification, communications, and management. Close to 60% of full truckload volumes are with carriers that have 50 or fewer trucks. And 97% of trucking companies have five or fewer trucks. The economics of truck ownership even make it possible for individual owner-operators to own their own trucks, which is exactly like Uber contract drivers owning their own cars.

This long tail of small providers can frustrate shippers, who don't want to build new interfaces for each new carrier. As mentioned above, some shippers use brokers to handle this fragmentation and hide the complexity of dealing with so many tiny service providers. This fragmentation and the existence of owner-operators benefits the Uber model, which provides the software platform to give customers visibility into a very diffuse base of assets such as empty passenger vehicles or empty trucks. Uber-style freight matching will hit a further complication when it also involves the different trailers of different large carriers in the shipper's carrier portfolio.

To Uber or Not to Uber

Roundtable participants discussed which portions of the transportation industry were most applicable to the Uber model. Some thought Uber-like services might work for regional freight, where trucks circulate around a state or large metropolitan areas. Long-distance line haul, on the other hand, was less likely to be Uberized. Smaller shippers might be more likely to use Uber-like services just as they are now more likely to use brokerage. These smaller shippers don't have the freight volumes to demand specialized services, which makes them more likely to accept commoditized freight service.

The participants also debated whether last-mile home delivery was ripe for Uber or not. Uber does offer that service with one- to two-hour delivery service. Yet some participants were concerned about brand reputation issues. If the delivery driver comes wearing flipflops and shorts, how does that affect consumer impressions of the shipper and its product? Brand-sensitive companies might prefer liveried drivers from established delivery providers for their shipments to consumers' homes.

The suitability of a new business model such as Uber could vary over time. When Amazon started, it only sold books. That category made sense given the economics of maintaining an inventory of hundreds of thousands of obscure titles that brick-and-mortar bookstores could not carry. Yet Amazon has since expanded into other mainstream categories to threaten traditional retail. Similarly, the future could see Uber-like freight matching services expanding into segments of transportation marketplace that don't seem particularly well suited to it today. If Uber-like services attain sufficient density, the value of being able to quickly summon a nearby empty truck at a decent price may cause companies to question the need for more specialized truck services.

Evolving Technology Landscape

The second session of the roundtable covered Transportation Management Systems (TMS) and began with comments by three software providers of TMS on technology trends. In the past, various concepts such as backhaul and dynamic routing guides have gone from witchcraft to widespread use. Similarly, Bluetooth phone-to-device networking was originally found only on luxury cars but now is standard everywhere. One key question was: what is the Bluetooth of today?

The software providers outlined a number technology trends that affect TMS. First, the rise of the cloud model for software deployment has changed how companies use TMS and has shortened the implementation time for some companies.

Second, companies are now more comfortable using advanced algorithms such as optimization software and machine learning. Third, real-time data and the rise of the Internet-of-Things (IoT) have enabled real-time visibility. Fourth, the rise of mobile technology has changed where and how people expect to access data and functionality. Fifth, companies are starting to integrate their planning and execution sides for a convergence of short-term and long-term activities. Yet many challenges remain in marrying all the technology, adapting processes to the new environment, and finding practical value in all the new buzzword technologies.

Life in the Cloud

ASP (Application Service Provider), SaaS (Software-as-a-Service), and "cloud" are successive generations of buzzwords for what is essentially a third-party hosting service for companies' data and applications. Improvements in the technology to offer secure, scalable access to enterprise IT has driven adoption of the most recent incarnation of this model -- cloud computing. As one carrier put it, if the cloud is good enough for the CIA, it's good enough for them. The cloud model lets the company outsource various software, hardware, and infrastructure management chores, with the service provider handling the sharing and scaling of resources behind the scenes. There are many different variants to the model depending on the customer and service provider.

End user expectations are changing about the ease of use of technology. The rise of Apple and Android smartphones, Facebook, and mobile apps has driven expectations for simplicity in user interfaces. No one reads manuals anymore. Five years from now, if configuring app takes nine months and reading documentation, it won't happen. This trend highlights a common value proposition for both technology and service providers: hiding all the complexity and the details of execution while delivering specific services.

Yet not all easy-to-use visual interfaces were considered valuable. The group debated the value of maps for visualizing transportation systems. Some thought maps were more sexy than useful, being something VPs like to see but operations managers prefer a fast green screen interface. Others saw maps as useful for customers who want to see where the truck is.

TMS Flavors: Vanilla, Rocky Road, or Microservices Buffet?

One technology provider reported that TMS implementation times had dropped dramatically from years to months to weeks. There were no big projects anymore of the kind that systems integrators used as cash cows. Deal sizes have dropped. The larger companies at the roundtable were shocked by this news. Some of them were still on implementation projects of up to seven years duration and wondered how any TMS implementation could progress so quickly.

Further discussions revealed the differences between the short and long implementations; paralleling some of the Uberization discussions earlier in the day. The quick implementations were occurring primarily among small and medium-size companies that were moving to "vanilla" cloud versions of TMS. These prepackaged deployments could go quite rapidly. But these companies had to go live within the off-the-shelf box.

Customization or specialization, often desired by larger companies, still takes time. As with freight matching, larger companies had more specific requirements that made them less likely to use commodity freight options or commodity TMS deployments. Although a standardized software package was attractive to some, others found they needed so much customization that they were better off doing the TMS themselves. Many of the larger companies had good business rationale for more complex TMS implementations, including diverse product lines, different needs in different geographies, and customer segmentation. Another factor affecting the implementation time was whether the company merely wanted to embed an existing business process into the system or whether it wanted to take extra time re-engineering its processes to take full advantage of what the technology might enable.

One approach was to implement a vanilla TMS and then customize it over time -- adding flavor as the limits of the vanilla system became known or as the needs of the company changed. One way to add selected bits of functionality is called "microservices," which are easily-deployed modular software components. The components all talk to each other in a standard way that enables each component to be upgraded or changed without too much impact on the rest of the system.

APIs (Application Programming Interface) are structured interfaces by which a software package, cloud hosted system, or data service lets other systems manage, query, download from, or upload to the target system. APIs enable companies, customers, suppliers, and service providers to build functionality on top of each other's systems. Although no one reads the user's manual, they do read the API documentation to see what is possible and to understand how to integrate various systems and functionality. Several participants wondered if standardization of transportation-related APIs might be a way to reduce friction.

Mobile Assets + Mobile Data = Asset Visibility

The third session of the roundtable discussed the effects of mobile computing and tracking on transportation. Two service providers in the truck tracking industry provided an overview of the current state of the art before the participants discussed their own experiences with tracking. Perhaps the biggest forthcoming change is a US government mandate for ELDs (Electronic Logging Devices) on trucks, which holds the promise of real-time visibility -- like FlightAware for trucks. Many large carriers have been using tracking devices on their assets for decades for a host of business reasons related to driver productivity, asset utilization, and service. ELD may extend this kind of visibility and control over the broader, fragmented carrier base.

Unfortunately, the ELD mandate does not guarantee universal real-time tracking. Although many ELD systems do include a wireless data link for real-time tracking, the letter of the law does not require it. A USB port suffices to enable law enforcement or auditors to check HoS (Hours of Service) compliance. Thus, some truck owners may choose to install less expensive ELDs without an uplink or not pay the monthly fee (about $30/month) to have that data transmitted. Moreover, the ELD mandate only covers certain categories of commercial trucking, leaving some kinds of freight or mobile inventory untracked (e.g., service parts in trunks of cars). In the absence of a real-time link to an ELD or other asset-mounted GPS device, some tracking services use the driver's phone. Yet using the driver's phone to track freight depends on a somewhat fragile chain of assumptions that the phone is with the driver, the driver is with the tractor, the tractor is hooked to the trailer, and the load is in the trailer.

One issue on the carrier side is the older demographic of truck drivers. These drivers may be less likely to have a smartphone or, if they have a smartphone, know how to install and use apps. In some cases, drivers may disable location services to avoid being tracked. Smartphone adoption also varies by country. One tracking service uses cellphone tower triangulation to track truckers that use older phones that lack GPS. The low penetration of smartphones and app usage among truck drivers may also limit liquidity in freight matching if the drivers aren't comfortable using an Uber-like app to post their availability, find loads, or respond to tender requests pushed to them. ELD and tracking service vendors are trying to convince owner-operators and smaller carriers to invest in tracking by using value propositions such as enhanced driver safety (by avoiding "check in " calls while driving).

Some participants were concerned about the effects of ELDs on trucking costs and capacity. By itself, the cost of ELDs won't drive anyone out of business or change costs much. But being constrained to drive legal might bankrupt many smaller carriers or owner-operators that relied on looser operating practices. One logistics service provider estimated the mandate might reduce performance for a few quarters but then truckers will learn to use the data to make smarter routing decisions and performance will improve after about a year. The net impact will depend on market conditions, which were soft at the time of the roundtable but might be different when the ELD mandate deadline hits.

Could Blockchain Fix Communication Blockages?

Blockchain is a cryptographic technology that enables creating a public, shared ledger of private, secure transactions. Even though the blockchain itself is a public data object, stored and replicated across many cloud servers for scalability and robustness, the items on the blockchain are secured cryptographically so that only authorized parties can decode the transaction or add data to it. Blockchain is currently used by Bitcoin, which is an online peer-to-peer currency that works without banks, governments, or other parties to guarantee the trustworthiness of the transacting parties. The financial services system is looking at blockchain technology to create secure ledgers for global interbank transactions. Potentially, the same technology could be used in business as a global standard backbone for recording and managing B2B transactions, including the transportation elements of the transaction.

Yet as attractive as standardized communications might be, some participants feared that blockchain (aside from being inscrutable in its details) was not actually solving the deeper root cause of the lack of standards. The frictions in the current system seemed to arise less from the lack of a standard communications layer than from the wildly different information needs of different companies. That is, businesses lack a standard for "what" to communicate more so than "how" to communicate. Yet the undeniable interest that banks have in blockchain may lead to its use in financial transactions, which could include business transactions; these, in turn, would drag at least that side of the supply chain into using blockchains in B2B commerce. Overall, the participants wanted a universal standard but seemed skeptical of its feasibility.

Robo-trucks: A Driverless Future?

Another potentially disruptive and major new technology is autonomous vehicles (AV), which might operate in conjunction with Uber-like services or as part of traditional trucking fleets. Skeptics thought that self-driving vehicles were 5, 10, even 20 years away from widespread adoption. Lobbying against self-driving trucks by labor unions or other modes of transportation might also delay adoption.

The counterargument is that self-driving vehicles exist right now and at least some regulators are moving to enable adoption. Uber, for example, already has seven autonomous trucks and is testing self-driving taxis in Pittsburgh. Participants also cited existing autonomous vehicle deployments in warehouses, factories, container-handling in the Port of Rotterdam, and farming. Thus, one carrier forecasted that 20% of freight might be moved by autonomous vehicles as early as five years from now if the value proposition is there. The new technology may be coming, but it's less clear where AV will be deployed first, how AV will be managed, and who will own these vehicles.

Autonomous vehicles are actually a spectrum of technologies that range from single-purpose driver-assistance devices (such as automatic emergency braking) to fully driverless vehicles designed to function over some range of driving conditions. Yet comments suggested that driver assistance may be a risky strategy in that it increases the chance of driver boredom, inattention, and accidents. Moreover, the more the truck does for the driver, the less experience the driver attains, making them less able to handle emergency situations should they arise.

Full, all-weather, all-road autonomy might take many years and delay replacement of all drivers, but that won't delay partial switch-over to self-driving trucks for some scenarios. One good candidate was long-haul highway routes in fair weather southern states. Autonomous functionality might provide one side of a machine-human driving team. The machine could do the bulk of the "easy" highway driving while the human driver is off-duty or sleeping. The person would take control as needed such as in construction zones or in more congested city driving scenarios. Or a remote drone operator might take control as needed. Another application might be freight yards and intermodal terminals where the physical environment is more structured, under the direct supervision of the company, and not heavily populated. The point is that autonomous vehicles can be most readily adopted in more controlled driving environments where the vehicle operator can collect, analyze and pre-code data about the route and the software can more readily learn that stretch of road.

Fully autonomous vehicles could radically change the economics of long-haul trucking. Currently, 40% of the cost of a long-haul truck is in the sleeper compartment and driver amenities. Eliminating the driver's compartment would also significantly reduce the weight of the tractor and enable more freight to be carried. The operating model also changes significantly by eliminating HoS restrictions, labor costs, and labor-related routing constraints. Insurance costs might also drop to the extent that autonomous vehicles prove to be safer than human-drivers. Fully autonomous vehicles could literally be on the road 24x7 and more than double the range of one-day trucking.

One major open issue was who will buy and own self-driving trucks. It's not clear whether larger carriers would embrace self-driving vehicles faster than smaller carriers or whether smaller carriers might be locked out by technical or operational challenges. Shippers may be less likely to buy autonomous trucks (except for yard, dray, and milk-run applications) unless they have balanced lanes or feel confident that they can find backhaul for their new trucks. OEMs' liability for the safety of the new technology may motivate them to become fleet owners or restrict sales of these trucks until the technology becomes more foolproof. As a new industry, autonomous vehicles might spawn large numbers of startups with an inevitable consolidation as companies learn how to get the greatest value out of the new technology. A related issue is whether these trucks will lead to a new type of control tower to manage autonomous fleets, remotely pilot trucks that need some human control, or help in matching freight to these trucks.

From Buzzwords to Business

Throughout the day, many of the discussions revealed deeper business issues, such as challenges or opportunities created by the new technologies. All the data and technology will only provide value to the extent that it enables better business decisions and actions. One shipper noted that they know what happened yesterday but don't know what is happening today -- intraday visibility would help them manage dynamic markets. One such vision was called "synchromodality," in which a company has an integrated multimodal transportation system that optimizes and coordinates the motion of freight over time.

The deeper issue is that technology could significantly change how managers structure and operate their business rather than just tweak performance and costs of the current structures and processes. For example, a railroad reported that using real-time data to manage terminals and lights changed its network operating philosophy. In theory, the innovations discussed could enable companies to become much more proactive and much more internally and externally integrated.

The Data-Decision Gap

With the growing level of real-time visibility -- implied by new technologies such as ELD and required by new applications such as digital freight matching -- comes a growing stream of data on the locations of assets and shipments. A carrier for high value freight noted that each shipment might have as many as six or seven tracking devices. The rise of Internet-of-Things (IoT) devices – which provide much more data gathering on trucks, loads, warehouses, factories, retail outlets, and even consumers -- adds to the challenges and opportunities to use data to improve freight transportation. IoT sensors can provide timely data about variables such as location, temperature, tampering, excessive humidity, rough handling, vehicle operating conditions, inventory levels, and so forth.

Yet this deluge is not without its challenges. A prior roundtable on ocean freight highlighted the problem of there being "multiple versions of the truth" about a shipment. Different EDI messages, RFID/barcode scans, or GPS measurements might disagree about the location and timings of freight movements. Each added source of data can add either confidence or confusion.

The challenge comes in merging all the fragmented data sources and cleaning the data to get an accurate picture. The tracking services gather and cleanse data from various sources including phones, GPS devices, ELDs, and telematics. These services maintain interfaces to the various providers of ELDs, GPS, and telematics vendors. Technology can also help reduce the friction of non-standardized interfaces and data sources. Software such as Kapow enables robotic collection of business data from different sources to automatically map information from different systems.

Many companies on both the technology provider and technology user side were working to make sense of all the data and gain value from it. The most obvious applications were the tactical ones, such as rerouting freight, expediting replacement shipments, and rescheduling labor or manufacturing as a function of changed expectations for the arrival of freight. In some countries, such as Brazil, companies use tracking data to reduce freight losses from crime. Even if all the data agrees on the location or status of an asset or shipment, the meaning of that data may be uncertain. For example, an empty truck might not be an available truck if the asset is part of a continuous movement plan.

Participants wondered how Uber's driver and rider quality rating system will translate to the more complex world of freight. In Uber's passenger ride service, the customer rides with the driver and can appreciate extenuating circumstances encountered on the ride when rating the performance of the driver. Yet for freight, the situation is more complex and less transparent. There's no representative of the shipper who might fairly judge whether problems such as delays or damage are the fault of the driver or due to issues at the origin, route, or destination.

This issue of measuring quality of service raised a more general concern among carriers about the quality of the data used to judge, reward, or penalize carrier performance. As shippers aspire to ever greater precision and reliability, small errors in the data or in the interpretation of the data can have large consequences for shippers' assessments of carriers. Carriers wanted more collaboration on assessing root causes of issues. A freight tracking provider said that data actually made shippers less likely to be swayed by one-off anecdotal events, such as one late delivery, and more likely to use robust analytics that spot the underlying pattern, such as a receiving dock with a history of delays.

More WISMO or Less?

"Where is my freight?" is a common question that provokes anxiety and consumes shipper, broker, and carrier resources. Overnight parcel delivery companies have created the WISMO (or, Where Is My Order?) tracking expectation. Participants shared stories of how real-time tracking promises to both improve and worsen these calls. On the plus side, real-time data can make WISMO much easier and more automated by serving the data through apps, online interfaces, or APIs. Demand for WISMO varies.

Several shippers said they didn't need to know where every shipment was every minute of the day. If they trusted the broker or carrier to alert them of meaningful exceptions, then they did not need to constantly track the shipment. A retailer allowed delivery time windows of one hour to help manage labor planning and workflow in the building. Another shipper was primarily concerned with being notified of disruptions. A shipper felt like this reflected what should be the normal state of shipper-carrier relationships in which the shipper delegates freight movement to the carrier and expects the carrier to seamlessly handle most minor issues so that the shipment arrives as expected.

Other shippers had more demanding expectations for visibility. A consumer electronics company wanted visibility during product launches to avoid any delays in customs and ensure that all customers got the product on launch day. A chemicals company had customers who wanted high visibility because delays in inbound shipments could shut down production lines. A software provider remarked that its customers have time sensitivities ranging from 9 minutes to one day. Although some companies may not be using real-time tracking now, the pressures to reduce inventories, increase service, and increase precision will probably push companies toward tighter time bounds of activities.

Ignorance is Bliss: Don't Watch the Sausage Makers

Sometimes the raw tracking data might scare the customer unnecessarily. One e-commerce retailer previously showed the customer everything as the shipment progressed from supplier to destination, but that actually caused more WISMO calls. The shipments often went LTL and the routes could be circuitous, which prompted anxious customers to call about the seeming misrouting. Similarly, shipments on multi-drop routes might show anomalous tracking data (e.g., the truck is only one mile away but then takes four hours because it has 20 other stops). Moreover, the networks and routing patterns of LTL carriers is part of their secret sauce. Some shippers, carriers, and tracking service providers all reported filtering or hiding some kinds of data to mitigate the problems of too much information.

Automation Ought to Improve

One key promise of all this technology is automation to speed processes and reduce labor costs. A broker noted that 80% of its freight is tendered automatically, with customers getting a timely reply on whether the broker would take the load or not. The system also interacts with carriers through an app. LTL is almost 100% automated. Although some manual processes may occur, brokerage is a lot more automated than it used to be.

For example, no person actually looks at all the data being streamed from every point in the supply chain. Instead, the real-time data can be used to detect exceptions such as potential delivery delays, out-of-route movements, vehicle breakdowns, impending stock-outs, or other disruptions to operations. Detected at-risk situations can spawn alert messages or color-coded annotations on map displays and dashboards, which then prompt workers to drill-down into the situation and mitigate it as needed. Yet this feature prompted two questions: 1) what constitutes an exception and 2) tuning the system to avoid false alarms or missed crises.

Companies at the roundtable mentioned widely varying tolerances for delivery delays, ranging from days down to minutes. For some shippers who run tight JIT manufacturing operations, a 9-minute delay is a big issue. Retailers are trying to compress inventory by routing goods direct to store, but this places greater dependence on reliable transportation to avoid stock-outs. Thus, each shipper sets its own tolerances, which are encoded into the shipper's systems and may need to be communicated to the carrier. Technology providers offer tools to define geofences around freight and timing tolerances. Each company controls the "twitchiness" of the alert system depending on the tolerance for false alarms or missed problems.

Although shippers and carriers do work to reduce the rate of exceptions, they also work to automate the handling of common exceptions. The better a system can detect and automatically mitigate problems, the lower the headcount allocated to fixing such problems. The goal the technology group at one carrier is to embed smart intelligence into decision-making processes without adding people.

From Reactive to Proactive

Real-time data lets a company react to problems faster than ever before, and mobile technology lets them quickly implement those corrections. But many would like to avoid the problems in the first place. Companies can use the historical data to model loading, travel, and unloading times to predict and update dynamic ETAs (estimated arrive times). These predictive systems can then feed into control tower visualizations, highlighting potential problems in red.

One potential approach for finding meaning is machine learning. The growing volumes of data -- especially from IoT -- are enabling the use of machine learning algorithms that automatically glean actionable patterns from the reams of data. For example, a food company is using machine learning to find predictors for on-time deliveries to a large retailer . The food company wants to predict when a shipment is going to be late, even before it leaves the dock. In theory, machine learning could enable TMS and other management systems to have self-tuning algorithms to adapt as the business, customers, or suppliers change.

Real-time data and transportation management systems have also helped companies become more resilient. On the input side, many companies track news of potential disruptions such as weather events, port labor issues, and traffic either on their own or with the aid of services such as Resilinc. And on the response side, event management systems in the TMS can help automatically send alerts and handle some kinds of exceptions, such as automatically shipping a replacement product if a shipment is damaged en route. Yet more can be done. For example, one shipper admitted that it has internal systems for carriers to transmit real-time notification of disruptions, but that the company itself needs to work more on passing those notifications to customers.

Several companies reported implementing proactive changes before disruptions hit. In the case of recent hurricane, a beverage company worked to determine which customers were likely to be open, which bottling plants might be affected, and how the company could shift production and shipping around the region. With the flip of a switch, the beverage company was able to use its TMS to change their normal transportation patterns to address the disruption. Another shipper handled a major East Coast snowstorm by pre-shipping orders to clear the distribution centers before the storm stuck. Doing this required seamless integration across multiple systems.

40 Words for "Integration"

If Eskimos have 40 words for snow, companies have 40 words for integration, according to one participant . Other words for integration heard at the roundtable included: "convergence," "orchestration," "coordination," "collaboration," "wing-to-wing," and "ecosystem." Although the simplest applications of real-time freight data may be for real-time transportation management, the larger promise of the technology is in bigger changes in the business. Companies are beginning to use real-time data to more fully understand how the supply chain is operating and then use that knowledge to change upstream decisions. For example, one shipper used the data to see actual dwell times in the network and make changes. During the roundtable, companies mentioned three types of integration: across timescales, functions, and partners.

First, the growing use of predictive analytics, machine learning, and other applications of big data lead naturally to much more ambitious efforts to bridge the gap between tactical execution and more strategic-level planning processes. The goal is to make better long-term plans (anything from multi-week to longer) that reflect a timely awareness of operational conditions as well as to make better operational decisions that reflect the spirit of the plan when conditions forestall rigid adherence to the plan. For example, a shipper aspires to use self-learning algorithms to create a constant feedback loop between the TMS and planning processes.

Another dimension to integration is a functional cross-connection across silos in the organization. Functions such as transportation, warehousing, manufacturing, and others can be cross-optimized and manage the cost-increasing or reliability-reducing constraints that each function imposes on the others. A food company wants to connect transportation and warehousing to each other and to planning. For example, if the company has a load and dispatches it late to a downstream DC, how should the company deal with labor in its warehouse? A beverage company is integrating management of manufacturing, transportation, and yard management to better connect its network of factories to its network of customers.

Integration, especially in the realm of transportation, extends beyond the four walls of each company as goods move from supplier to customer via the carrier with potential intermediation by a broker or other freight matching service. At the end of the day, several participants hoped that the discussions begun at the roundtable could continue for improving and standardizing how shippers, brokers, and carriers interoperate. Even if true standardization isn't possible, improving the technology for moving bits while the transportation system moves boxes could help supply chain partners to plan, operate, and react. Open, industry-wide APIs could enable better freight matching, better sharing of real-time data, and better management of exceptions that span supply chain partner boundaries.

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