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To Our Readers

Welcome to the 2012 edition of Oliver Wyman’s *Transport & Logistics* journal. This issue focuses on strategies and ideas that may prove to be fertile ground for competitive growth, in the context of a global economy that is still struggling to regain momentum.

Our first two articles examine what can be done on a collaborative basis with hard assets—fleets and infrastructure—to improve costs and service levels. Understanding the entire life cycle of a fleet can open up chances to optimize costs from the start of the procurement process. On the infrastructure side, working to achieve “best-in-class” maintenance performance can make much-needed capacity stretch further.

We next turn to logistics: In the area of contract logistics, we recently have conducted research and executive interviews to understand what trends will drive logistics demand for key customer sectors such as retail and technology. In addition, we preview some new thinking about how the efficiency of the underlying logistics network can itself be a source of growth.

Our third area of focus is risk. With $53 trillion needed in infrastructure spending worldwide in the next two decades, there is a greater need than ever to bring large projects in on time and on budget. Better risk transparency and mitigation can accomplish this. Internally, companies need to better understand risks across their entire portfolio of initiatives and seek to head off “core” risks before they impact growth projections.

Finally, we look at one of the most important drivers of future growth and cost control across virtually all industries: increasing worldwide concern about sustainability. Cities in particular are looking for sustainable solutions as urbanization increases. And beyond what your own company is doing to become more sustainable, there may be an opportunity to help your customers improve resource usage along the supply chain.

We hope you enjoy this issue of the *Transport & Logistics* journal and look forward to hearing your comments.
Upcoming fleet replacement needs, shareholder requirements for better ROIC, limited capital funds availability, and growing cost pressures can all increase the urgency for rolling stock owners and operators to optimize capital and operational expenditures for their fleets. Understanding life cycle cost (LCC) is a prerequisite for effective optimization, as LCC transparency can enable cost reduction no matter where a fleet may be in its life cycle.

Based on recent Oliver Wyman work with rolling stock operators, the most important success factors for effective ROIC optimization are:

- Getting the fleet strategy right
- Applying an integrative, cross-functional optimization approach that includes OEMs and systems suppliers
- Comprehensive use of all relevant optimization levers
- Deployment of the right methods and tools to relevant systems and components and that match the supplier landscape
The Value of Transparency

A rolling stock fleet can be thought of as having four major life cycle stages: Fleet strategy, procurement, design and production, and operation and maintenance. The early life cycle phases—fleet strategy and procurement—provide the largest opportunity for cost reduction. By the time a fleet is in the operation and maintenance phase, life cycle costs have been largely determined and cost reduction opportunities will decrease (but still exist). Thus, it is important to look at LCC as early as possible in the fleet strategy and procurement process.

As shown in Exhibit 1, transparency around total life cycle cost enables an ROIC optimization approach where scope is prioritized based on impact. Transparency should include splits by cost type, systems, and, ideally, components. Both costs and performance metrics need to be fully modeled to determine:

- What are the largest cost drivers? E.g., procurement, overhaul, energy
- What are the most significant deviations vs. best practices or benchmarks? E.g., ratio between unscheduled and scheduled maintenance
- What are the available capex-opex trade-offs? E.g., design for maintainability

As an example of how LLC transparency can be leveraged, the most important systems may show strongly varying capex/opex ratios. For example (see Exhibit 2), capex only represents 40 percent of total LCC for trucks, while capex is four times opex for car body and propulsion systems. An early focus on ROIC optimization strategies can leverage such differences, e.g., focusing on fleet design for trucks to lower maintenance costs, versus a focus on competitive procurement for car bodies to reduce up-front capex costs.

Exhibit 1: Life Cycle Cost Breakdown by Cost Type (Illustrative Railcar)

<table>
<thead>
<tr>
<th></th>
<th>Procurement</th>
<th>Capex 30%</th>
<th>15%</th>
<th>10%</th>
<th>7%</th>
<th>5%</th>
<th>0%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>100%</td>
<td>100%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40-Year Assumed Useful Life NPV Projection</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breakdown by System</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overhaul material illustration (in %)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Truck</td>
<td>Doors</td>
<td>HVAC</td>
<td>Brakes</td>
<td>Car Body</td>
<td>Propulsion</td>
<td>Electric</td>
<td>Electric</td>
</tr>
<tr>
<td>48%</td>
<td>13%</td>
<td>10%</td>
<td>7%</td>
<td>7%</td>
<td>7%</td>
<td>6%</td>
<td></td>
</tr>
<tr>
<td>Maintenance Opex ~40%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Car/ project cost</td>
<td>Inspections</td>
<td>Labor</td>
<td>Material Overhaul</td>
<td>Labor</td>
<td>Material Unscheduled maintenance</td>
<td>Energy</td>
<td>Cleaning</td>
</tr>
<tr>
<td>0</td>
<td>25%</td>
<td>5%</td>
<td>10%</td>
<td>7%</td>
<td>7%</td>
<td>7%</td>
<td>5%</td>
</tr>
<tr>
<td>50</td>
<td>15%</td>
<td>7%</td>
<td>15%</td>
<td>7%</td>
<td>7%</td>
<td>7%</td>
<td>6%</td>
</tr>
</tbody>
</table>

Note: Excludes indirect cost; typical NPV discount factor for public sector applied.

Source: Oliver Wyman.
LCC Optimization Success Factors

In Oliver Wyman’s work for clients, we have uncovered five aspects critical to successfully reducing life cycle costs:

- **Maximum transparency:** Understand life cycle cost structure and performance data by fleet and system to ensure the right scope of optimization activities, then build a baseline to challenge existing and new suppliers on cost structure and target cost.

- **“Right fleet” strategy:** Define objectives to guide fleet specification and procurement; determine the right size of the fleet, replacement timing, and target useful life; then, develop a competitive strategy for procurement and operations.

- **Integrative, cross-functional approach:** Bring all relevant stakeholders to the table to maximize impact, align interfaces, and increase leverage. This includes internal departments (engineering, procurement, planning, etc.) and OEMs and system suppliers.

- **Comprehensive use of levers systems, and tools:** Pull all technological, commercial, and supplier-oriented levers for cost reduction to ensure maximum result through a multi-perspective approach. Then build on existing experience and tools and reflect activities to date.

- **Right scope:** Define appropriate modules (e.g., to match the supplier landscape) and apply methods and tools at the right level (avoid too detailed as well as too high level of scope).

**Optimizing Costs at Every Stage**

As mentioned previously, opportunities for cost reduction will be highest early on in a fleet’s life cycle. But as shown in Exhibit 3, there are still levers that can be pulled to reduce cost at every stage. An optimized approach to life cycle cost reduction will attempt to incorporate as many of these levers as possible. The prerequisite for cost optimization across all stages is a life cycle model that enables full transparency on cost and performance drivers.

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**Exhibit 2: Total Life Cycle Cost, Ratio of Capex to Opex by System (Illustrative Railcar)**

<table>
<thead>
<tr>
<th>Component</th>
<th>Capex/Opex Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Truck</td>
<td>0.4</td>
</tr>
<tr>
<td>Car body</td>
<td>3.8</td>
</tr>
<tr>
<td>Propulsion</td>
<td>3.8</td>
</tr>
<tr>
<td>Doors</td>
<td>1.3</td>
</tr>
<tr>
<td>HVAC</td>
<td>1.2</td>
</tr>
<tr>
<td>Brakes</td>
<td>0.9</td>
</tr>
<tr>
<td>Electric equipment</td>
<td>1.2</td>
</tr>
<tr>
<td>Communications</td>
<td>3.3</td>
</tr>
<tr>
<td>Train controls</td>
<td>2.7</td>
</tr>
</tbody>
</table>

**Note:** Opex excludes “indirect” cost elements for energy, cleaning, and inspection labor, for allocation reasons.

**Source:** Oliver Wyman.
Key opportunities in the fleet strategy phase include defining the full scope of the fleet (its size, useful life, etc.), what technologies/innovations are required, and whether standardized modules can be used. Both the financing model and the procurement approach can be defined based on the desired level and trade-offs between capex and opex.

The procurement phase provides an opportunity to actively involve vendors in the cost reduction process, by encouraging innovation/prototyping and the use of a pre-award product cost-down process to jointly optimize costs with suppliers. (Pre-award product cost down involves closely cooperating with potential suppliers to develop specs to enable the most cost efficient bid. Pre-award specification provides ideal timing for maximum impact, i.e., no benefits sharing is required, while a competitive scenario motivates the involvement of target suppliers.) The negotiation process and bid evaluation provide further opportunities to aggressively optimize costs.

In the design and production phase, a post-award product cost-down process can be used to jointly develop win-win cost reduction ideas with chosen suppliers. Post-award product cost down enables specification decisions to be re-examined or challenged and allows more ideas to be considered (e.g., changing the design for simplified manufacturing). Solutions are incentivized by providing benefits sharing between the operator and the car builder.

In the final life cycle stage, operation and maintenance, a number of opportunities exist to optimize costs over the long term, including optimizing operational processes and the repair/replacement

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**Exhibit 3: Representative Levers for Each Life Cycle Stage**

<table>
<thead>
<tr>
<th>Fleet Strategy</th>
<th>Procurement</th>
<th>Design &amp; Production</th>
<th>Operations &amp; Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Define objectives</td>
<td>• Vendor reach-out</td>
<td>• Post-award product cost down</td>
<td></td>
</tr>
<tr>
<td>• Target useful life</td>
<td>• Technology/innovation search &amp; prototyping</td>
<td>• Joint identification of win-win cost reduction ideas</td>
<td></td>
</tr>
<tr>
<td>• Fleet size</td>
<td>• Pre-award product cost down</td>
<td>• Business case-driven decision making and benefits sharing between operator and car builder/OEM per idea</td>
<td></td>
</tr>
<tr>
<td>• Timing</td>
<td>• Negotiation strategy &amp; planning</td>
<td>• One-sided change orders</td>
<td></td>
</tr>
<tr>
<td>• Functionalities &amp; specs</td>
<td>• Bid evaluation &amp; decision making</td>
<td>• Operational process optimization</td>
<td></td>
</tr>
<tr>
<td>• Technologies &amp; innovation</td>
<td></td>
<td>• Reliability centered maintenance approach</td>
<td></td>
</tr>
<tr>
<td>• Module standardization &amp; interoperability</td>
<td></td>
<td>• Lean maintenance optimization</td>
<td></td>
</tr>
<tr>
<td>• Procurement approach</td>
<td></td>
<td>• Spare parts sourcing &amp; inventory management</td>
<td></td>
</tr>
<tr>
<td>• Financing model</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Interdependency of levers

Prerequisite: Life Cycle Cost Model/Transparency
cycle, adopting “lean” maintenance processes, and improving spare parts sourcing and inventory management. Reliability-centered maintenance, for example, builds an optimal portfolio of maintenance approaches that are adapted for the characteristics of each fleet, car, system, and component (Exhibit 4). This portfolio of approaches can then be built out into a comprehensive and cost-effective cross-fleet maintenance plan.

In summary, life cycle cost and performance modeling can provide a transparent and comprehensive process that enables costs at every stage in the life of a fleet to be identified, evaluated, and optimized. As a result, the best possible trade-off can be made between up-front capital expenditures and ongoing operating expenses, while optimizing ROIC. Over time, millions or billions of dollars in costs can be avoided across the entire asset life cycle, while increasing available capacity and delivering better customer service.

**Exhibit 4: Maintenance Approach Decision Tree by System/Component**

- **Step 1:** Is the component critical, i.e., would a failure create service disruption?
- **Step 2:** Can failure be predicted? (based on failure patterns, e.g., time, mileage, cycles)
- **Step 3:** Can component condition be assessed in inspections or tear-downs?

- **Yes**
  - Preventive maintenance: Analyze patterns and anticipate failures
  - Condition-based maintenance: Perform maintenance as required (e.g., revise schedules)
  - Interval-based maintenance: Maintenance is triggered by time, mileage, or cycle milestones
  - Corrective maintenance only: No preventive maintenance

- **No**

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Rail volumes are projected to double over the next two decades in North America and continue expanding in Europe (particularly cross-border) as well as in other regions of the world, making the issue of network capacity more critical than ever. Squeezing more performance out of existing assets is essential to minimizing long-term capital expenditures while meeting the demands of customers. One area ripe for reform is maintenance-of-way, which is usually seen as an activity that reduces capacity by taking up train slots and slowing down trains. But by pulling the right improvement levers, railroads and infrastructure managers can instead create “best-in-class” maintenance organizations and operations that add capacity to the system, improving infrastructure condition and reliability.

Oliver Wyman recently analyzed what companies across a range of industries are doing to develop such organizations, and how these lessons can be applied to the rail industry. Typically, best-in-class maintenance organizations/operations:

- Undertake a self-diagnostic and ensure the right data and processes are in place to support maintenance throughout the asset life cycle
- Fully integrate the planning and scheduling process. In the US, the goal of this process is better slot management, i.e., creating “windows” that can increase the amount of maintenance performed at one time (and eventually reduce the number of slots required), while enhancing the quality of the infrastructure. In the EU, where slot
management is more advanced, the goal is to optimize work so as to eventually reduce the number of slots required.

- Improve preventive maintenance plans through advanced analysis of network performance, condition, and operational data to determine predictive defective component patterns. This information is then built into maintenance planning for each segment of the infrastructure.
- Improve maintenance execution efficiency by “leaning out,” e.g., defining and documenting the “right” way to complete maintenance tasks and improving component reliability

Ultimately, if more work is planned and preventative, and infrastructure is kept at a higher level of availability, unplanned interventions will be fewer and less overtime will be spent fixing problems, thereby reducing overtime costs and enabling a better work-life balance for those in charge of getting the work done.

Self-Diagnostic & Data Resources

Before an organization can attempt to move toward best-in-class status, it must have in place the data and processes required to build a life cycle view of maintenance requirements. For railroads, this means first building a comprehensive inventory of track, signals, and structures—together with condition information—to provide a foundation for determining what planning/scheduling capabilities will be needed. Equally, the maintenance department must build a good working relationship with the transportation department—one that recognizes the importance of maintenance and the need for the appropriate windows to keep track in optimal condition (in open access situations, of course, these will be different organizations, but the same principles apply).

A self-diagnostic is another key starting step, to understand where you are along the continuum of maintenance practices—from reactive maintenance on one end (“putting out fires”) to well planned, predictive-model based, and prevention focused on the other. The self-diagnostic will indicate what “gaps” must be met and what steps need to be taken—whether in terms of data, models, processes, etc.—to get to the most efficient and effective stage of maintenance program management.

Planning and Scheduling Levers

Once a complete inventory has been taken and condition status is being tracked for all maintenance-of-way assets, the next step is the development of an integrated planning and scheduling process. Responsibility for planning needs to be vested with a strong engineering project management office (Exhibit 1). The PMO should focus on developing:

- Full visibility of the network and its related infrastructure assets (e.g., component profiles, maintenance backlog)
- A comprehensive view of maintenance requirements across the entire network (e.g., OEM guidelines, real world experience and data for individual components, infrastructure condition, capex plans)
- A cross-functional view of availability constraints and reliability (or non-reliability) impacts (e.g., operational requirements, marketing plans, regulatory/safety constraints)
Centralized priority setting and decision making (based on cross-function consultations, regulatory/government/other use considerations, financial cost/benefit analysis, etc.)

Maintenance window planning and logistics, detailing tasks, sequence of events, resource requirements, tools & materials, etc.

The goal of the PMO-directed planning and scheduling process is to minimize overall infrastructure downtime by performing all maintenance for all infrastructure related to a specific network slot. Furthermore, best-in-class planning and scheduling will reduce service disruptions and increase workforce efficiency, since window durations will be more predictable and realistic, and eventually less frequent.

Preventive Maintenance Levers

A deep understanding of network inspection results, performance trends, and operational data can enable the development and refinement of more efficient and proactive preventive maintenance plans (Exhibit 2). Key levers to improve preventive maintenance performance include:

- Strong model-based analytical capabilities to identify reliability and wear and tear trends
- Comprehensive understanding of warning signals and resulting preventive measures
- Deep knowledge of asset life cycles and impact of activity on remaining life
- Full visibility on “total cost” to develop the business case

Exhibit 1: Engineering Program Management Office

<table>
<thead>
<tr>
<th>Work order request initiation and screening</th>
<th>Planning and estimating</th>
<th>Scheduling and execution</th>
<th>Follow up and close out</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work request</td>
<td>Job plan</td>
<td>Weekly schedule</td>
<td>Closeout procedures</td>
</tr>
<tr>
<td>• Concise problem identification</td>
<td>• Tasks</td>
<td>• Work schedule</td>
<td>• Follow-up work orders</td>
</tr>
<tr>
<td></td>
<td>• Material</td>
<td>• Track time allocation</td>
<td>• Equipment history</td>
</tr>
<tr>
<td></td>
<td>• Tools</td>
<td>• Daily schedule</td>
<td>- Problem</td>
</tr>
<tr>
<td></td>
<td>• Special needs</td>
<td>• Personnel schedule</td>
<td>- Action</td>
</tr>
<tr>
<td></td>
<td>• Sequences</td>
<td></td>
<td>- Component</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Quality check</td>
</tr>
<tr>
<td></td>
<td>Estimating procedures</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Labor hours</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Labor dollars</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Material dollars</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Contractor dollars</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Weekly plan</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tentative work list</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The PMO will:

1. Assess the priority backlog by type of work, urgency, and geography
2. Identify network slots where resources and equipment are available and ready for maintenance work
3. Set priorities to open up a track section where a maximum of maintenance tasks can be completed in the allocated timeline
Trend and predictive analyses are the critical starting point to determine what preventive maintenance is needed to prevent failures and avoid costly corrective/emergency maintenance in the future. Through a focus on preventive maintenance, a railroad can improve resource effectiveness (i.e., planning ahead increases wrench time, reduces preparation time, and ensures needed material/tools are on location) and drive infrastructure savings by increasing network capacity and avoiding costly operational disruptions: ~$1 of preventive maintenance can avoid ~$3 of corrective maintenance-related cost, and in many cases, even more.

**Lean Maintenance Execution Levers**

Only once the maintenance organization is functioning at a high level in terms of data tracking, planning and scheduling, and preventive maintenance should any attempt be made to “lean out” the organization. “Lean” maintenance involves developing work methods that eliminate waste and non-value added activities through the use of Lean methodologies, as well as investigating opportunities to improve component reliability. Key performance levers include:

- Training the organization in Lean tools and methods (kaizen, root cause analysis, etc.)
- Standardizing documentation and simplifying works steps
- Eliminating waste (e.g., time, inventory) for non-value added activities

Adoption of Lean methodologies can reduce overall maintenance costs and improve component reliability. Furthermore, Lean methodologies focus on creating an environment to capture, codify, and document knowledge that is both essential to standardized work and critical to building a knowledge base that can be used to train future hires.

**Exhibit 2: Preventive Maintenance Concept**

<table>
<thead>
<tr>
<th>Inspect</th>
<th>Detect and Characterize</th>
<th>Monitor and Analyze</th>
<th>Plan Work and Communicate</th>
<th>Maintain Infrastructure</th>
</tr>
</thead>
</table>
| • Gather manual and automated inspections, performance, and operations data | • Build and update comprehensive database  
  - Analyze data to determine predictive patterns of component breakdown  
  - Pareto and root cause analysis of past failures | • Analyze data (trend and predictive analysis) and real-time characteristics to predict failures  
  - Define needed preventive maintenance and asset issues  
  - Routine repair  
  - Design issues  
  - Procedure changes | • Develop preventive maintenance work packages  
  - Link to PMO’s overall maintenance plan  
  - Quickly communicate tasks and information to appropriate groups | • Execute work using critical path management  
  • Utilize error proofing techniques to minimize rework  
  • Document standard work tasks and new findings  
  • Utilize post-work reviews as feedback on all previous steps |
The Path to Best-in-Class

Best-in-class transformation requires institutional learning and embedding of processes through several developmental stages (Exhibit 3), as well as the involvement of all stakeholders.

In summary, world-class maintenance organizations:

- Consider the total cost of maintenance (including impact on capacity), by assessing the trade-off between the cost of failure and the cost of maintenance
- Develop the comprehensive data and asset tracking required to understand life cycle maintenance needs and support planning and scheduling
- Utilize a self-diagnostic to understand where they are now in terms of data, processes, and capabilities and what gaps must be filled to move forward
- Follow a fully integrated approach to planning and scheduling, which requires an effective PMO
- Increase proactive and preventive maintenance, using model-based analyses of network inspection, performance, and operational data to determine predictive defective component patterns
- Improve maintenance execution efficiency through the use of Lean tools
- Are supported by all stakeholders and led from above by the railroad’s management team

A best-in-class maintenance organization/operation is a destination, but it’s also a journey. The benefit is that each step along the way adds value, by enhancing track capacity, infrastructure reliability, and operational performance.

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A North American railroad that was facing capacity constraints due to record traffic volumes wanted to improve the quality and reliability of its track infrastructure while not increasing the cost of track maintenance. The maintenance work force was stretched thin, and most maintenance was reactive rather than proactive. Already limited track maintenance time was being continuously reduced as capacity was consumed; limited trust between the transportation and maintenance departments also was an issue. Maintenance had become a “necessary evil,” rather than a strategic imperative.

To improve track condition and reliability, reduce slow orders, and increase capacity while maintaining maintenance costs, Oliver Wyman worked with the railroad to conduct a diagnostic, develop a new maintenance vision, and design interactive processes for the transportation and maintenance departments. The first step involved joint workshops with key stakeholders and front-line personnel to design the new maintenance plan. Next, this plan was tested through a four-month pilot project that demonstrated proof of concept and helped start the process of building greater connectivity between departments. The results of this pilot exceeded our initial estimates for improvement, e.g., a 10 percent improvement in maintenance efficiency, a 10 percent reduction in track time, 90 percent track window integrity, and a material reduction in slow orders.

Based on the lessons learned from the pilot, the program was refined and rolled out system-wide. Additionally, data from the pilot allowed the railroad to increase preventative maintenance during the roll out and justified the addition of reliability engineers who could support ongoing collection and analysis of track condition data to further refine performance improvements.

Ultimately, by improving the alignment of the maintenance and operations departments, the project led to longer, more reliable, and less frequent maintenance windows. Optimized processes increased wrench time in the window, while planning coordinated work across all maintenance functions, enabling more work to be done in the window. Better diagnostic data was used to develop a better understanding of infrastructure condition, leading to a higher level of preventive maintenance and reducing the amount of high-cost unscheduled maintenance. Most important, these changes met the railroad’s objective, keeping a lid on costs while increasing capacity and reliability (e.g., failure-related slow orders decreased by more than 30 percent).
Economic volatility is increasing and industries are under competitive pressure to meet changing consumer demands near instantly. In turn, these factors are putting pressure on logistics operators—whether parcel, express, freight, or integrated—to generate better performance from their road-based networks. Based on recent work for transport logistics providers, Oliver Wyman has identified new strategies for optimizing networks based on the collaboration of sales and operations management. Indeed, viewing the network as a strategic asset and applying integrated capacity management can represent an opportunity to generate more value from existing customer relationships as well as from product and service innovations.

Network Management Challenges

Logistics networks are complex, and over time many mathematical models and tools have sprung up to deal with the specifics of what, when, where, and how. But the “why” of strategic network management—effective decision-making linked to company goals—is not so easily accommodated. In particular, it can be difficult to gain visibility into what might be “wrong” with a network at a strategic level. Between optimization exercises, network quality may start to deteriorate: Factor and network costs increase (e.g., driver

Turning Logistics Networks into Strategic Assets
costs, tolls) and service levels erode. Often, the cause is not inherent in the network, but the result of external forces, such as:

- Changing customer demands/service-level requirements (e.g., changing delivery mix ratio of pallets to parcels)
- M&A activity that leads to poorly executed network integration
- Manufacturing/production location shifts, leading to fragmented operations
- Distributed responsibilities across the network (e.g., P&D, depot operations, network operations) such that “silos” of improvement develop
- Shifts in volume flows that occur step-wise, with limited visibility into macro-level changes

Numerous and complex “optimization” or “simulation” approaches are used to track, configure, and correlate discrete network parameters. But these approaches rarely provide the right level of information for making larger-scale decisions about the network in relation to the market and operational shifts listed above. The challenges appear to be both operational and organizational:

- Operations-related challenges revolve around whether the tools and processes used to optimize the network are ideal. If these tools and processes are too complex, this may put data collection into overdrive. Data quality may be lacking, or the developed network model may not inherently support business scenario analysis. In particular, network tools may not be tied to an understanding of company objectives, such that network design impacts revenue or cost levers that could boost performance.
- On the organization side, neither operations nor sales can optimize the network in a vacuum. Sales and marketing managers can provide key insights into future planned or requested changes to products, volumes, and lane/transportation requirements. Operations managers, on the other hand, have insight into network contingencies, operational costs (which impact pricing strategy), and operational performance metrics (which impact customer expectations).

Using the right tools and then aligning sales and operations management perspectives can lead to a much more holistic view of network configuration, based on strategically important metrics, such as profitability by customer/lane/depot and customer satisfaction and retention.

### Stepping Up to Integrated Network Management

Based on the above, Oliver Wyman sees three stages to developing a network into a strategic asset:

- Quick fixes based on optimized capacity and consolidation opportunities
- Operationally optimized network management: Ensuring a structured process that incorporates the right level of data and right tools to support management decision making, enabling cost/service level trade-offs to be optimized
- Fully integrated/holistic network management: Incorporating collaboration across cross-functional teams (especially sales and operations) into network management, thereby enabling greater revenue and cost transparency and driving earnings from the network (Exhibit 1)

Two case examples serve to illustrate these steps and the results they can produce.
Multi-Country Logistics for the Fashion Industry

A logistics services provider serving the fashion industry across 12 countries was losing an average of US$2 million per month; more than two years had passed since the last time the network had been optimized. In addition, the market was trending toward greater outsourcing of value-added activities, such as hemming and clothing repair.

The client set a goal of increasing its network agility to accommodate changing customer needs, the shelf life of fashion products, and seasonality requirements. As a first step, based on better data and network modeling tools, the company focused on improving the operational aspects of network management. This included rationalizing depots, better aligning customers with service lanes, rationalizing transport providers, and increasing truckload utilization on high-volume O/D lanes.

As a second step, the sales management and operations management teams developed a collaborative process for reviewing and analyzing network data. This not only improved the quality of strategic management decisions but increased customer satisfaction, as the teams were more closely aligned around customer requirements. Some of the major benefits the client realized through integrated network management are shown in Exhibit 2.

Postal Logistics

A postal company provided services across approximately 200 post offices. A network optimization exercise had not been conducted in three years. The client set a goal of achieving on-time delivery of 95 percent of volumes, while adding new B2B customers where possible and keeping a lid on network costs.

As a first step, operational optimization of the network focused on improving the baseline efficiency of postal operations. Identified cost improvement opportunities included reducing the number of sorting centers and post offices and greater leasing of vehicles. Service level improvements were achieved through better facility planning (e.g., appropriate automation) and trip planning (which also positively impacted resource and
fuel costs). A more cost effective network also enabled prices to be reduced by nearly 10 percent, helping increase market share for more profitable logistics services.

The next phase, integrated network management, involved a collaborative effort by the operations and sales teams to develop a strategic view of the best future operating model for the postal network. Information on customer needs from the sales team led to a more aligned network strategy related to core operational elements, such as collection and distribution models. Similarly, dynamic volume data from the sales team enabled operations to better assign sorting centers, improving average network utilization by as much as 80 percent.

Customer data also enabled technology investments to be identified and provided visibility into preferred mail formats and potential innovative services (e.g., 24-hour pick-up/drop-off stations). These changes were then flowed through into scenarios to identify network configuration impacts.

Ultimately, integrated network planning and management, backed by a solid baseline model, operations and sales data, and external intelligence, enabled the client to identify the most feasible future business model and network structure (complete with contingency planning) and develop a practical 5-year business plan.

In summary, as these examples demonstrate, strategic network management can be a persuasive source of competitive advantage. For many companies, the course correction required to achieve this is to move away from ever-more complicated and fussy modeling exercises and instead focus on increasing collaboration within the organization to align the existing network with strategic objectives, the needs of customers, and anticipated changes in markets. Too often, companies find themselves “serving the network,” when optimal performance lies in making sure it serves them.

**Exhibit 2: Benefits of Strategic Network Management**

<table>
<thead>
<tr>
<th>Cost Reduction</th>
<th>Revenue Improvement</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profitable customer targeting</td>
<td>Better pricing of customer contracts</td>
<td>Better target setting</td>
</tr>
<tr>
<td>Collective modeling of network data</td>
<td>Visibility into network costs and utilization rates</td>
<td>Better business planning and more pragmatic targets could be set by the sales and operations teams by collectively leveraging network and customer data</td>
</tr>
<tr>
<td>to avoid bringing in new customer contracts with profitability levels of less than 15%</td>
<td>helped the sales team better price contracts for pipeline &amp; existing customers</td>
<td></td>
</tr>
<tr>
<td>Incremental network improvement</td>
<td>Increased revenue from new solutions</td>
<td>Better risk management</td>
</tr>
<tr>
<td>Ongoing review of network performance scorecards helped operations make gradual network changes</td>
<td>Additional revenue was captured by understanding market trends and what value-added services customers wanted</td>
<td>Risks associated with making network configuration changes were better understood through joint review of network performance scorecards, and mitigating actions were adopted more quickly</td>
</tr>
<tr>
<td>Proactive asset procurement</td>
<td>Development of innovative products</td>
<td></td>
</tr>
<tr>
<td>Better sales forecasting and qualification of the customer pipeline (next 6-9 months) helped the real estate team procure or lease depots or transportation assets at more competitive rates</td>
<td>Collaboration drove innovative product development, such as building e-commerce fulfilment solutions, increasing customer market share by 15%</td>
<td></td>
</tr>
<tr>
<td>Improved cross-selling opportunities</td>
<td>New revenues were generated from cross-selling freight management services to customers seeking greater optimization of transport modes on the existing network</td>
<td></td>
</tr>
</tbody>
</table>

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The economic turmoil of the past few years has left its mark on contract logistics firms. Outsourcing trends continue to support third-party logistics providers and specialist supply chain providers, but the recent economic crisis has pointed up the need for better management and integration of supply chain activities—choosing the right markets, industries, and business model has become more important than ever before.

To provide some perspective on where contract logistics has been of late and where it’s headed, Oliver Wyman analyzed the ongoing impacts of the 2008-2009 economic crisis on the industry, how the strongest companies managed through the crisis, and what trends are likely to play out over the next 12-15 months that could provide new opportunities.

Cushioning a Crisis

The contract logistics industry took a significant hit during the economic crisis, with overall market value dropping by 8.2 percent from 2008 to 2009. Supply chain activities were not affected at the same level across industries, however. For example:
• Transport volumes for tech manufacturers dropped 20 percent. Although tech did bounce back quickly, this level of volatility plus shrinking product sizes has prompted technology-focused logistics providers to start thinking about how to make their business models more agile.

• Transport volumes for automotive OEMs and their suppliers also dropped by about 20 percent. The impact of the economic crisis was deeper and longer lasting for automotive—a reflection of the underlying structural challenges of new demand paradigms. Logistics firms serving this market are evaluating risks more carefully, especially where longer-term investments into specialized assets may be needed.

• The consumer products industry remained relatively stable, especially food and DIY, although the crisis laid bare the need for logistics innovation to better support service levels and increase sustainability (particularly in the fresh food sector).

During the crisis, logistics clients focused on identifying economically stable logistics providers to manage their supply chains. They also increased the number and frequency of tenders, often with the added stipulation of cost reductions of 8-10 percent per year, with equal or even higher productivity metrics. In addition, some large industry players chose to outsource and redesign their supply chains, in the hopes that economic conditions could help them procure external services at a reduced cost.

Strong contract logistics players responded by implementing across-the-board improvement and customer retention programs. Four core business model strategies helped logistics companies survive the crisis and position themselves for future growth:

• **Contraction**: Reduced sales growth, with a steady EBIT margin. Companies that used this strategy generally focused on selected industries, like healthcare, high-tech, and retail/consumer goods.

• **Consolidation & focus**: Slightly reduced sales growth, but increased profitability. Companies pursuing this strategy focused on cost efficiency and implementing modularized/standardized products across a defined range of industries. Some changed their business strategy from generalist toward multi-industry.

• **Sales growth**: Increased sales growth at constant/slightly lower EBIT margins. Typically, companies with a regional and road focus opted to expand their footprint during the crisis (at the expense of short-term margins), by taking advantage of opportunities in Asia and other emerging markets that ramped up again quickly after the crisis.

• **Profitable growth**: Sales growth and increased profitability. A few companies did succeed at this strategy, typically coming from a strong pre-crisis position of global coverage of their products tied to specific market sectors.

In addition, activities that helped contract logistics companies manage better during the crisis included:

• Creating innovative products that could generate a higher EBIT margin; identifying growth products and aligning the internal support network to increase market share across those products

• Better and closer management of key industry customer accounts, largely aligned around: 1) capturing growth opportunities across large industry players who wanted to transform their supply chains, or 2) retaining key accounts by providing tailored, value-added services
• Helping customers capture cost-saving opportunities, e.g., by creating intra-industry, international, or cross-industry alliances and offering services to these alliances that would benefit from scale economics and portfolio effects

• Investing ahead of the curve in areas such as real estate, by leveraging growth in emerging countries (as well as some developed countries)

Industry Outlook: A New Partnering Standard?

Overall, the economic crisis appears to have been a tonic, leading to much-needed improvements in contract logistics. Looking ahead, ongoing economic turbulence likely will drive many industries to continue focusing on core competencies and thus outsourcing supply chain-related services to qualified third parties. Alliances across companies to manage logistics, including portions of purchasing and distribution, also are likely to increase.

The standard outsourcing model appears to be evolving as well, toward vested partnerships between clients and logistics suppliers, with jointly defined and agreed goals. In these cases, contract length is often fairly long (> 5 years), with a focus in the early years of the contract on achieving a stable operating environment; in the latter years, challenging targets are expected to be delivered. An agreement to share risks equally drives a mutual interest in pushing the envelope and investing in refined logistics models and innovative solutions.

Oliver Wyman believes this model could be a new standard for a number of industries, e.g.:

• For telecom services providers, specific non-core activities could be handed off to logistics companies, such as equipment purchasing or repair of mobile communication devices. Such services, coupled with a logistics provider’s transportation and warehousing capabilities, could lead to greater efficiency at a lower cost.

• In the healthcare industry, we continue to see consolidation of hospitals in Europe and the outsourcing of their procurement and catalogue management activities to logistics services providers. By adopting jointly developed and agreed upon procurement management processes, the logistics services provider can drive value both through better purchasing management and by leveraging its understanding of transportation and warehousing to increasing the availability of medical products at the ward level within hospitals.

What’s Next: Industry and Regional Trends

Underlying market forces and overall GDP projections appear to support a healthy future for contract logistics providers. But—and there is a but—we also see supply chain activities being increasingly shaped by specific industry and regional trends. Logistics providers will need to consider how they can increase their flexibility to take advantage of upcoming opportunities in the sectors listed below.

Retail

Contract logistics should be stable for retail, which is projected to grow by 4.7 percent per year through 2015. A key trend in developed markets is the maturing of e-commerce as
an integrated component of retail, as this will require multi-channel fulfillment solutions that offer fast, reliable, and cost efficient delivery to end customers. In emerging markets, large retailers are moving into complex new urban areas, which will require innovative store formats, in-store logistics options, and transportation solutions.

Finally, returns management and warranties management activities across retail outlets are becoming more complex, creating an opportunity for logistics providers to offer integrated returns management platforms, where in-store returns processes are coupled with more traceable distribution solutions.

consumer products

Global consumer durables and apparel market value is projected to increase by more than 18 percent per year through 2015, but there will be regional disparities in growth: Consumers in emerging markets are set to increase spending, while in developed economies they are likely to be more budget conscious.

Localization will be a critical emerging trend. Products are being redesigned to be local-market specific (e.g., Colgate developing toothpaste specific to the Chinese market), which will require logistics providers to localize their global knowledge and best practices and embed them into local client production and supply chain operations. At the same time, the push into new markets may require aggressive pricing, which will drive multi-product bundling, and thus the opportunity for local co-packing and packaging solutions.

A second emerging issue is consumer concern over sustainability, which is driving greater introspection around product packaging. Innovative packaging capabilities, coupled with strong waste management solutions, could be a valuable logistics opportunity space, as this would support regulatory/environmental needs while protecting clients’ brand identities.

Finally, Oliver Wyman expects that lead logistics provider (LLP) solutions will increase, due to growing portfolios of manufacturing sites (local/global), complex inbound & outbound supply chains, and the need to reduce time to market for new, more customized products.

Technology

Global technology hardware and equipment market value is projected to increase by 7.2 percent per year through 2015. Production innovation (particularly toward smaller, lighter products) will drive demand for a flexible and responsive supply chain. Logistics companies stand to gain if they can effectively leverage their capabilities and assets in a more agile manner within their existing networks (vs. having to build new networks).

Cost pressures related to competitive product pricing in the tech space are driving an increase in outsourcing of non-core activities such as claims, returns, and repairs. Management of these activities must take into consideration tech company business goals, such as enhancing customer satisfaction (as evidenced, for example, by positive Internet-based feedback and reviews).

The postponement of final configuration and packaging until the product is in or close to the market where it will be consumed is another trend. This can create an opportunity for logistics companies with light assembly capabilities to assemble and deliver products in local growth markets at competitive costs. Similarly, strong multimodal network capabilities can be critical for tech products...
that have short design-to-market cycles with concurrent multi-market or multi-country launches.

Automotive

Global car production is projected to increase by 6.7 percent per annum through 2016. Increased complexity in the industry is being driven by a change in geographic patterns of demand and production, particularly a move away from North America and Western Europe to China, India, South America, and Eastern Europe. A significant geographical presence and the ability to manage movements in geographies with poor infrastructure will become key differentiators for contract logistics providers serving this industry.

In addition, production is becoming more concentrated, leading to the development of regional production centers and new market routings, while car makers’ production processes are evolving toward more flexible production lines and build-to-order systems, tied to newer “pull” rather than “push” sales models. This trend will require logistics providers to develop more agile inbound-to-manufacturing solutions.

Lastly, tightening regulation on recycling and waste management will create an opportunity to provide differentiated environmental management solutions that adhere to country or regional requirements, e.g., regulatory recycling requirements for batteries for electric vehicles.

Life Sciences and Health Care

Global pharmaceutical, biotechnology, and life sciences market value is projected to increase by 7.1 percent per annum through 2015. This is a “niche” market, but one that may offer a variety of opportunities for logistics providers willing to make the investment, particularly as stringent regulations and industry requirements are driving a need for high-quality transport, warehousing, and handling operations.

Some of the trending requirements for this market include:

- Traceable temperature-controlled solutions to cater to the increased use of “live culture” vaccines and medicines and geographically widespread clinical trials
- Recall management solutions to support the expanded launch of products that have only partially completed the last stage of clinical trials
- Serialization and traceability to support an increased emphasis on e-pedigree requirements
- Better packing, handling, and returns management to support the convergence of pharmaceuticals and medical devices (e.g., pre-filled syringes)
- Development and servicing of new fulfillment channels to support innovative business models, e.g., “direct to pharma” solutions that reduce dependency on wholesalers

Geographic Trends

Logistics providers also will want to be aware of geographic trends, particularly the divergent needs of developed and emerging markets. Mature markets such as North America, Western Europe, and Japan still account for 75 percent of the global supply chain market. These tend to be competitive markets, with ongoing consolidation and complex solutions requirements, which gives an advantage to major 3PLs. Mature
country outsourcing is around 30 percent for all companies and near term will be driven by core business refocusing and pressure on customers’ balance sheets.

Emerging countries, such as the BRICS, account for a quarter of the global logistics market. Outsourcing rates in emerging countries are only about 15 percent, as the notion itself is relatively new and the quality of local offers tends to be poor. But local suppliers are improving fast and overall economic growth makes these regions target areas for all major global logistics providers.

Logistics in emerging markets can be challenging: Poor infrastructure is a bottleneck in many regions; business environments often are constrained by taxes, bureaucracy, and security impediments; and less sophisticated clients do not necessarily perceive the value of logistics. Logistics providers often must compete with a large number of local road freight operators, while in some countries, the specificities of the market make it difficult for international firms to enter, even if the local offering is rather weak (e.g., China).

Despite these challenges, contract logistics is enjoying strong growth rates (greater than 10 percent per year) in emerging markets, driven by underlying economic growth (Exhibit 1) and increasing consumer consumption. We believe that India, China, Russia, and the Middle East will represent significant contract logistics opportunities in the near term.

**Are You Ready?**

In summary, the outcomes of the latest economic crisis and the outlook for key industries/regions going forward suggest the following five strategic imperatives for contract logistics firms:

- **Update the business model:** Review your organizational structure. Good companies manage the balance between industry and regional organizations well and mix entrepreneurial local drive with deep industry expertise. Furthermore, the business model must be flexible enough to change in tempo with market expansions and contractions.
• **Be ready for the next crisis:** Develop an action plan for the next crisis—right now. Economic volatility isn’t going away, so good companies will have blueprints ready and know exactly what to do long before the next crisis hits.

• **Grow outsourcing:** Assess new outsourcing opportunities, such as updating products/services for changing industry sectors and emerging markets. Good companies develop innovative product bundles and look to unlock significant growth across all regions.

• **Actively partner:** Develop new partner models. Good companies move from answering RFPs to actively shaping the industry and putting together long-term, value-adding partnerships. Partnering with tech, telecom, and life sciences industries should be on that list.

• **Industrialize product replication:** Critically review your industry focus and internal structure. Good companies periodically scan their existing solutions, develop replicable modules from a few, and align their sales programs in step.

Things may be looking up for logistics, but the next “game changer” is always just around the corner. Trend awareness, a focus on customer perspectives and active partnering, updated and replicable products, and crisis preparation are the cornerstones of a contract logistics business built to prosper in good times and bad.

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**Exhibit 1: Regional Projected GDP, 2010-2030 CAGR**

<table>
<thead>
<tr>
<th>Region</th>
<th>2010-2030 CAGR</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>+2.53%</td>
</tr>
<tr>
<td>Middle East</td>
<td>+4.18%</td>
</tr>
<tr>
<td>India</td>
<td>+8.11%</td>
</tr>
<tr>
<td>China</td>
<td>+7.53%</td>
</tr>
<tr>
<td>Russia</td>
<td>+3.88%</td>
</tr>
<tr>
<td>Western Europe</td>
<td>+1.68%</td>
</tr>
<tr>
<td>Middle East</td>
<td>+4.18%</td>
</tr>
<tr>
<td>USA</td>
<td>+2.53%</td>
</tr>
</tbody>
</table>

**Source:** Oliver Wyman analysis.

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Maximizing Returns on Large Investment Projects

At any given moment, more than 200 large public and private capital investment projects, each worth at least $500 million, are in progress globally, while thousands more valued at $100 million-plus are under way. These numbers are bound to become even larger, as an estimated $53 trillion needs to be invested in public infrastructure by 2030 to keep the global economy on a trajectory toward recovery, according to a recent study by the Organisation for Economic Cooperation and Development, which was supported by Oliver Wyman’s Global Risk Center (Exhibit 1).

Unfortunately, unless organizations improve how they manage the risks inherent in large projects, these investments could suffer from huge losses. Consider: The construction of a nuclear power plant typically runs over budget and 150 percent behind schedule. In addition, utility companies forego roughly $1 million in revenues every day that a plant’s construction is delayed.

There is a better approach. Recent research conducted by Oliver Wyman has shown that by developing more sophisticated capabilities to manage the risks inherent in infrastructure investments, governments could free up more than $5 trillion by 2030 for other purposes. The potential impact of these savings could be substantial for the public finances of debt-ridden European countries and the United States.

By developing greater transparency around the risks involved in large infrastructure projects and tracking mitigation efforts rigorously, governments and companies could reduce cost overruns and delays by 20 percent or more. Such processes enable organizations to both quantify the full economic impact of risks inherent in capital investments and better target efforts to avoid these risks—improving project earnings significantly.

Exhibit 1: Global Infrastructure Requirements, 2009-2030

<table>
<thead>
<tr>
<th>Infrastructure</th>
<th>Aggregate investment US$ trillions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>17.7</td>
</tr>
<tr>
<td>Telecom</td>
<td>10.9</td>
</tr>
<tr>
<td>Roads</td>
<td>7.5</td>
</tr>
<tr>
<td>Electricity (transmission &amp; distribution)</td>
<td>6.1</td>
</tr>
<tr>
<td>Rail “new construction”</td>
<td>5.0</td>
</tr>
<tr>
<td>Oil and gas (transport &amp; distribution)</td>
<td>3.3</td>
</tr>
<tr>
<td>Airports</td>
<td>2.2</td>
</tr>
<tr>
<td>Ports</td>
<td>0.8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>53.5</strong></td>
</tr>
</tbody>
</table>

Source: OECD, Oliver Wyman.
Why, then, do so many governments and companies seem to ignore the opportunity to improve returns on their large project investments?

First, the risks involved in large projects are inherently difficult to manage. They are planned in an environment in which future demand is uncertain and they are intended to last for several decades at least.

Second, executives and officials who champion large projects in investment committees are usually unaware of the technical risks involved in capital investments. In the private sector, these same executives also may tend to exaggerate a project’s potential financial upside, so that the investment will be treated as a top priority.

Finally, engineers confronted with delivering on overly optimistic projections have trouble making the case for steps to be taken to reduce the risks involved in a project. This is in large part because they cannot quantify the difference their suggested actions would make on a project’s bottom line.

The result? Few organizations have a firm grasp of the potential impact on their financials of risks to the scope of their capital investments. And large projects continue to run over budget (Exhibit 2). That’s a big problem, as the real cost of a delayed construction project can be more than five times the cost estimated by engineers, once factors such as foregone daily revenues are taken into account. This is especially true if an important piece of equipment turns out to be faulty. For
example, a company can lose $1 billion if a nuclear reactor vessel does not meet required specifications, since it takes three years to build a new one.

Therein lies an opportunity for businesses and governments to improve not just the earnings of their infrastructure projects but their overall financials. To illustrate how this can be achieved, we discuss herein several strategies and examples for improving large-project returns at every stage of the project life cycle—from the initial assessment of the investment to planning and execution. Every stage offers opportunities to improve project performance by better anticipating inherent risks, designing projects in a way that will head off delays and cost overruns, and establishing key milestones that can be tracked to avoid potential problems.

Stage I: Investment Decision

By examining data related to risks, companies can improve potential returns even before projects are selected. They can prioritize competing projects and select those that potentially will generate higher profit or more stable revenues, thus avoiding raising alarm bells with stakeholders such as rating agencies.

As an example, the operator of “Mountain Railroad” knew its infrastructure was nearly at capacity and desperately needed to be expanded. But the company was unsure of how much additional volume to plan for. Figuring out how to expand profitably appeared to be a daunting task, since this involved factors ranging from which corridor the operator should upgrade, to whether it should count on heavy hauls across the entire network.

Thus as a first step, the operator closely scrutinized the implications of a variety of risks for the project’s financial performance. It identified and quantified the impact of potential changes in everything from demand and salaries to the prices of the commodities (such as steel) that its trains would transport, taking into account various operational models and investment scenarios. Linking such technical information to its business case improved the operator’s decisions on a whole range of issues, from the optimal length of its trains to whether it should buy diesel or electric locomotives.

In extreme cases, analyzing data related to potential project risks also can help companies figure out early on if they need to pull the plug. For example, one industrial company halted construction of a chemical plant after investing more than $40 million in it. After examining the commodity risks involved, the company realized that new shale gas discoveries would make the project unprofitable. The company lost its initial investment, but it saved $2 billion in potential sunk capital costs that would have never paid off.

Stage II: Project Planning

Sometimes achieving the highest risk-adjusted return requires taking what might appear at first to be a counterintuitive approach. For example, a company may be better off buying an older, more expensive piece of equipment if it is more reliable than a cheaper and more efficient alternative, if the latter is less proven. In extreme cases, it might even make sense to buy a duplicate of a key piece of equipment and keep it in reserve, just in case something goes wrong. Even if the company ends up disposing of the second unit, it will have mitigated the risk of costly delays.
Allocating more resources to a project can also make a big difference. For example, an oil and gas exploration company discovered that it could improve the financial performance of its project pipeline by hundreds of millions of dollars a year by hiring 20 oil field experts. The company had to pay these experts a total of $6 million a year, but considered the higher upfront cost to be well worth it: The company projected that by using these experts to reduce project delays by 20 percent, it stood to gain $1 billion over the next 6-7 years.

In another example, the case of “Valley Railroad” shows how building more flexibility into a plan to steer clear of risks can improve return on investment. This railroad planned to invest several billion dollars to boost its transport capacity by 30 percent within five years. But the expected payoff from the investment turned out to be wildly optimistic. The operator’s plan was based on the assumption that the railroad would operate consistently near peak efficiency levels. Upon closer examination, however, it became clear that the railroad was unlikely to reach this goal. In addition, project planners had underestimated the risks involved. Suppliers started missing deadlines for new railcars and tracks. Worse, the railroad discovered it would not have enough drivers for its new trains. It takes two years to prepare a new train driver, requiring coordination across departments, but this aspect of the plan had “fallen through the cracks” and had never been taken into account.

In response, “Valley Railroad” launched an investment program review and developed a revised capital investment plan. The operator wanted a plan tailored to its actual requirements so as to avoid introducing equipment that might become obsolete later. To that end, the company revised its capital investment agenda to account for possible key causes of underperformance as well as for upside potential. By defining a realistic range of throughput and revenues over a five-year time frame, the operator improved its overall business case. For example, the operator substantially increased the probability that it would achieve its targeted returns by investing in several hundred additional railcars as “insurance capital.” It also focused more on mitigating key risks related to axle load upgrades, crew availability, and operational efficiency.

Stage III: Project Execution

The final step in improving large-project returns is implementation of an ongoing process to closely monitor operational and financial performance.

For example, “Steady Energy,” a global power company, planned to invest tens of billions of dollars in expanding its power generation business globally. To prepare the organization for this massive construction challenge, the CEO sought to improve the company’s project delivery capabilities. In a pilot program that looked at a selected power plant construction project, his team identified the biggest risks based on past and ongoing initiatives and quantified the potential negative impact these risks could have on the project’s economic value. Together with the project’s economic planners, engineers, and technical personnel, the team then developed specific plans to avoid certain risks and prioritized risk mitigation based on an assessment of cost against the expected benefit to the project’s value.
Most important, the CEO’s team established a system to track key milestones and made people responsible for monitoring them. The company was able to improve the performance of the project by several hundred million dollars by developing an early warning system that would track critical performance indicators such as on-site accidents and maintenance schedules. Managers also began to visit suppliers more often. Based on the lessons learned in this pilot, a project risk management framework was developed for use across the organization’s entire investment program.

**Improving Returns by Reducing Risk**

Improving the returns on a company’s capital investments can make a major difference to its overall financial performance. And yet, it is a rare company that has fully explored this potential.

In our experience, applying risk management techniques to large projects can greatly reduce both delays and cost overruns. Developing this capability is crucial not only at the level of the individual organization, but imperative to address the growing infrastructure gap that threatens the long-term health of emerging and developed economies alike.

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Managing the “Risks That Matter” at Transportation Companies

Manny Hontoria
Nick Kuriya

Capital intensive, network-based transportation and logistics (T&L) companies face ongoing challenges and intense pressure to improve their financial performance. Despite lackluster economic growth in most major economies, uncertainty over how macroeconomics risks will spill into the transport sector, and years of hard driving on productivity, investors continue to push for better performance and returns. The recent experience of a major railroad, where an activist investor acquired over $1.4 billion in company stock and successfully gained control of the company, is an example of what can happen when stockholders are unhappy. In this environment, it is not surprising that senior management teams and their boards are demanding a deeper and more effective understanding of the factors that create volatility in performance and of the risks that put them in danger of missing their targets.

Virtually all large transportation companies have some form of enterprise risk management (ERM), with varying degrees of effectiveness—from simple compliance for governance purposes to corporate cultures that quantitatively consider risk in virtually all decisions. Oliver Wyman’s recent experiences with a number of T&L clients across the world suggests, however, that risk management processes in many instances could still...
be more effective than they currently are, particularly in terms of getting through the “noise” of many small risks to effectively focus on the risks that really matter: the subset of “core” business risks that truly drives exposure to underperformance across the organization and that must be actively monitored and managed.

### Traditional Risk Management Troubles

In our experience, transportation companies tend to have traditional risk management groups, whose efforts often focus primarily on compliance and reporting (and sometimes, in the least effective implementations of risk management, essentially on insurable risks). Large companies generally have more comprehensive “enterprise risk management” or ERM programs, often as part of a large enterprise resource planning system.

In general, the process and outputs of traditional risk management satisfy governance and public reporting requirements, but are seldom designed to effectively support executive decision making around strategic objectives and business performance. Some of the key shortcomings that we often see include:

- The process relies on a large and static “risk register,” making it difficult to prioritize and focus on the subset of risks that really matter, and contributes to the perception of risk management by line departments as an annual chore.
- There is excessive emphasis on insurable and catastrophic external risks, rather than those where management can intervene.
- The underlying drivers of risk are often qualitative, considered in isolation, and do not account for natural correlations and relationships.
- Impact quantification is not tied to key business metrics.
- Reporting tools give the illusion of depth and sophistication but fail to answer fundamental business questions.
- There are parallel risk management efforts—in finance, capacity planning, operations, legal, internal auditing, etc.—that lack coordination and have their own perspectives of risk.

The result of these various factors is that key strategic, sales, operating, and financial management processes are often independent of the risk management process. In addition, all too often, complex strategic and capital investment decisions are made on the basis of internal advocacy and incomplete assessments of the risks involved in a given potential opportunity. (As an example, see the sidebar on the Bakken oilfield opportunity.)

### The Need for Focus

To a large degree, the issue is one of focus: a comprehensive ERM program that is “all things for all users” is too unwieldy to be truly useful in terms of helping executives manage key risks; while individual department or business unit risk programs are too parochial and misaligned to coordinate effectively. Executives need a better risk management approach to provide insight on the areas that they can control, and that links underlying risks to the metrics that they use to manage and report on performance.
Most transportation companies, in the context of their strategic and business planning, rely on a mix of incremental revenue growth and productivity improvement efforts, as well as a set of “major initiatives” that are intended to have a significant impact on their performance. Forecasts on how demand and pricing are expected to evolve, as well as projections for operating costs and capital expenses, form the basis of these plans. However, when we examine the robustness of these plans from a risk perspective, insights are often superficial and rarely quantified.

In addition, the decisions involved in managing the business are complex, have some degree of uncertainty, and are virtually certain to change in a dynamic environment—particularly as transport and logistics tend to be highly tied to macroeconomic factors that have become increasingly volatile.

To be fully effective, risk management practices must be embedded within an organization’s approach to planning, analyzing performance, and making important decisions. Organizations must take into consideration not only core business risks but also the risks that might arise in the execution of key strategic initiatives within the organization. Such an approach should be backed by quantifiable financial/performance metrics, focused on specified timeframes, and tied to the company’s strategic plans (Exhibit 1).

With data-driven and practical inputs, risk management can aid senior executives in improving network and resource planning, capital program development, operational execution, and business development activities. The other necessary ingredient is a structured risk model that spans the full range of business drivers—market, operational, financial, and initiative-based.

Exhibit 1: Strategic Initiative Risk Management Framework
Stepping Up Risk Management

In recent projects with clients, Oliver Wyman has developed a structured process to help transportation executives better understand core business risks:

1. **Develop a “risk pyramid” of relevant risks:** Identify major enterprise and initiative-specific risks and the underlying drivers of these risks. The risk pyramid is the foundation for subsequent prioritization analyses and mitigation initiatives.

2. **Link each risk/risk driver to business performance statements:** Identify key financial metrics based on business targets, then determine how identified risks areas and drivers link directly to those metrics (Exhibit 2).

3. **Evaluate and prioritize core risks:** Prioritize risks based on their magnitude and the likelihood of impacts occurring. Assess the degree to which risk drivers are controllable.

4. **Quantify risks and develop a risk profile:** Quantify risks and allocate to prioritized risk drivers. Map “upside” and “downside” risk profiles and determine which risks really require action.

5. **Develop and implement mitigation actions:** Develop mitigation measures for prioritized risks and identify organizational requirements to implement risk mitigation actions.

6. **Integrate risk management processes:** Finally, integrate enterprise and strategic initiative risk management practices into organizational processes at every level, adjusting organizational and individual metrics as required to drive desired behavior and outcomes.

This process can be supported by a number of tools. One of the most useful is a dashboard, based on the risk model outputs, that is used by the executive team and the Board to communicate actions and status to stakeholders.

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**Exhibit 2: Breakdown of Risks and Drivers (Railroad Example)**

<table>
<thead>
<tr>
<th>Risk areas</th>
<th>Risk categories</th>
<th>Risks</th>
<th>Drivers</th>
</tr>
</thead>
<tbody>
<tr>
<td>P&amp;L Profit Target</td>
<td>Price</td>
<td>Market risk</td>
<td>Suboptimal locomotive and car utilization</td>
</tr>
<tr>
<td></td>
<td>Volume</td>
<td></td>
<td>Sporadic car supply</td>
</tr>
<tr>
<td></td>
<td>Fuel</td>
<td>Customer risk (losing key customers)</td>
<td>Network delays</td>
</tr>
<tr>
<td></td>
<td>Productivity/operations</td>
<td></td>
<td>Poor customer relationships</td>
</tr>
<tr>
<td></td>
<td>Information systems</td>
<td></td>
<td>Poor yard switching performance</td>
</tr>
<tr>
<td></td>
<td>Capital</td>
<td>Operational risk</td>
<td>Weather conditions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>E.g., poor economic conditions, FX</td>
<td>Human error</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Major contracts not renewed</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Failing to meet service standards</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Competitive landscape change</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>E.g., development of pipelines, barge/trucking competition</td>
<td></td>
</tr>
</tbody>
</table>

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The Performance Payoff

Can better risk management practices improve your company’s performance? Ask yourself:

• How often do business outcomes fall within the ranges identified by our risk analyses?
• Who decides which risks should be considered? Who makes the final business decision? How closely do they interact?
• Are the same risks treated similarly for different projects and decisions?
• Is our risk assessment tied to the financial values that our shareholders care about?
• Do our risk analyses actually identify ranges of financial outcomes?

A risk approach that is both practical and focused has the power to transform the ability of executives to communicate options, make decisions, mitigate volatility in outcomes, and execute planning. As detailed in Exhibit 3, fully linking the output of risk management to key management processes can produce step changes in corporate effectiveness, positively impacting margins and growth.

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Exhibit 3: Benefits of Fully Linked Risk Management

<table>
<thead>
<tr>
<th>Application</th>
<th>Common pitfalls</th>
<th>Benefits of a fully linked approach</th>
</tr>
</thead>
</table>
| Strategic planning           | • Data and information overload  
• Burdensome and discrete activity that occurs 2-3 months per year             | • Synthesizes a wide mix of market intelligence  
• Covers a range of scenario outcomes  
• Dynamic and integrated into an actionable set of strategic choices            |
| Capital budgeting            | • Investments are made in isolation  
• Overestimate return, underestimate risk levels                                     | • Aggregates a portfolio view of company assets from a risk-return perspective  
• Provides quantified expected impact of incremental investments/divestitures  
• Guides portfolio decisions to highest risk-return optimization                 |
| Large capital projects       | • Project risks are managed in silos  
• Decisions are made based on short- to medium-term outlook                        | • Ability to channel risk management resources where they are most needed  
• Comprehend long-term impact of decisions, avoid surprises that erode NPV in later years |
| Performance measurement      | • Incentivizes excess risk taking in pursuit of excess returns in the current time period  
• Need to differentiate between lucky and smart                                    | • Takes an economic view of performance  
• Permits comparison across dissimilar operations  
• Considers funding structure requirements in support of business operations    |
| Mergers, acquisitions & divestitures | • Evaluated on a standalone basis, integration is a summation of cash flows  
• Decisions focus on return and underestimate risk levels and alignment to risk appetite | • Quantifies risks of M&A options and values potential opportunities on a risk-adjusted basis  
• Guides growth/divestiture decisions to highest risk-return optimization  
• Ensures alignment of opportunities to risk appetite                             |
The vast Bakken oil and natural gas field stretches across Montana, North Dakota, and parts of Canada. The US Geological Survey estimates the field could have nearly four billion barrels of oil and 150 billion barrels of natural gas liquids in reserve, in addition to 1.85 trillion cubic feet of natural gas. Output has grown several times over since 2009 and the field is currently producing 20 million barrels of crude oil per month, exceeding the capacity of available pipelines. In addition, sand for use in hydraulic fracturing (fracking) must be brought in. These developments have driven railroads to invest heavily in the region, to capitalize on the need for transportation capacity between the Bakken and North American refineries and ports.

This explosive growth opportunity comes with substantial risk, however. Given the efficiency of pipeline transport, rail is a residual capacity provider and will absorb production volatility. This volatility is likely to be high in an industry that is already notoriously sensitive to changing energy prices and the high cost of horizontal drilling and fracking, and which may be impacted in the future by increased regulation.

More important, although pipelines are slow to build and require firm volume commitments to be economic, there are six large investment projects in the region currently underway. Some estimates suggest that even if only three are completed, all Bakken oil could be moving by pipeline as soon as 2014, even taking into account significant production growth. The transport of frac sand alone may not warrant the rail investments currently being made.

This suggests that in terms of risk planning, it is not enough to develop rail business plans based on Bakken oil production expectations and forecasts alone. Asymmetric risk sharing and competitive responses also must be taken into account. From a holistic perspective, the risks represented by this investment need to be considered vis-à-vis all other strategic initiatives (e.g., choosing not to fund other investments that could be made in capacity), and the upside/downside quantified to determine potential impacts on the entire project portfolio and overall financial performance.
Railroads and other transportation & logistics (T&L) companies have been moving to institute more environmentally responsible and sustainable practices throughout their organizations. But T&L companies do not work in a vacuum; they are typically part of the supply chain of their large and small customers, which are themselves striving to reduce their impact on the environment while generating positive financial growth.

Consideration of this role could lead T&L providers to a new view of sustainability as an opportunity to increase differentiation and drive market share growth, through the development of innovative solutions aligned with customer needs. Doing so will require that T&L companies first understand the intricacies of their customers’ sustainability programs and mandates, and then design solutions that can meet both environmental and economic goals. Our research suggests that a rail service provider that addresses the unique sustainability requirements of customers, for example, could realize as much as a five point improvement in operating income as a result.
Sustainability Trends and Your Customers

The customers of T&L providers are being subject to a range of pressures to become more sustainable, from government regulation and financial market actions to customer demand for more sustainable products and rising energy costs (Exhibit 1). A few of the most critical trends are described below. From a T&L provider perspective, each customer industry sector and subsector will have a different set of sustainability issues, requirements, opportunities, and solutions, necessitating a customized approach.

- **Resource usage**: At current growth levels, companies in many industries are facing or soon will face a resource gap. Current industrial production still relies predominately on limited production inputs (fossil fuels, non-renewable raw materials), which will see rising prices and potentially increased government protections as world populations industrialize. Companies will have to focus in the future on improving resource efficiency and developing alternative resources.

  As an example, auto makers are at about the midpoint of sustainable/ “low-carbon economy” development, in terms of energy usage, and CO₂ waste generation (from manufacturing). While seeking economic growth, better resource efficiency will need to be a goal in coming years for the industry (particularly as further regulation is likely).

- **Regulation** to protect the environment and meter resource usage continues to expand. Western Europe has spearheaded the development of environment-friendly regulation, but eco-regulation in the form of policies, subsidies, and penalties is increasing in other regions as well. One focus of international political action is measuring the environmental impact of businesses (e.g., their “carbon footprint”) and imposing stricter transparency regulations. CO₂ emissions and waste are two principal areas of concern, followed by water and land use.

  - **Financial markets** increasingly expect companies to exhibit sustainable behavior. Sustainability indices and publically available ratings provide transparency to investors. As financial markets become more knowledgeable, PR-driven “greenwashing” is on its way out. The markets are coming to link corporate sustainability strategies with the likelihood of better long-term growth, as this focus may indicate a more robust strategy in response to risks such as material price shocks or regulation. As an example, internal credit ratings by banks consider sustainability as a factor in determining the cost of debt, while pension funds are developing...
It’s not just the environment: Sustainability can be a source of competitive advantage, too.

separate investment classes for sustainable investments.

- **Customer demand**: Sustainability is becoming a “must-have” for many products. Increasingly, both businesses and end customers expect their suppliers to be actively working to increase sustainability. Many end customers now explicitly demand sustainable products, while business customers are eager to react to this demand to maintain a competitive edge (e.g., automotive, retail) and are ramping up their evaluation of suppliers’ attention to sustainability.

As an example, a large textile manufacturer demanded that its logistics providers use only specific types of energy-efficient ships on Asia to US/Europe routes. Similarly, BMW is ensuring that the entire production and supply chain for its new “i-series” cars is carbon neutral.

- **Clean tech**: Refers to evolving technologies that support increased sustainability. Clean tech can help companies not only become more eco-friendly, but develop new products or reduce operational costs (e.g., by increasing fuel efficiency). In some cases, an industry is “not there yet,” but is considering how clean tech will play out in the future. As an example, automotive companies are considering how cars might become “energy batteries” (e.g., recapturing more of the energy they use). Clean tech innovations are often disruptive, suggesting a need to “stay tuned” to research and development that might generate opportunities for service and product differentiation.

These trends above suggest, at a high level, a variety of strategic questions that T&L companies could be asking about how to become more involved with their customers in driving sustainability (Exhibit 2). Responding to customers’ sustainability needs will require understanding how each customer has integrated sustainability into its commercial strategy, business model, and culture, and what its end goals related to sustainability might be.

### Mastering the Sustainability Space

Recent interviews and research conducted by Oliver Wyman found that most mid-sized to large companies have corporate social responsibility reporting, that most managers consider their companies “somewhat” green, and that much more is being done to foster sustainability than was the case 5-10 years ago. But many managers we interviewed also expressed uncertainty as to whether or not the company’s current actions would continue to be sufficient, and whether sustainability could “do more” in terms of improving financial performance. Clearly, greater transparency is needed around value levers and best practices to optimize sustainability strategies.

Briefly, for transportation and logistics companies that have developed their own sustainability solutions, there is an opportunity to socialize and align their programs with customers who are seeking improvement options. For transportation, distribution, warehousing, etc. a transportation and logistics provider can help its customers improve sustainability by understanding:

- What is the customer’s current sustainability footprint with regard to T&L activities? What are the critical areas for change or key opportunities?
• What sustainability trends are most relevant to the customer’s T&L activities? What is the level of urgency for developing responses to these trends?
• What is the right set of solutions to maximize both P&L and environmental impact? What are realistic targets in the T&L space, in terms of vision, timing, and type of changes (e.g., new products, joint initiatives)?
• How should implementation of more sustainable T&L practices go forward? What levers can be pulled, such as, for example, business model, process changes, KPI’s, training?

Assessing the impact of relevant trends on an industry or company from the point of view of exposure and time pressure is critical, as this will determine the urgency with which solutions need to be developed. Is regulation imminent—or already here? Are input costs rising, and how quickly? It’s also important to understand how the customer defines sustainability. What are its motivations and what benefits does it seek?

Based on this initial assessment, potential levers or solutions that might increase sustainability can be identified; to be of value, such solutions must take both environmental resource and financial impacts into account (e.g., ground source heat pumps for warehouses reduce both carbon emissions and cost). What resources will be used vis-à-vis the status quo must be carefully determined to understand whether the change will make a measurable difference in terms of costs and benefits (see examples in Exhibit 3).
In addition, the solution must be perceived as sustainable by the customer—and the customer must be able to leverage that perception—through transparent communication about environmental impacts. For example, such communication is used to encourage customers to buy Deutsche Bahn’s new passenger rail “green” BahnCard and Deutsche Post’s/DHL’s new GOGREEN postal and logistics products.

Doing More With Less

In summary, the demand for more sustainable business behavior and products is one of the most powerful trends driving wholesale industry change today. While the urgency to act on sustainability differs by industry—and even by company—it is a topic that all companies will have to address sooner rather than later. Many companies have already implemented sustainability measures and have seen positive economic and environmental impacts as a result. Transportation and logistics companies, many of which are at the leading edge of sustainability development themselves, should have a sector by sector and customer by customer strategy to capitalize on these early successes, as helping customers develop more holistic resource usage programs will have long-term, positive consequences for competitiveness and growth.

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Exhibit 3: Sustainability Solution Examples

<table>
<thead>
<tr>
<th>Strategic goal</th>
<th>Measure</th>
<th>Economic Impact</th>
<th>Environmental Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel cost reduction in the aviation industry</td>
<td>• Reduce fuel cost</td>
<td>• Mix jet fuel with 50% biofuel (while regulation drop-in rates are lower)</td>
<td>• €46 M cost savings p.a.¹</td>
</tr>
<tr>
<td></td>
<td>• Mitigate risk of future fuel price increase</td>
<td>• Develop new biofuels (e.g., through JVs)</td>
<td></td>
</tr>
<tr>
<td>Energy and waste disposal savings via waste to energy technologies for a retail outlet</td>
<td>• Reduce operational and waste disposal cost</td>
<td>• Incinerate organic waste</td>
<td>• €6,260 p.a.² electricity savings</td>
</tr>
<tr>
<td></td>
<td></td>
<td>– A store produces on avg. 300 metric tons of waste p.a.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>– ~550 kWh can be produced per metric ton of waste</td>
<td></td>
</tr>
</tbody>
</table>

Note: ¹. 17.7M tons CO₂ emission, price of CO₂ = 6.14 €/t, 85% CO₂ emission reduction by using biofuels. ². Electricity day base price in Germany: 0.044 €/kWh. Source: The Emirates Group—Environmental Report 2010-2011, ft.com, EEX, Oliver Wyman analysis.
As cities continue to grow, both in terms of population and resource needs, they are running up against what will become one of the increasingly important questions of the 21st century: How to manage that growth sustainably. In this article, we discuss one key challenge of urbanization: how best to handle the increasing flow of physical goods into cities. A new focus on urban freight could be an opportunity both to remake cities—by reducing traffic, pollution, and noise—and to generate growth for industries such as third-party logistics and transportation, automotive OEMs, and information systems providers.

Urban Challenges

There are currently more than 800 cities with greater than one million inhabitants; every three months, another city surpasses five million people. Urbanization is a continuing trend, with 55 percent of the world’s population expected to be living in cities by 2050 (up from 51 percent today). Naturally, as population grows, so does resource demand (Exhibit 1): Cities are more productive than rural areas, and incomes are higher. In some areas, resource availability already falls well short of demand. For example, water demand in Mumbai equates to 135 liters per person per day, while the supply network delivers only around 90 liters (and just 25 liters in some areas).

Urban air pollution is another issue: in China, only one percent of city dwellers breathe air that is “safe” by European standards, while 60 percent of Americans live in urban areas where they are exposed to air pollution capable of causing health problems.

Further adding to this strain will be the need to adapt globally to
the impacts of climate change—many of which will affect cities directly, such as coastal flooding, extreme weather, and water shortages. The likelihood of these impacts increases as it becomes clearer that the world will miss the goal of reducing greenhouse gas emissions by 50 percent versus 1990 levels (450 ppm) in the next 10 years, which would be needed to keep temperature rise within 2°C.

The Impact of Freight

Cities’ need for infrastructure to support the flow of goods and people will increase in line with other resource needs. For example, road capacity demand in cities is projected to increase by a factor of four in the next 40 years. Road capacity already is and will become even more of a bottleneck not only for transport but for economic development as well. In many large cities, road speeds during daytime hours (7a.m. to 7p.m.) already have fallen by 50-65 percent in the past 10 years.

For many city authorities, the situation has become untenable—or will be so in the near future: More road capacity is required, but in most cases, space and funding is unavailable and the cost of maintaining existing infrastructure already too high. Alternative means of transportation, such as metro and bus systems, can help increase the density of passenger transport but cannot be expanded indefinitely. And although cities generally have integrated master plans for passenger transport, they often lack substantial planning for the other major type of traffic impacting infrastructure: freight.

Every business and household in the city receives freight. A mall might receive 50+ trucks a day, a hospital 10-20 trucks per day, a grocery store 5-10 trucks. Each truck may drop off only a pallet or a parcel (the main difference being whether dry van or refrigerated). This is due to the fragmented nature of the industry and the norm of buying from multiple suppliers. Each truck takes up space on the city’s limited infrastructure. On major arteries, trucks may make up 25-30 percent of all traffic during the workday, essentially becoming “moving bottlenecks,” due to their slower acceleration/braking and overall speed than cars. Parking and unloading in the streets also takes up space, as unloading bays are limited and often nonexistent. Conversely,
### Exhibit 2: Example Urban Freight Delivery Challenges

<table>
<thead>
<tr>
<th>Types of Companies</th>
<th>Challenges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturers</td>
<td>• Making deliveries</td>
</tr>
<tr>
<td></td>
<td>• Single set of products to distribute</td>
</tr>
<tr>
<td>Distributors</td>
<td>• Regular replenishment (e.g., biweekly)</td>
</tr>
<tr>
<td></td>
<td>• Additional ad-hoc deliveries</td>
</tr>
<tr>
<td></td>
<td>• Limited product scope</td>
</tr>
<tr>
<td>Third-party logistics providers</td>
<td>• High level of fragmentation</td>
</tr>
<tr>
<td></td>
<td>• Service level requirements lead to frequent and inefficient deliveries</td>
</tr>
</tbody>
</table>

Reducing the impact of trucks at critical times during the day increases capacity by more than just the length of the truck, as traffic also becomes more fluid (where truck lanes are not separated).

**City Logistics: Higher Speeds, Less Pollution**

Of course it isn’t possible—or desirable—to simply remove trucks from the city. But there is an alternative that could make city infrastructure more sustainable: namely, a more focused approach to city freight planning, similar to how cities currently plan and operate their transit systems, which is known as “city logistics.”

In the case of cities with advanced transit systems, passengers are discouraged from driving in with one person per car. Instead, passengers park in lots outside of the city and are consolidated onto trains and buses that run like a “conveyor belt” into the city, or encouraged to carpool to use HOV lanes, increasing the passenger load factor per vehicle.

Similarly, trucks on their own do not start off with 100 percent load factors and then make efficient “milk runs” through the city. Due to a fragmented supplier and receiver landscape (Exhibit 2), varying service level commitments, special needs goods (chilled/frozen), and the mostly unregulated use of roads, trucks generally start with load factors closer to 40 or 50 percent (in some cases, only 25-30 percent).

A city’s infrastructure capacity could be vastly increased simply by consolidating freight traffic outside of the city and ensuring only full trucks move through it. This concept involves:

- Consolidation centers are developed outside of the city, most likely close to major freight arteries.
- Consolidation centers are used primarily for cross-docking, with limited storage capacity (although storage could be an add-on if required, e.g., for quick replenishment solutions and 24-hour spare parts logistics).
- Consolidation centers offer dedicated compartments by type of goods, e.g., food, chilled, frozen, dry van.

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1 The OECD defines city logistics as “an integrated approach for urban goods distribution based on a systems approach. It promotes innovative schemes that reduce the total cost (including economic, social and environmental) of goods movement within cities.”

Initially, consolidation centers offer pure pallet cross-docking; breaking and re-palletting or even cage loading for delivery into the city may be desirable, depending on the specific situation and economics (e.g., trade-off between additional labor cost versus additional delivery cost).

- The concept includes IT capabilities that enable planning for multi-stakeholder, cross-docking (scanning, etc.) and daily route planning.
- Trucks to be used could vary from 1-7.5 tons for delivery in historic and narrow city centers to as much as 30 tons to outside malls, etc.

This concept of course is not new, and it has been tried before, with varying success (or lack thereof). What has changed, however, is the political environment: as cities face increasing pressure to boost infrastructure productivity and reduce environmental traffic impacts, they are showing a new willingness to play an active “market” role.

The Opportunity: B2City and City2B

Oliver Wyman believes that ex-urban freight consolidation is a workable solution to increase city freight efficiency. But this will require new thinking on the part of both cities and potential freight service providers. Providers will need to understand, for example, that cities are administrative units which often do not think in the same P&L and risk terms as businesses. Third-party logistics firms will need to develop products that target cities and incorporate city decision making processes and stakeholder structures. And automotive OEMs will need to build the right trucks: freight consolidation could make e-trucks viable delivery vehicles, since round trip from a consolidation center into the city and back would typically be less than 100 km; battery recharging or changeout could then take place during reloading.

Cities in turn may need to consider new ownership models for assets (land, facilities, trucks), ranging from the logistics provider as sole owner to partial or full city ownership. Similar to transit services, city logistics services would require a planning function to be put in place, both long-term and day-to-day, and backed up with state-of-the-art technology, particularly to manage delivery complexity and to provide sustainable delivery options (e.g., electric one-ton trucks). Finally, a consolidated delivery model would require regulation to enforce load factors, based on time of day, route, etc. and to determine which industries/goods or zones would be required to participate.

To put freight consolidation into action, cities would need to develop close working relationships with a limited number of solutions providers, e.g., third-party logistics firms that are specifically awarded contracts to consolidate freight outside the city and then deliver. Another option might be for consortia (made up of automotive OEMs, logistics providers, and information systems companies) to develop turnkey or “one-stop shopping” options for cities seeking to implement freight consolidation.

As is the case with many other city services, freight consolidation and delivery could be put out for competitive tender, for example, on a 5-10 year contract basis with service-level guarantees, and at least two providers serving each region/zone to enhance competitiveness, city scale permitting.

Companies that start looking at this opportunity now and gaining the relevant
experience will likely create a large “first mover” advantage, with the potential to then add further market share at a relatively low cost. And it is worth the effort: For a start, there are those 800 mega-cities to consider. A number of third-party logistics providers, automotive OEMs, supply chain integrators, and industry-specific solution providers are already gearing up to ensure they are at the front of the pack when the city logistics market opens wide.

What Can City Logistics Deliver?

For cities, a freight consolidation solution could lead to an increase in average speed for all vehicles on major arteries of 30-40 percent, a reduction of 35-45 percent in CO₂ emissions from trucks, plus reductions in other vehicle impacts such as fumes and noise. In many parts of the world, truck consolidation centers could be 75 percent cheaper to build than additional traffic lanes, faster to build, and use less “premium” real estate (Exhibit 3). There would be additional work involved in managing logistics services providers, but cities usually have procurement and contract management processes already in place for other outsourced services that could be adapted.

For solutions providers, city logistics will open up a large new competitive market. Additionally, we believe that electric-truck makers will have an opportunity to realize scale, even for current vehicles that are not suitable for long-haul but that could easily distribute goods within city limits. Furthermore, OEMs could ride down the learning and cost curve, as city delivery is likely to be one of the first applications where total cost of ownership for e-trucks could be less than for conventional trucks (depending on the cost of electricity versus diesel fuel).

Of course, there are potential “cons” that must be considered, such as that consolidation would increase handlings and the complexity of route planning. In addition, small truck providers could lose out as the market would become professionalized and less truck capacity would be required overall. But critical needs to substantially reduce freight traffic into urban centers and reduce the burden on infrastructure are likely to outweigh these challenges.

Exhibit 3: Example Cost of Freight Consolidation Centers Versus Roads

<table>
<thead>
<tr>
<th>Option 1</th>
<th>Option 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Add a 20km inbound lane to an existing road</strong></td>
<td><strong>Build a cross-dock facility outside of the city and consolidate deliveries</strong></td>
</tr>
<tr>
<td><strong>Initial investment</strong></td>
<td><strong>$5 M</strong></td>
</tr>
<tr>
<td><strong>Km/h impact</strong></td>
<td><strong>+8</strong></td>
</tr>
<tr>
<td><strong>Investment to increase speed by 1 km/h</strong></td>
<td><strong>$2.5 M</strong></td>
</tr>
</tbody>
</table>

Source: Oliver Wyman analysis.
In terms of who foots the bill for such a transformative process, several options are possible, including sharing costs among the city and shippers/long-haul providers, all of whom would realize economic benefits (e.g., avoided assets/resources for shippers, avoided infrastructure costs for the city). Depending on the cost of labor, capital costs, and land costs, even the additional expense of one or more consolidation centers (and associated handlings) could yield a positive business case in many countries.

In summary, leveraging existing (or soon to come) technologies and value chain collaboration to increase resource productivity will be a critical component of cities’ future prosperity. This will require a new level of cooperation between cities and corporations; while cities can take a lead role on some fronts (e.g., regulation and management), they will need to look to the business world as technological innovators and solutions providers. City logistics planning is a great example of the potential markets and opportunities that may underlie an enhanced focus on sustainability, and could be one of the first areas to offer a test for developing city-corporate cooperation and a positive business case.

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