

Travel, Logistics & Infrastructure

Finding the right (of) way to efficient road operation and maintenance

Comparing operation and maintenance performance of different roads is complex, but it can help improve efficiency for roadway owners and operators and unlock much-needed capital.

by Diego Hernandez Diaz, Gabriel Valtueña-Ramos, and Frank von Willert



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To fix roads, fix the fixing

Roadway owners and operators today are under pressure from multiple trends. To keep pace with projected growth in passenger and freight road transport, governments around the world will need to invest \$900 billion per year once traffic returns to prepandemic levels. However, that investment falls short of \$180 billion per year.¹ Failure to address expanding capacity will exacerbate road congestion and will deteriorate road conditions—a factor in nearly a third of road fatalities.

To unlock value, a good place to start is by revising the operation and maintenance (O&M) practices on existing roads. O&M accounts for approximately 25 to 35 percent of the total \$900 billion spent on roads globally.² Making O&M activities more efficient will provide financial breathing room to road owners and operators and

allow them to make investments in much-needed upgrades, expansions, and technology.

Most road operators use past maintenance budgets and historical data to plan for O&M spending. However, such methods do not provide operators with insight into how their current maintenance spending compares with its potential—nor into what others in the industry are doing differently.

We have experience in helping roadway owners and operators to understand better their road O&M activities by employing a tried-and-tested benchmarking methodology to measure how efficient they are. This approach allows us to make different road types comparable, and we conclude that technical complexity does not necessarily mean higher costs (see sidebar, “Making road operation and maintenance comparable”).

¹ For more, see “Bridging global infrastructure gaps,” McKinsey Global Institute, June 2016, McKinsey.com.

² International Transport Forum, Organisation for Economic Co-operation and Development, itf-oecd.org.

Making road operation and maintenance comparable

Laying the groundwork to make meaningful comparisons across road assets is challenging. But there is an upside to tackling the challenge: making like-for-like comparisons helps asset owners and their operators understand how their portfolio is performing against those of global peers. Comparing their portfolio to the right roads can give a more rigorous assessment of what the operation and maintenance (O&M) costs could or should be and can lead to a frank discussion about operational efficiencies and what it takes to achieve them.

In our approach, we accounted for nearly 200 variables that we categorized into the three following types. Such variables can change even along the length of one road, highlighting the challenge in normalizing them to compare cost levels across

different road assets.

- **Technical asset characteristics.** O&M requirements on a stretch of road may be affected by the number and types of structures on the road, such as viaducts, bridges, tunnels, overpasses, and underpasses. The number of lanes, traffic volumes, and even type of traffic (for example, trucks versus light vehicles) will also affect the level of maintenance a certain stretch of road will need.
- **Regional.** Macroeconomic differences across markets—such as currency, wages, productivity, and material costs—are just a few of the variables that must be normalized to make meaningful comparisons. In some geographies, maintenance is carried

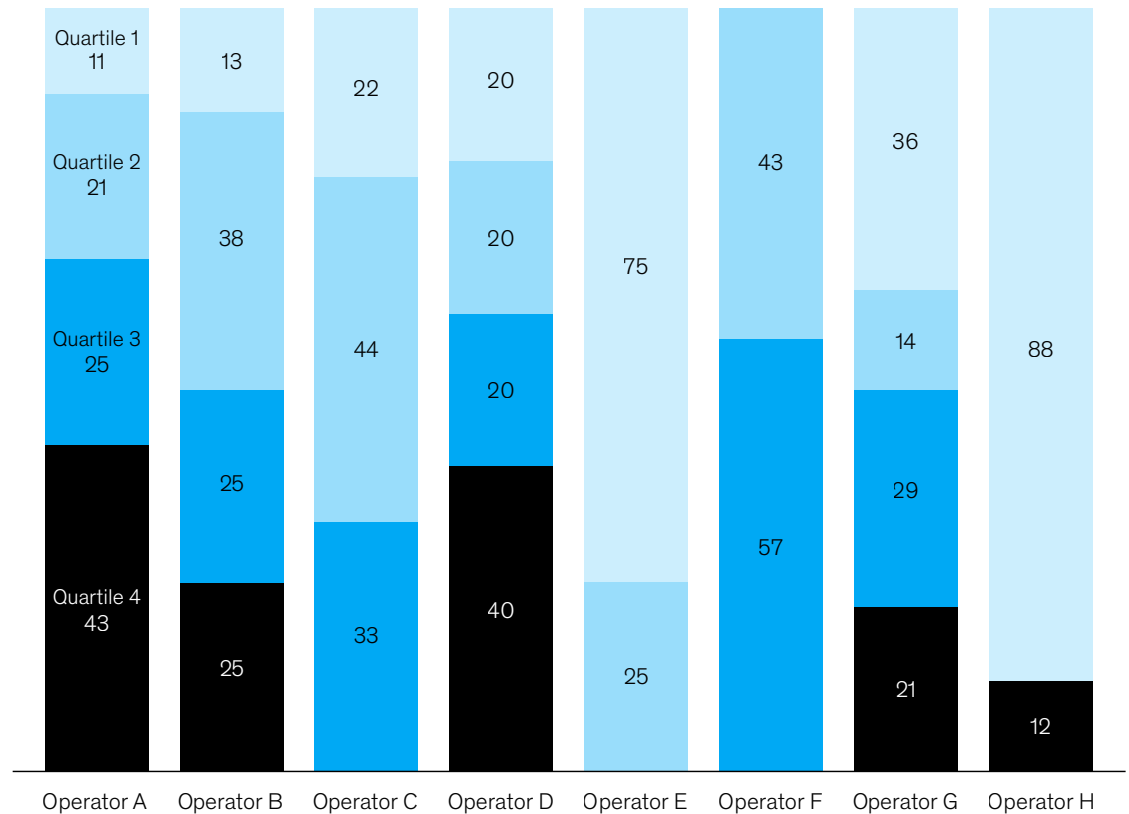
out by small but specialized teams with a high utilization of equipment. In other geographies, larger, semiskilled teams may be deployed. Additionally, weather has a great impact on long-term road conditions. For example, roads in the Nordics and in Brazil have different wear-and-tear and maintenance patterns.

- **Contractual.** Road-operations contracts differ by market, owner, and even asset. Some contracts may include more complex key performance indicators to monitor, such as congestion and vegetation management, availability of lanes throughout the year, or response time to traffic incidents. To make meaningful comparisons, such contractual variation needs to be considered.

Exhibit 1

Even for the same road operator, cost performance varies across quartiles for different assets.

Distribution of road operator's assets among quartiles



Note: Figures may not sum to 100%, because of rounding.

Our emerging insights on opportunities

Our benchmarking efforts to date cover more than 33,000 kilometers of road across 20 countries in Africa, the Americas, Asia, and Europe. Several types of highways, toll roads (for example, free-flow or shadow toll roads), availability payment-funded roads, and ownership models—including publicly owned and private-operator concessions—have been benchmarked and analyzed.

Though this is a sample of the entirety of the vast global road network, it is sufficiently representative to lead to the following insights:

- *There are no singularly good or bad road operators—merely pockets of outperformance or opportunity.* Even companies with an overall good track record in road O&M have variable performance across their assets (Exhibit 1). Therefore, before considering cutting-edge practices to push maintenance efficiency holistically, companies could benefit more immediately by looking within their portfolios and addressing assets that perform in the lower quartiles, fostering the cross-pollination of ideas and best practices.

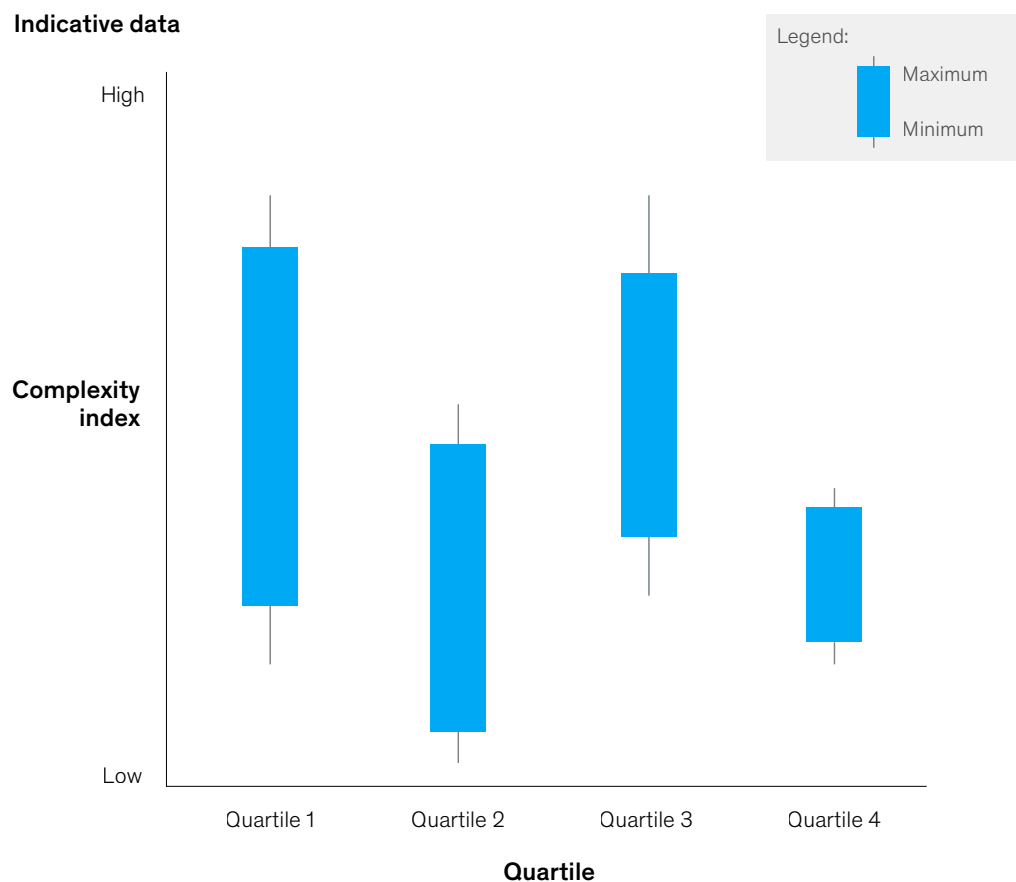
- *Higher technical complexity does not automatically mean worse cost performance.* Contrary to popular belief, when appropriately normalized for technical asset characteristics, road assets with a high number of road infrastructures, such as long tunnels or viaducts, do not always exhibit a poorer cost performance. Assets with a high complexity index in our benchmark often exhibited better overall cost performance than simpler assets. Because performance and complexity are not inherently

linked, operators can deviate from the typical mindset—“We operate a more complex network than others”—and are free to investigate potential gaps in the organization (Exhibit 2).

- *Almost 40 percent of all identified opportunities came from direct costs within operating expenditures.* Benchmarking focused at the level of different cost drivers helps identify the largest improvement opportunities at an operational level (Exhibit 3). Given that the

Exhibit 2

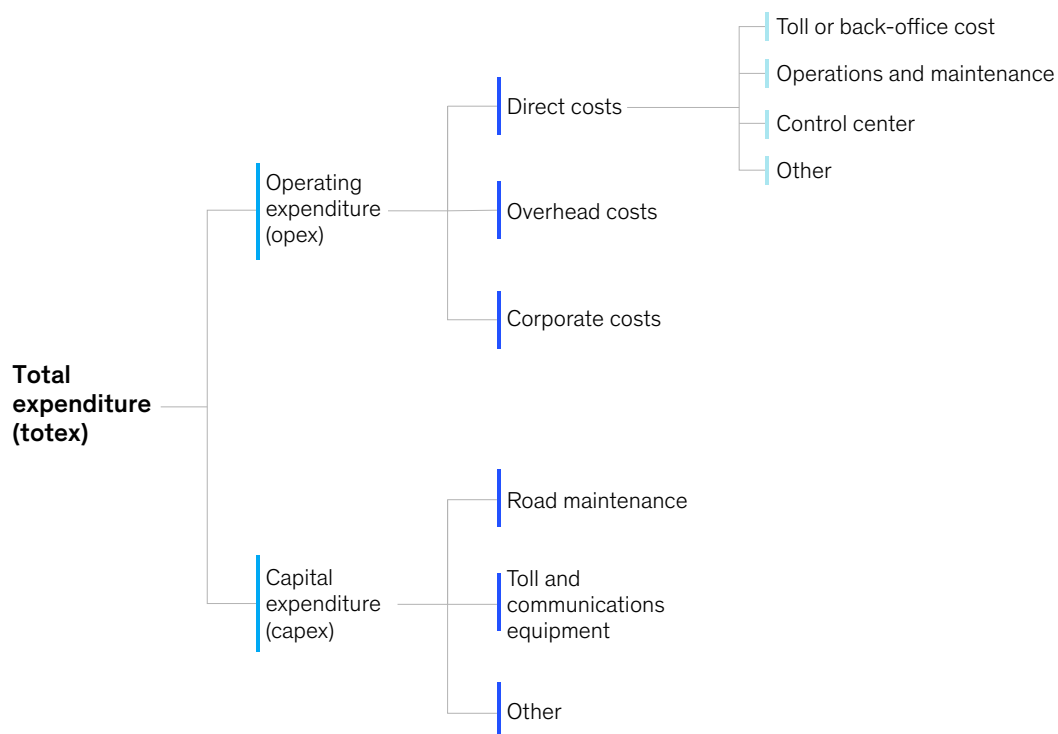
Road-asset complexity and cost performance do not always go hand in hand.



Note: 91 assets were analyzed.

Exhibit 3

Direct costs within operating expenditures make up 40 percent of all identified improvement potential.



road industry is one usually associated with chunky capital expenditure to propel key strategic projects, the ability to find budgetary opportunities in a recurring element of the expense is significant. We found that almost 40 percent of all identified opportunities came from direct costs within operating expenditures—driven by management capabilities, processes within the organization, and the asset-management tools of road operators.³

- *Data are key to improving performance.*
Most participants realized the power of advanced

analytics and identified the opportunity to capitalize on precise data to improve their operations. The benchmarking effort prompted companies to rethink their data-collection processes and start their digital journeys by employing advanced analytics. We observed different levels of performance across companies regarding specificity of data, centralization, and operational key performance indicators (KPIs) used in day-to-day operations (Exhibit 4).

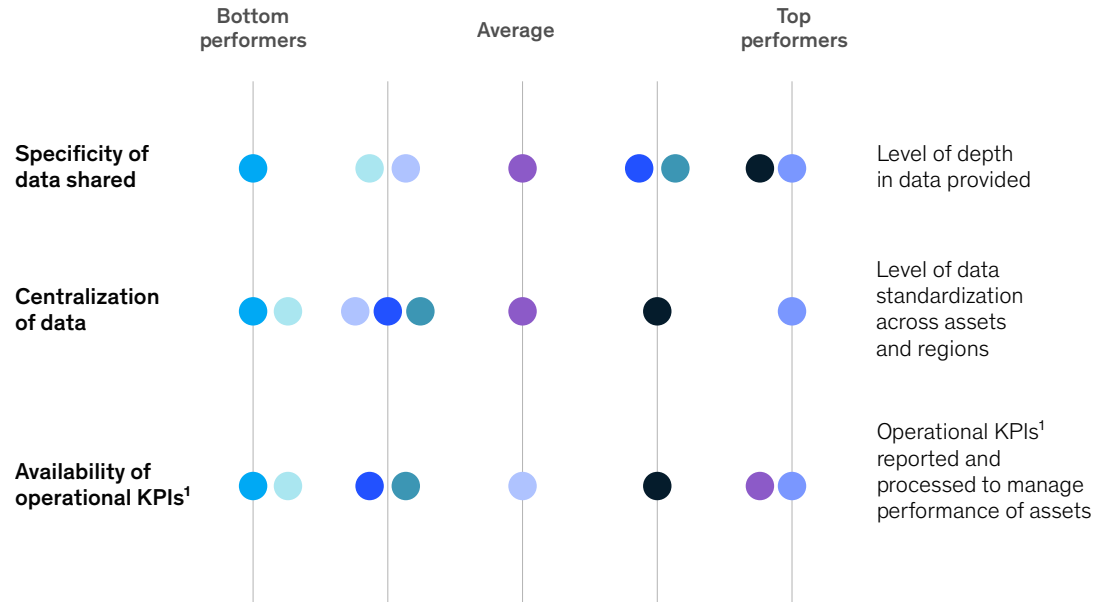
³"Direct costs" are equal to the sum of tolls, O&M, control centers, and other costs.

Exhibit 4

Data management to improve operational performance varies across organizations.

Indicative data

● Operator



¹Key performance indicators.

The (data) brick road to efficiency

Our benchmarking indicates that direct costs related to O&M, back office, and control centers represent the most significant opportunity for cost improvement available to roadway owners and operators. Changing how asset management is run is therefore critical in capturing this opportunity.

To evaluate asset-management maturity, we analyze performance along five dimensions that build on one another (Exhibit 5).

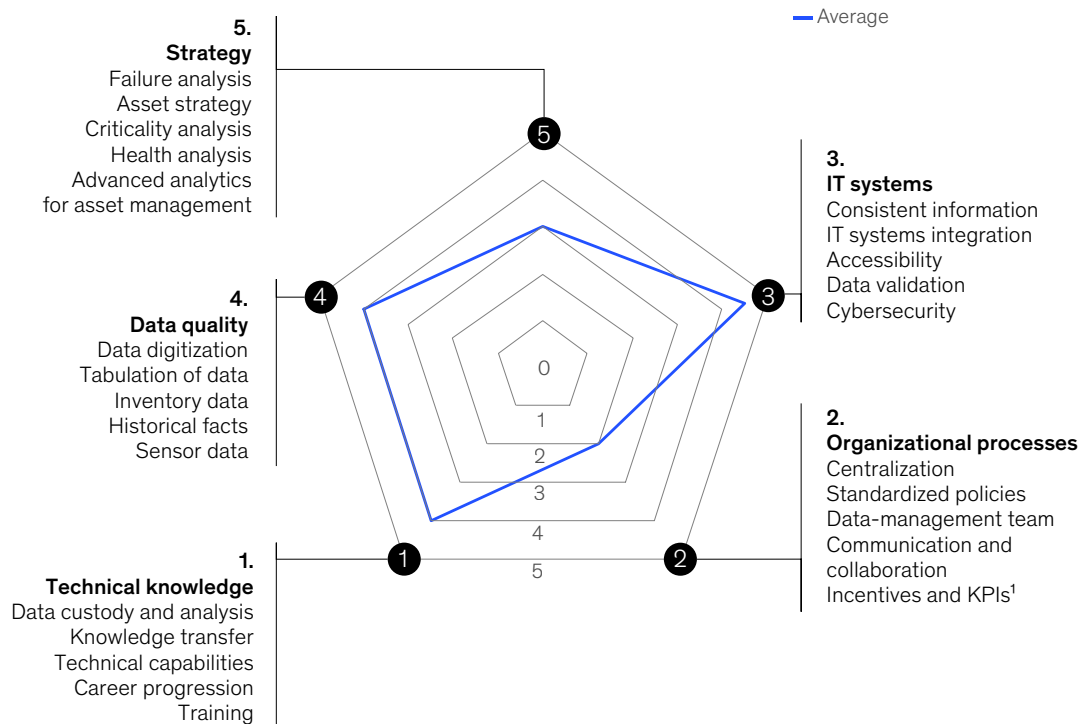
- **Strategy.** Companies with mature IT systems and high data quality are able to run in-depth failure analysis on main assets and subcomponents. Transparency on asset performance and relative

accuracy of failure-forecast models allow strategic maintenance choices on different assets—some could be made to run until failure, some maintained on condition, and others based on a calendar or predictive-forecast model.

- **Data quality.** Technical knowledge, IT systems, and organization processes affect data quality at the company. More sophisticated companies have a greater share of digital (versus paper) reporting, complete inventory data, related organization data, sensor registrations, and updated measurements for more than five years—all collected in a consistent structure.

Exhibit 5

Five related dimensions can be analyzed to evaluate asset-management maturity.



Note: Asset-management maturity level (0 = none, 5 = high)

¹Key performance indicators.

Source: McKinsey global roads benchmark

- **Technical knowledge.** Best-in-class operators have a specific team with the required span of control and technical knowledge to make decisions on availability and use of data on different platforms.
- **Organizational processes.** The penetration and level of standardization in data collection across the organization are also driven by organizational processes. Frequent and fluid communication among IT, operations, and analytics departments allows quick and clear deployment of use cases; implementation of initiatives to address identified value opportunities; and adaptation of KPIs, cost, or reliability targets.
- **IT systems.** In mature organizations, assets have a unique, consistent identifier across all platforms and registration systems—or systems to reconcile different identifiers. IT systems are fully integrated, and all relevant systems have access to interrelated, available information. This information is often hosted on a central platform-as-a-service-style tool that the operator can access at any time. Systems have built-in data-validation tools that check the viability of the input data. Additionally, given the sensitivity of highways as an infrastructure asset, the organization employs relatively advanced cybersecurity practices.

Our initial benchmarking results show that the single largest cost opportunity in road maintenance lies in the management of the processes. More efficient management of O&M can increase flexibility in capital allocation for road operators, channeling funds into improving road conditions and improving the experience for most travelers. We hope to see more road operators take this data- and transparency-driven approach.

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