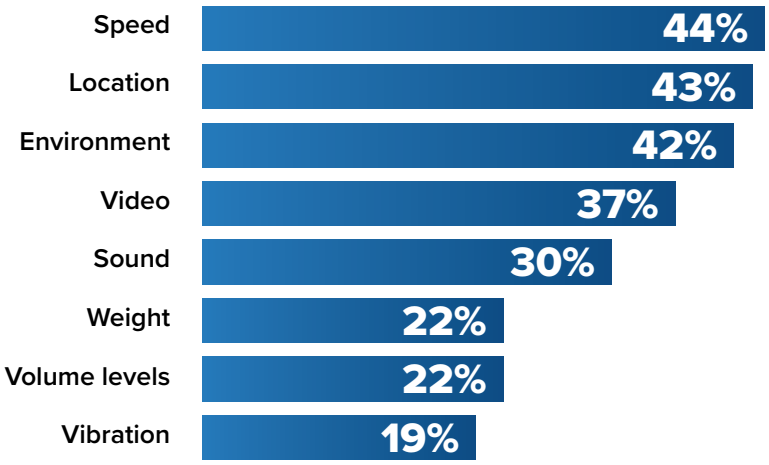
Leveraging Artificial Intelligence to Efficiently Manage and Monitor Bridges, Tunnels, and Key Infrastructure

Bridges and tunnels are foundational for economic prosperity, providing individuals and families with access to jobs, urban areas and communities, along with educational and healthcare services. Due to its critical role, government agencies need to better monitor and manage infrastructure as it ages. To help them become more efficient in monitoring and maintaining critical systems, agencies are turning to artificial intelligence (AI) and the Internet of Things (IoT).

Collection of Key IoT Data Enables Efficient Management and Safety of Bridges and Tunnels

Types of data agencies are collecting/planning to collect



Source: Global IoT Decision Maker Survey 2019, IDC, June 2019, N=657 government respondents

Data Insights Are Critical for Managing Bridges and Tunnels Safely and Efficiently

Maintaining bridges, tunnels, and other critical infrastructure is a global challenge for government agencies. Consider that over the service life of a bridge, its constituent materials continually deteriorate due to mechanical loads, traffic volumes, and chemical and environmental stressors. In the U.S., growing traffic and increases in legal truck weights may create structural stresses in excess of those considered during the original design of the bridge. Agencies also struggle with the difficulty of physical inspections, the high cost of continued maintenance, restoring aging facilities to required capacity, and ensuring that bridges remain open without restrictions to legal loads.

By implementing predictive and prescriptive maintenance strategies coupled with visual recognition tools, organizations can model, map, and monitor each structure.

Message from the Sponsor

Reinventing how the world's infrastructure is managed, monitored, and maintained will both reduce risk and drive economic reward. It requires a more modern approach to managing assets, activities, and investments, empowered by AI and the IoT to monitor, analyze and predict issues. IBM Maximo for Civil Infrastructure is built on a powerful suite of tools that industry leaders around the world rely on to deliver needed societal, environmental, and economic benefits for years to come.

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Technology can enable efficient critical infrastructure management through digitizing data and by deploying the IoT to obtain rich data about structures, motors, switches, mechanical operations, and the environment. Many agencies are collecting key data on vehicle weight, traffic volume, structural vibration, environmental impact, and other factors via IoT sensors placed on critical infrastructures. Applying insights from AI and IoT data, governments can drive operational efficiencies, reduce maintenance costs, and ensure the structural safety of bridges and tunnels.

The Criticality of Inspections and the Importance of Resiliency

According to the *American Road & Transportation Builders Association 2019 Bridge Report*, there are 47,052 bridges considered "structurally deficient" in the United States. For workers, inspection of bridges to determine structural integrity can involve dodging vehicles during lane closures, being suspended from significant heights, navigating potentially unstable structures, and working in and around water. Physical inspections are always difficult, and this challenge is exacerbated by the global pandemic. On-site inspection is beginning to shift to virtual visual inspection. According to IDC's *COVID-19 Impact on IT Spending Survey* (conducted August 26-September 6), 28% of government agencies surveyed indicated that due to COVID-19, they will replace on-site inspection of infrastructure with virtual visual image inspection applications during 2020 and 2021. By collecting IoT data generated from sensors placed on structures, combining it with pictures and measurements from drones and cameras, and then having inspectors and engineers analyze this data, organizations can identify and more efficiently plan for needed maintenance. In addition to collecting pictures, measurements, samples, or video for analysis, virtual visual inspection can improve working conditions for bridge inspectors by minimizing the need to access dangerous or out-of-reach areas.

The Benefit of AI for Prescriptive Analytics

Over half of agencies surveyed are deploying or planning to deploy critical infrastructure management for bridges, tunnels, dams, and other critical structures. Only one third are using prescriptive analytics that provide recommendations to improve an outcome. Using AI for prescriptive analytics can help prolong the lifespan of aging bridges, tunnels, highways, and railways by adding and analyzing weather data, measuring the impact of damage such as cracks, rust, and corrosion, as well as the effects of displacement vibrations and stress. By implementing predictive and prescriptive maintenance strategies coupled with visual recognition tools, organizations can model, map, and monitor each structure. This data-driven strategic approach enables a rapid assessment to prioritize maintenance decisions for critical repairs, reduces downtime, improves planning while keeping service ability high, and addresses compliance issues to meet regulatory obligations.