White Paper

Intelligent, Integrated Transport Systems for the Future

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IDC OPINION

The confluence of urbanization and technological advances strongly merits a review of how transport systems are structured and managed, especially existing systems that are discretely managed and fragmented in nature, across both the public and private sectors. New and emerging technology offers considerable scope to transform such systems and make them more efficient for users and operators.

The objectives of intelligent, integrated transport systems include:

- Traffic decongestion
- Increased acceptance and use of mass transport modalities
- Cost savings (including sharing costs)
- Increased efficiency in revenue collection, law enforcement, and travel scheduling
- Environmental and pollution management
- Enhanced access for social welfare recipients (greater equity)
- Making such systems a pillar of Smart City strategies

IDC believes the transformation of the transport sector must involve all players — but the public sector should take the lead in providing a road map. It should formulate a framework that enables private sector players and citizens to align and evolve the sector, surmount challenges, and deliver sustainable transport systems.

A consultative process involving all stakeholders is key to attaining intelligent, integrated transport systems — but, again, the public sector must play the central role in coordinating players. It should provide an enabling policy/regulatory framework to address issues around data protection, security, digital identities, and secure payment systems.

Intelligent, integrated transport systems invariably complement existing or planned Smart City strategies that seek to resolve issues around traffic congestion, environmental protection, quality of life, public safety, urban planning, and social equity.

Key tools that enhance existing systems and help evolve transport management include cloud computing, the Internet of Things (IoT), Big Data analytics, artificial intelligence (AI), mobility, and digital identities. These can augment and help integrate existing applications.

IN THIS WHITE PAPER

This IDC White Paper examines public and private transport systems. It highlights areas in which technological interventions can help deliver benefits like increased usage of public transport, regulatory compliance and enforcement, revenue collection, efficiency, convenience, and reliability. The document identifies challenges that must be addressed in a multi-stakeholder approach to transformation and further proposes actions that stakeholders should consider.

SITUATION OVERVIEW

National transport systems are undergoing rapid transformation as they come under increasing pressure from urbanization, infrastructure development, safety and security considerations, and rising traffic congestion (and the resultant pollution).

Across the wide range of transport modalities — in both the public and private sectors — operations are, for the most part, fragmented. There is little or no integration or exchanges of information to provide transparency and visibility. Users have multiple points of contact with providers, rather than a seamless experience across all.

The transport ecosystem of public and private providers, private motorists, security agencies, policymakers, payment platform providers, infrastructure providers, investors, urban planners, and regulators currently lacks a unified program to exchange information and standardize data. Such a program would enhance systems, reduce costs, and deliver numerous other benefits. Current ICT implementations address some of these elements but in isolation (e.g., number plate recognition, parking, fines, toll systems, licensing, registration, payments, scheduling of mass transit, incident reporting).

Benefits cannot accrue without new assessments of transport in urban areas. Multi-stakeholder collaboration and data standardization would enhance the safety, security, compliance and enforcement, efficiency, and reliability of transport systems.

FIGURE 1

Transport System Key Elements
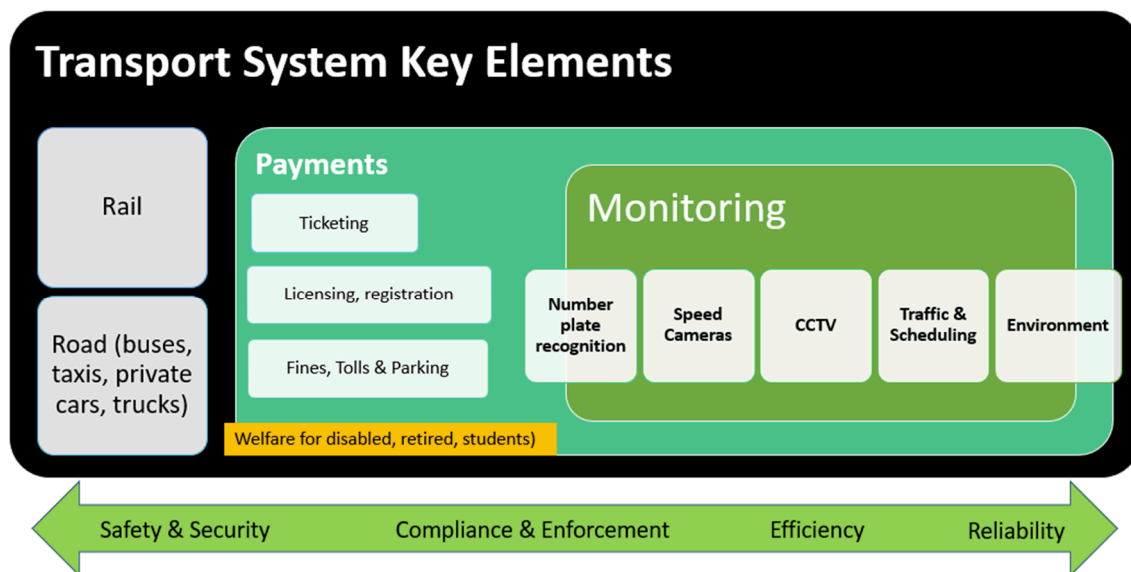
Source: IDC, 2021

At the periphery are issues around pollution and environmental monitoring. These issues can be managed via sustainable interventions that address aspects like route planning, mass transit, and congestion.

Cost and time savings and improved efficiency and reliability will lead to greater user acceptance of mass transit options. Increased usage of mass public transport helps reduce pollution and traffic congestion and can also foster societal equity. Cost savings can be channeled to subsidies for marginalized and vulnerable groups (e.g., pensioners, people with disabilities, students). Such welfare systems can be underpinned by digital identity controls that enable the disbursement of benefits via integrated payment systems.

A framework that enables cross-industry collaboration — including between operators of different types of transport, cutting across the public and private sectors — does not now exist. Regulations and laws governing such a framework would need amendments to address issues around information sharing, data protection, privacy, and security.

FUTURE OUTLOOK

Intelligent, integrated transport systems envisage ecosystem players sharing a technology platform. This platform would enable them to exchange information, automate processes, and leverage data, analytics (for different data points in the ecosystem), and artificial intelligence in areas like route planning, trip scheduling, fares, booking, ticketing, and provider mapping.

When linked to traffic management systems, these tools make transport planning more efficient for both users and providers. They enable commuters to avoid congestion by using multiple mass transit modalities. When a single view of a trip is possible, integration may even extend to air

travel. Big Data analytics can be deployed to assist in environmental monitoring, traffic management, public safety and health, security, urban planning, infrastructure, and development.
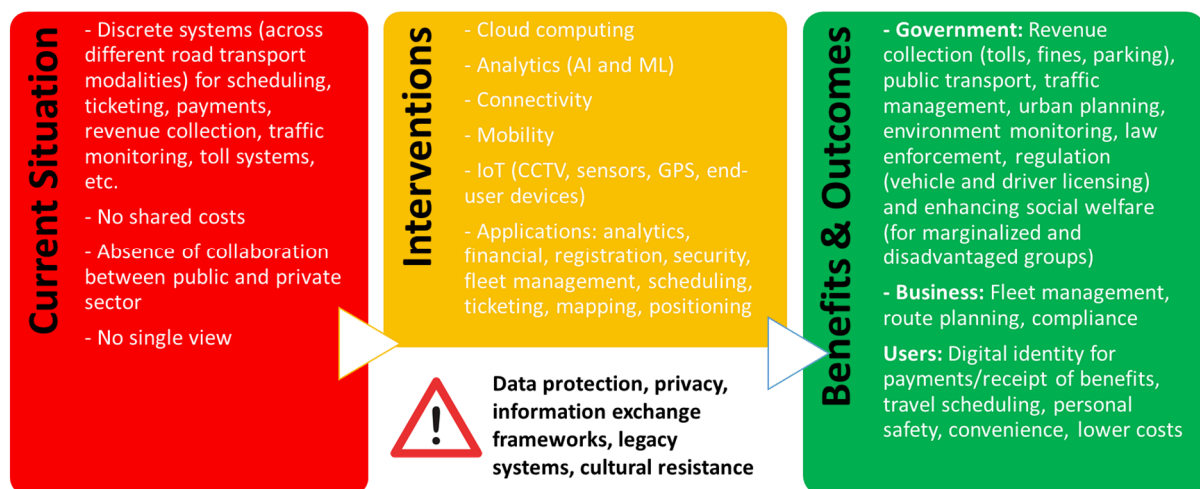
ICT deployments should ensure the inclusion of citizens of all classes in sustainable transport systems. Deployments should aim to build trust by helping assure both personal safety and the security of information shared digitally (i.e., personal details, payments, and locations).

Core technologies that can consolidate and augment existing standalone systems include cloud applications (for providers), mobile applications (for commuters), next-generation connectivity (4G and 5G), data analytics, IoT (for navigation and positioning systems), mapping, and alert systems (road closures, weather, accidents). Such technologies can also aid environmental monitoring, number plate recognition, integrated payment platforms, security (data protection, privacy, identity management), licensing, and regulation.

Public sector stakeholders (ministries, regulators, and local authorities) must be at the center of integrated and intelligent transport system projects. They are pivotal in coordinating the players and defining roles and standards. They will develop the road maps for collaboration, laws and regulations, and infrastructure. Private sector players, whose organizations and customers will benefit from these initiatives in many ways, can be expected to lend their support.

FIGURE 2

Evolving Integrated Transport Systems

Current Situation
- Discrete systems (across different road transport modalities) for scheduling, ticketing, payments, revenue collection, traffic monitoring, toll systems, etc.
- No shared costs
- Absence of collaboration between public and private sector
- No single view

Interventions
- Cloud computing
- Analytics (AI and ML)
- Connectivity
- Mobility
- IoT (CCTV, sensors, GPS, end-user devices)
- Applications: analytics, financial, registration, security, fleet management, scheduling, ticketing, mapping, positioning

Data protection, privacy, information exchange frameworks, legacy systems, cultural resistance

Benefits & Outcomes
- **Government:** Revenue collection (tolls, fines, parking), public transport, traffic management, urban planning, environment monitoring, law enforcement, regulation (vehicle and driver licensing) and enhancing social welfare (for marginalized and disadvantaged groups)
- **Business:** Fleet management, route planning, compliance
- **Users:** Digital identity for payments/receipt of benefits, travel scheduling, personal safety, convenience, lower costs

Source: IDC, 2021

Intelligent, integrated transport systems provide a broad range of benefits for governments/public sector providers. Revenue collection, traffic management, environmental monitoring, urban planning, and enhanced regulation and enforcement are among the public sector dividends. Businesses will benefit from more automated processes, shared costs on platforms and systems, streamlined processes, and compliance. New payment modes, better travel and trip scheduling, and lower costs are among the benefits to be obtained by commuters and motorists.

Gamification should also be considered for intelligent, integrated transport systems (i.e., the use of reward systems to encourage the use of non-motorized and/or mass transit).

CONCLUSION

- The realization of an intelligent, integrated transport system must be an inclusive process involving all stakeholders — but primarily led by local and national governments. Government roles may range from providing the framework (i.e., policy, regulations, standards, enforcement, monitoring) to providing the transport services. The government would attend to aspects like affordability and quality. It would guarantee that transport services can be accessed by the elderly, disabled, and students.

- The public sector's involvement would include departments relating to security, the environment, ICT, and social welfare.

- An intelligent, integrated system will involve private sector transport providers (e.g., bus and taxi companies), citizens who drive private vehicles, and businesses that use commercial vehicles. The system must address compliance and core issues like traffic decongestion, transparency in revenue collection, registration, and licensing services.

- Local authorities with Smart City ambitions are crucial players, as their priorities include addressing congestion, air quality, waste management, and other aspects of Smart Cities, such as CCTV for public safety, speed cameras, and air sensors for pollution.

- To address the challenges and deliver the benefits outlined in this document, stakeholders must find partners to help build and implement intelligent, integrated transport systems. Partners will need to know how the discrete parts of transport systems work, operationally and technologically — in order to understand how these parts best work together.

- Core tools that enable intelligent, integrated transport systems (and that can be integrated with fleet management, ticketing, and scheduling systems) include cloud computing, IoT, analytics, AI, Big Data, mobility, and digital identities. Financial applications can enable ticketing, parking, fines, and tolls on a payments processing clearing platform shared by stakeholders.

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