Reimagining Transportation the IoT Way

Abstract

In an increasingly competitive business environment and with sharply rising demands for passenger and cargo mobility, the global transportation industry is going through a challenging time. Industry players need to look for innovative ways to improve operational efficiencies, contain costs, and retain market share, while nurturing customer delight.

The Internet of Things (IoT) holds great promise in the transportation industry, and can help pave the way for a 'smart' future. While connected ecosystems will help counter industry challenges, stakeholder expectation management will be the key to ensuring success in the longer term.

Globally, transportation systems are reeling under the sharp growth in the number of vehicles, estimated to rise from 1.1 billion in 2011 to 2.5 billion by 2050.[1] The economic cost of the resultant congestion is enormous—the United States Department of Transportation estimates it to be around US $200 billion per year, for all modes of transport considered together.[2]

Bottlenecks in the Transportation Industry

Apart from congestion issues, the transportation and logistics value chain is paved with bottlenecks.

- Customer expectations are constantly on the rise, and the need for future-proof integrated offerings is imminent

- Workforce optimization and in-transit visibility is critical

- There is increasing pressure to improve throughput and margins while reducing costs

- Regulatory obligations are expanding, and the share of regulatory fees and tolls in total transport costs will likely go up from approximately 10% to 15–25%[4]

- Changes in industry regulations will force ports, aviation, railway, and truck manufacturers to ensure environmental sustainability

- There is a pressing demand to focus on health and safety in operations

The need of the hour is a transformational solution, one that infuses knowledge and intelligence across the entire transportation ecosystem. The IoT makes such a solution possible. Characterized by connected platforms, pervasive computing devices, advanced mobile networks, improved security, privacy protection technologies, sophisticated data algorithms, and simulation and visualization tools, an IoT-driven ecosystem is the answer to our transportation woes.

The Smart Transport Promise

Smart transport has the capability to address all the challenges faced by transportation and logistics players. It is not a simple point solution, but an amalgamation of digital technologies spanning a variety of domains, from transportation and logistics to telecommunication, from automation to machine-to-machine (M2M) interactions, and from Big Data analytics to Artificial Intelligence.

Smart transport aims to connect and integrate transport and other infrastructure into an interactive system of physical things and services. Ultimately, these digital technologies can be used to solve the demographic, social, economic, and environmental challenges related to transport infrastructure in developed and developing regions.

Identifying Key Stakeholders for Collaborative Operations

The key stakeholders in the transportation ecosystem include:

- Business-to-business (B2B) customers

- Third party logistics (3PL) or logistics service providers (LSPs)

- Warehouse and terminal operators of equipment

- Manufacturers or shippers

While transportation and logistics rely on a network of interdependent participants, most of them operate in silos today. The absence of integration implies the lack of end-to-end visibility in operations.

Smart transport can address these issues, provided the entire ecosystem shares information, works collaboratively, and implements advanced technology solutions. All members of the ecosystem—customers, providers, operators, and shippers—should be able to access relevant data in real time, and use digital technologies such as mobility, analytics, and augmented reality, to convert data into actionable information, insights, and finally, wisdom.

The Building Blocks of a Smart Transport Solution

The key building blocks of a smart transport solution have to be mapped to the needs of various stakeholders. These building blocks can be interconnected through the IoT to improve the overall experience.

- **Smart vehicles**
  Smart vehicles arguably form the epicenter of an IoT setup in logistics and transportation, with trucks, planes, locomotives, and ships bristling with embedded sensors and processors. This is where most of the conditioning and monitoring take place.

- **Smart assets and terminals**
  A tremendous amount of intelligence and sensing capability can be embedded in assets and structures of the terminals including:

  - Mobile assets such as forklifts, yard tractors, container handlers, mobile cranes, and other equipment.

- Stationary or semi-stationary assets including gantry cranes, conveyor belts, carousels, automated storage, and retrieval systems.

- Terminal structures and ingress or egress points like dock doors, yard entry or exit gates, light poles, floors, pavements, ceilings, and other structures.

- **Smart workforce**
  The use of smart apps and mobile devices like tablets can help truck drivers avoid traffic jams, stress, and delays. In the smart transport paradigm, such application programs will, for instance, allow drivers to pass terminal gates faster because customs and freight document numbers can be transmitted straight to the tablet in their cab.

- **Smart planning**
  With the IoT, it will be possible to gain actionable insights and use predictive analytics for designing smart transportation business models based on historic data. Smart planning can include capacity sensing, planning and reporting, routing optimization, remote asset management, energy-efficiency management, and proactive fault detection and resolution. It can establish a mechanism of continuous improvement by feeding captured information to the feedback loop, thereby finding newer ways to generate value in the process.

- **Smart compliance**
  Transportation and logistics companies have to comply with a number of regulatory mandates, which currently involve significant manual effort. A lot of this can be automated in the smart transport scenario.

How a Smart Transport Solution Will Help

Smart transport promises several direct benefits to both providers and customers, including saving time, and enhanced security, traceability, and protection of cargo. It also has the potential to make a profound impact on the issues faced by transportation networks—congestion, environmental pollution, and accidents. With sensors transmitting data in real time, operations will become safer and more transparent once smart transport becomes a reality. Companies will gain greater visibility on supply chain operations, with updates on the location and movement of physical assets. Driven by real-time data insights, they will be able to reduce their carbon footprint and optimize fuel consumption. By digitizing shipping

For Driver Vehicle Inspection Reports (DVIRs), LSPs can replace the traditional paper-and-pen approach with an IoT solution that combines sensors for real-time data gathering, a mobile app, and predictive analytics to make DVIR inspections smarter and more efficient.

According to the International Transport Forum, passenger mobility will increase by a staggering 200–300% and freight activity by 150–250% by 2050.[5]

documentation and establishing a system for advance intimation of shipment delays and re-routing options, congestion can be significantly reduced. Overall, organizations will be able to drive cost-effective operations and enhance performance efficiency.

Conclusion

With conventional transportation systems struggling to meet current loads, there is a clear need for a reimagined, transformational alternative—a smarter transport solution. This essentially means more intelligent and integrated systems for moving passengers and freight, driven by the IoT.

As the IoT connects different assets and equipment along the transportation supply chain in a meaningful way, it will generate huge amounts of real-time data that can be analyzed to derive useful insights. These will help providers drive operational efficiencies and deploy future-ready infrastructure, while creating customized, dynamic, and automated services for end users.

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