Intelligent Transportation Systems

Developments in Mobility

Prepared by

THE SHPIGLER GROUP

STRATEGY MANAGEMENT CONSULTING SERVICES

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- Water
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Executive Summary

By any measure, the size and scope of the United States' transportation is immense. Annual road activity is estimated at 4.3 trillion passenger-miles, with passenger vehicles and motorcycles responsible for 86.4%, buses responsible for 7.3%, and trucks making up the remaining 6.3%.[1]

At the same time, the continuing growth of the demands within the U.S. transportation sector have demonstrated costs and stresses:

- Safety[2]
    - Over 37,000 people die each year in road crashes
    - An additional 2.35 million are injured or disabled
    - Road crashes cost the nation $230.6 billion per year, or an average of $820 per person
- Mobility[3]
    - In 2017, the cost of road congestion was $305 billion
    - Road congestion in some of the United States' largest cities – Los Angeles, New York, San Francisco, Atlanta, Miami, Washington, D.C., and Boston – comes to over $2,000 per driver
- Environment[4]
    - Traffic congestion results in 3.9 billion gallons of wasted fuel
    - According to the Texas Transportation Institute, this amount is equivalent to 130 days of flow in the Alaska Pipeline

With the situation getting progressively worse as time goes on, the nation as a whole as well as individual cities have gotten serious about the idea of pursuing concepts in Intelligent Transportation Systems (ITS) – ways to leverage technology to improve urban mobility. Today, deployments of ITS systems are becoming a larger part of smart city strategies for an increasing number of municipalities.

ITS is a broad term, incorporating a number of disparate systems that offer the promise of relief to a growing trend of traffic congestion. Some of the leading applications of ITS being pursued by the U.S. Department of Transportation include:

- Electronic Toll Collection
- Ramp Meters
- Red Light Cameras
- Traffic Signal Coordination
- Transit Signal Priority
- Traveler Information Systems

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[1] Bureau of Transportation Statistics. US Department of Transportation.
[2] Association for Safe International Road Travel.
[3] Schneider, B. (February 7, 2018). "Traffic's Mind-Boggling Economic Toll", CityLab.
[4] United States Department of Transportation, "ITS Research Fact Sheets - Benefits of Intelligent Transportation Systems".

- Next Generation 9-1-1
- Cooperative Intersection Collision Avoidance Systems
- Integrated Vehicle Based Safety Systems
- Integrated Corridor Management Systems
- Emergency Transportation Operations
- Mobility Services for All Americans
- Electronic Freight Manifest

In this paper, we look in detail at some of the developments within the ITS sector and how cities can leverage ITS for their own benefit.

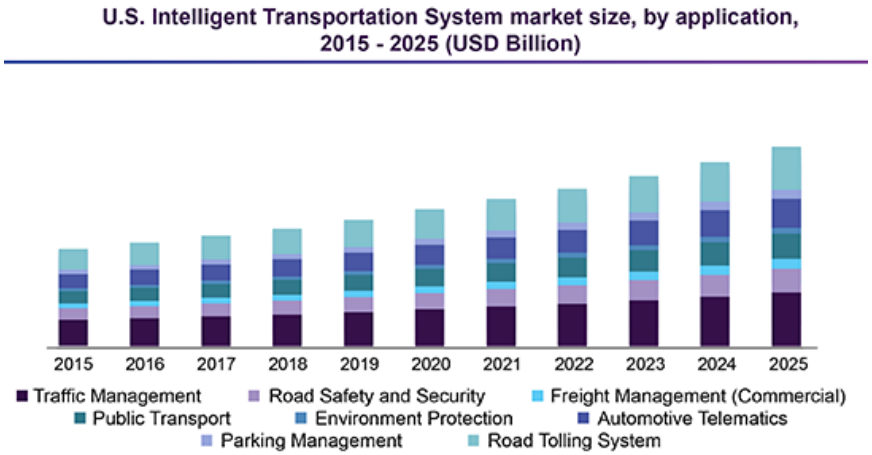
What is an Intelligent Transportation System?

An intelligent transportation system (ITS) is a set of advanced applications that offer the ability to optimize a diverse set of modes of transportation and traffic management systems in order to provide users with enhanced information and help them to make safer and more coordinated use of transport networks. The value of ITS stems from the ability to integrate devices and systems to optimize the experience of a wide array of users with respect to safety, convenience, and information.

A comprehensive ITS network will feature a number of elements in order to provide desired capabilities, ranging from intelligent sensors, management systems, and back end analytics. Some of the elements include enhancements on traditional traffic management approaches, but today more and more developments are found in other areas, including parking management and pedestrian services. Some of the key elements include:

- Data collection devices – hardware devices including vehicle identifiers, locators, sensors, and cameras that gather network data
- Data transmission networks – communication networks, including RF, cellular, and fiber to deliver two-way information across the system
- Analytics systems – error rectification, data cleaning, data synthesis, and adaptive logical analysis of the data collected
- Traveler information – information delivered to network users on a real-time basis alerting them to transport conditions

With the growing needs of communities to address transportation issues, the vendor community has been rapidly developing newer and more advanced systems. Recent estimates of the scope of traffic management application suggest an annual market size approaching $4 billion, with annual growth close to 7.5%.[5]



[5] "Intelligent Transportation Systems (ITS) Market: Market Estimates & Trend Analysis" (2019). Grand View Research.

Overall, the range of items included in the overall market includes such diverse elements as vehicle detection systems, bridge traffic management systems, ramp metering systems, and many others. Furthermore, certain segments of the ITS sector are growing at even faster rates. For example, the field of automatic telematics is forecasted to grow at more than double the overall ITS rate, driven by regulatory initiatives related to security and safety that are expected to have a positive impact on the adoption of telematics services in vehicles. Telematics tracking systems are widely deployed in cars, which include accessing and activating remote vehicles using RF identification.

Another high growth segment of the market is found in the field of parking management. With the rise in the number of on-road vehicles, there has been an increase in demand for parking management. Intelligent parking management systems enable parking operators to offer a high level of convenience to car users and reduce the wastage of time.

What is the Future for Intelligent Transportation Systems?

One of the key aspects of appeal for ITS stems from the diverse development within the sector. There are a number of complimentary elements of an overall Intelligent Transportation System:

- Advanced Traveler Information System (ATIS) – any system that acquires, analyzes, and presents information to assist surface transportation travelers in moving from a starting location (origin) to their desired destination
- Advanced Traffic Management System (ATMS) – top-down management perspective that integrates technology primarily to improve the flow of vehicle traffic and improve safety
- Emergency Management System (EMS) – ITS technologies provide transportation service and public safety agencies with the ability to communicate and coordinate operations and resources in real time
- Advanced Public Transportation System (APTS) – apply transportation management and information technologies to public transit systems to increase their efficiency of operation and improve the safety of public transportation riders
- Advanced Transportation Pricing Systems (ATPS) – include electronic toll, variable parking fees, congestion pricing and vehicle miles traveled, and usage fees collection
- Cooperative Vehicle Infrastructure Systems (CVIS) – acquire vehicle and road information by use of wireless communication and sensor detection technologies, allowing interaction and data sharing between vehicles, and between vehicles and infrastructures

With growing technology capabilities, each of these areas offer the potential for communities to implement ITS systems. Moreover, the requirement for interconnected systems that support a number of smart city applications suggest that the growth of connected infrastructure offers the potential to markedly grow the market for ITS. For example, CVIS offers the potential to improve the capabilities of autonomous vehicles. With increased prevalence of smart sensors, radar, RFID, LiDAR, and other field devices, there exists the opportunity for city infrastructure sites like poles and buildings to quickly enable additional services.

Much of the growth is being fueled by a number of developers, featuring a number of well-established players alongside focused market entrants:

- ADCCO
- Agero
- Denso
- Efkon
- Garmin
- Hitachi
- Iteris
- Kapsch
- Lanner Electronics

- Nuance Communications
- Q-Free
- Ricardo
- Sensys
- Siemens
- Telenav
- Thales
- TomTom
- TransCore
- TrafficCom
- WS Atkins
- Xerox

The Value Proposition

The world of transportation is rapidly changing. Bike sharing, car sharing, scooter sharing scarcely existed a decade ago; today each segment is growing rapidly and demonstrating the refinement of business models. At the same time, smart parking solutions have emerged across the world and are reshaping the way that commuters and shoppers interact with downtown shopping sectors. The result of all of these are new opportunities – and new demands – for owners and developers of last mile solutions.

At its core, ITS offers a reshaping of networking capabilities to offer greater degrees of interconnectedness. As a result, one of the largest segments of growth within the ITS sector is the field of mobile communications. Mobile network operators have become a large player within the overall ITS value chain, with capabilities that extend well beyond data networking. The opportunities to develop systems that enable mobile payments, data analytics, and a wide variety of user-centric applications presents a new opportunity for a segment of the market that offers solutions in connectivity.

With all of the developments occurring at such a rapid pace, the question of how to best leverage the technology for the use of municipal application is a natural one. For cities, the new acronym is MaaS – Mobility as a Service. With a move away from personally-owned modes of transportation to a shared set of resources on a service-based orientation, cities have a part to play. As cities pursue smart city programs, mobility becomes an increasingly important element. This is especially true given the fact that cities often serve as the ultimate stewards of public infrastructure – the key element to make MaaS or any smart city application function. As cities develop their plans to redesign their scope of operations for the future, there are a number of considerations that each must take into account:

- Platform development must be comprehensive and must also be designed economically. It is vital for cities to implement mobility solutions that offer a value proposition to users that offer end-to-end capabilities, integrate with other smart city solutions, and do so at a reasonable cost. Without these elements in place, market penetration will be insufficient to make the program work.
- Data security must be sacrosanct. The viability of ITS solutions lies within the management of data; this data must be secured in a way that protects users and the private information they carry. Furthermore, data mapping of systems must be laid out in a way to utilize the data in a meaningful way in support of daily city system operations.
- Smart mobility solutions should be viewed by cities as part of an overall network and not just an isolated system. As cities implement smart mobility solutions, they ultimately should be designed as one integral part of an overall smart city system design.

There are more opportunities to create connected system for smart city applications, and ITS programs offer the potential to offer significant value. Smart cities are often considered as having the potential to offer aspects of six different components[6]:

- Smart governance
- Smart economy
- Smart human/social capital
- Smart environment
- Smart living
- Smart mobility

The field of smart mobility attempts to use advanced information and communication technology to optimize logistics and transportation systems and provide efficient, safe, and environmentally friendly services. With these capabilities in place, smart cities offer the potential to pursue even greater capabilities.

Ultimately, any city pursuing such a program would be wise to consider a number of questions about their ITS program[7]:

- Does the plan create incentives to increase use of public transport?
- Does it reduce congestion and pollution?
- Is there a culture of openness and data sharing?
- Is it socially inclusive?
- Does it encourage active lifestyles?

[6] Sumalee, A., Ho, H.W. (July 2016). "Smarter and More Connected: Future Intelligent Transportation System". International Association of Traffic and Safety Sciences. IATSS Research, Volume 42, Issue 2, July 2018, Pages 67-71.

[7] Bray, J. (January 20, 2020). "How Cities can Engage with Mobility as a Service". GreenBiz.

Summary

The field of Intelligent Transportation Systems is still at a relatively early stage, with much growth an additional capabilities ahead of us. As such, it is incumbent upon municipalities to consider how to integrate the capabilities of ITS into their overall smart city design. There is little doubt that doing so offers the potential to:

- Minimize pollution
- Increase security and safety
- Support new user-centric capabilities
- Deliver enhanced mobility parking solutions for city residents

"A city's transport system acts as a lifeline for the smooth functioning of the city. In the absence of right commuting channels, life comes to a halt for people residing in urban areas. Proper means and management of transport channels defines the quality of life in modern hi-tech cities."[8]

[8] "Intelligent Transportation Systems for Smart Cities". (August 14, 2017). SmartCity Press.