Intelligent Mobility: The Internet of Things and the Future of Transport

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The Internet of Things (IoT) is changing, in significant and unforeseen ways, how businesses and governments produce goods and services around the world and how consumers access and use those goods and services. The IoT can be described as a vast global panoply of interconnected devices all sharing data for the purpose of analysing it and making behavioural decisions without human intervention. The IoT allows a wide variety of devices to connect with an ever-increasing web of networks to create a more interconnected world. According to a 2015 report by Deloitte University Press, it is estimated that 50 billion devices will be connected to the IoT by 2022, generating over 1.3 zettabytes of data[i]. Estimates vary about the financial value of the IoT, but Industrial-IP put the value at $14 trillion in global GDP by 2020[ii]. This is only a guideline. The real value of the IoT has yet to be unlocked and measured.

In general terms, the IoT creates value for companies through sequences of activities enabled by specific technologies for each stage, from real world objects in real time. The activities are

- creating information through sensors and sensor enabled technologies
- communicating the information across a network
- aggregating information through the use of standards/norms/protocols
- analysing the information through a variety of mechanisms and technologies
- using the information for automated decision-making or to enhance better human decision-making

Why Transport Matters

In parallel to the expansion of the IoT, economic and demographic patterns are driving changes in the way human beings live and work. Over 55% of the world's populations now reside in cities, and that is expected to grow to 70% by 2050, according to a UN Report[iii]. India, China and Brazil have dedicated mass urbanisation programmes, as do many other countries. Governments and international institutions have begun to explore the potential of the IoT to predict and manage the impact of changing demographic patterns on mobility and energy consumption. The UK government, for example, has launched a series of consultations and programmes on the future of mobility which aims to capitalise on innovations in engineering and technology.

While demographic changes alone will drive the need for individual and global mobility, governments must also consider other factors. With population density and economic clustering in urban areas, governments must address issues of inadequate or aging infrastructures, pollution, congestion, and the devastating ecological impact of concentrated industrialisation. Additionally, aging or obsolete vehicle fleets, systems that lack interoperability with emerging technologies, and increased user demands for connected services force governments to seek innovative technology solutions to existing and future urbanisation problems.

If governments and international institutions fail to resolve these issues, mass urbanisation and industrialisation will engender gross inequalities in social and economic advancement, increase reliance on fossil fuels, destroy fragile ecologies, and contribute to poverty induced violence and despair.

According to a report by the World Bank, the scale of growth poses several challenges for urban transportation[iv]:

1. Rapid Urbanization – cities will need infrastructure, services, housing and employment options for burgeoning populations, all of which impact mobility as a public service. The increased volume of users and consumers of mobility and transport services will cause higher levels of pollution globally.

2. Low-quality public transport – train breakdowns and derailments, bus breakdowns, and other forms of public transport breakdown are a frequent occurrence in developing nations and a source of major concern for transport authorities in more developed nations. Aging public transport infrastructures add extra pressures to already over-burdened systems. Providing seamless and sustainable public mobility is a serious challenge for almost all governments.

3. Increase in motorization – a greater number of people around the world will be mobile in the coming years, increasing pressure on highways and roadways. For nations with aging or inadequate transport infrastructures, the volume of new users will be a major logistical challenge. Many drivers will use smart cars, or access smart transport systems, generating vast quantities of data. Smart cars will generate 290 exabytes of data over the next few years[v].

4. Lack of hierarchical highway, road, and street systems – patchy highway and road development, stretches of underdevelopment in major highway systems, and disconnected road and street systems place extra pressure and costs on public sector transport and maintenance services

5. Lack of Resources (People, Institutions, and Funding) – the pressures of mass urbanisation, mass industrialisation, and increased population density will add to the demand for publicly funded services such as traffic management, incident response, and protection of transport as a critical national asset for a nation. Budget cuts, funding priorities and political agendas all determine how governments allocate resources. Resource allocation may not be enough to resolve some of the more complex transport issues faced by urban populations.

The IoT and the Future of Transport

While commercial and industrial sectors are struggling to understand the impact and uses of IoT technologies on their supply chains and manufacturing capabilities, companies in the transport and logistics sectors are leading the way. By their very nature, transport and logistics companies rely on vast quantities of information minutely calibrated in real time across widely distributed networks. The advantages offered by sensors and connected technologies are immediately obvious in managing the data flows and adjustments needed to move goods by air, land, sea and rail networks.

The efficiency, speed, accuracy and cost savings that transport and logistics (T&L) companies can provide along their supply chains is a primacy driver for value creation. T&L companies have mainly used IoT applications for track and trace, network efficiency and to reduce idle time. Real time monitoring, asset maintenance and predictive analytics can speed up turnover in both supply and demand chains, leading to greater user satisfaction. Supermarkets, retailers with a high turnover of goods, and pharmacists all benefit from just in time delivery made possible by the IoT. For consumers, tracking of goods from point of purchase until final delivery is now commonly expected as part of the customer experience with online retailers.

The range and complexity of transport logistical operations can be modelled and mastered using the IoT. Schipol Airport is using a mesh network of low power, local nodes that continuously route information between the nodes in the network to trace and maintain ground support equipment. This cost saving exercise has additional benefits in reduced lost luggage, reduced traveller complaints, and reduced liability payments.

Fleet management can be enhanced with intelligent dispatching, real time incident response and asset monitoring. The logistical complexity of managing vast fleets, across multiple countries and supply chains can be simplified by combining IoT applications for trace and track with systems wide real time monitoring. This leads to fluidly interconnected business solutions, built from a central coherence with elements of customisation to suit specific fleet and customer needs. The supply chain for temperature sensitive goods, for example,

can be monitored and adjusted as necessary without human intervention. This capability reduces supplier risk and potential costs through spoilage or contractual failure. For agricultural companies, produce being transported across locations must remain at a steady temperature to retain its freshness and quality for end users. Green peppers, for example, are vulnerable to disease if transported at inconsistent temperatures. A percentage of the crop must be lost enroute, representing financial loss of supplier and vendor. Honeybees become distressed and weakened if temperatures become to too high while being transported.

Singapore is leading efforts to unlock the potential of the vast quantities of data from IoT transport applications. Intelligent mobility as a publicly provided service is the cornerstone of future sustainable transport systems. Singapore is a test bed for many of the components of intelligent mobility, from truck platoons of driverless vehicles to electric mobility for decarbonisation of urban transport to analytics systems to model commuter flows and improve street and road planning.

The IoT Platform

The challenges that arise from changing demographics and mass urbanisation are set to increase in volume and intensity in the coming decades. As businesses and industries explore the options offered by the IoT for increased revenue and growth, governments concurrently look to technology and innovation to solve some of the world's social challenges. What the IoT offers, beyond its commercial and technology value, is a global platform for collaborative working across borders and divisions. Using IoT enabled technologies, Small to Medium Enterprises have just as much to contribute as larger, more established corporations. The growing interconnectedness of the devices and networks link developed and developing economies in ways not previously seen in human history.

About the author

Mariyam Hasham is a Market Insights Analyst at BSI.

[i]A Zettabyte is 270 bytes of data.

[ii]Industrial IP is a consortium of companies who came together in 2013 to share best practices and educational resources about ethernet and internet applications for industrial use.

[iii]World Population Prospects, 2017 Revision. United Nations, DESA, Population Division.

[iv]Building Sustainability in an Urbanizing World: A Partnership Report. Urban Development Series Knowledge Papers, World Bank, 2013.

[v]An exabyte is 216 bytes of data

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