

Use of IOT in Container and Shipping Industry and its impact on Global Trade

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As per the United Nation's report titled " World Population to 2300 " over 8 billion people will inhabit the earth by 2030. That's more than a billion more in 2010 and 95% of this increased population will be born in developing and emerging markets . According to a PWC report titled " The World in 2050 " only 23% of the world's population will live in Europe, North America and Australia. Thus, the Global economy is being reshaped , and so is the distribution of wealth and Global trade in goods and services is also likely to rise more than threefold to US \$27 trillion by 2030. Trade is also going through some volatile conditions. Consumers are increasingly adopting an anything, anytime, anywhere expectation, while products to be shipped are becoming more sophisticated and diverse. At the same time workforce shortage and regulations impose pressure and obligations. To cope with these conflicting demands logistics and supply chain needs to become more efficient, automated and analytics driven.

The world trading systems has always been shaped by technological progress. As per the World Trade Report 2018 International trade costs declined between 1996 and 2014. The report predicts that trade could grow by nearly 1.5 to 2% more until 2030 as a result of the falling trade costs. Leveraging Disruptive digital technologies like AI, IOT, 3D Printing and Blockchain will help to further reduce trade costs. Not only is technology a determinant of trade costs , but it also defines what kind of products can be traded across international borders. New digital technologies leverage the Internet to process and analyse data . Computer systems , automation and data analytics are coming together in an entirely new way that is transforming the global economy and global commerce. One of the significant effects of digital technologies is the extent to which they reduce trade costs , such as transport and logistics costs , the costs of crossing borders ,information and transaction costs and costs of cross border payments. As per the World Trade Report 2018 , Transport and Logistics costs combined account for more than half of the variation in trade costs in agriculture and manufacturing, and for more than 40% of the variation in trade costs in services . The Application of AI, IOT and Blockchain to reduce transport and logistics costs are likely to have the largest effects on overall trade costs.

Intelligent Shipping Containers

As the logistics and transport sectors join the Industry 4.0 revolution , shipping containers leveraging the power of IOT technology are set to play a very big role in ensuring new levels of efficiency, safety and transparency. Building intelligence into shipping containers (both refrigerated and dry) will create new opportunities for container manufacturers and expand their offerings to the end customers. By integrating reliable and secure Global connectivity and traceability with the sensors and tracking devices within containers , they are able to provide an improved customer experience. On an average , shipping containers have utilization rates of only 20% because companies often ship merchandise to many locations. Tracking each container using IOT technologies could improve container utilization by 10 to 25% and reduce annual spending on containers by nearly \$13 Billion by 2025 as per a report by Lund and Maynika of Mckinsey released in Jan 2016.

Shipping containers are the most widely utilized transport method in the world as they are responsible for more than 80% of global transportation of trade goods . There are an estimated 30 to 32 million containers travelling around the globe today and approximately three million containers are produced and deployed each year. As more and more of these containers traverse the high seas, it becomes increasingly complex to keep track of individual containers and the condition of assets inside them. There is the added pressure on manufacturers and retailers to improve their margins through better supply chain visibility through better stock control and prevention of losses.

For eg, the Pharma industry which is highly regulated need to ensure that the high value pharmaceuticals which are very temperature and humidity sensitive are being safely transported in cold chains .

Today , using the power of Internet of Things (IoT) technology, Shipping liners are in a position to track and monitor the condition of refrigerated containers with perishable goods. In the past , onsite supply chain managers would spend time manually checking the condition of each container. The shipping lines now can obtain near-real time visibility into the conditions of each refrigerated container at almost any part of its journey during the supply chain. Their shipping supervisors can monitor mechanical performance to help ensure the equipment is in proper working condition. IOT technology can help them to improve the level of services they provide and also ensure they are optimized and arrive in the proper condition – no matter the length of the journey.. This can help companies better manage their delivery process and offer service their customers can depend on. Shipping liners can keep its customers informed about the location and condition of each shipment, helping them operate more efficiently and giving them peace of mind about their cargo.

To track these containers, container devices can be architected and designed with a 2G/3G/4G High Temperature and heat tolerant SIM card, a GPS unit, any short range wireless solution like a ZigBee radio and antenna, and multiple interfaces for connecting into the refrigerated container's controller. The Container device can operate with two-way connectivity from just about anywhere in the world. Once the containers are traversing the high seas and lose cellular connectivity, the container device can connect via a Satellite network to ensure continuous connectivity throughout its journey. The solution can reduce labor costs, decrease loss, prevent thefts, help in risk management and mitigation and also help in Audit efficiency



Automation reduces cost and enhances container visibility across the entire supply chain. Enterprises and their end customers can now centrally track their intermodal containers, trailers and other unpowered industrial assets as they are transported globally, from the production location to the final destination. IOT devices attached to these containers are sensor rich with high precision GPS engine using a solar panel for charging and IP67 rated.

Digital and Connected Ships

Having addressed the importance of the need to leverage IOT technology to track Shipping containers, I would also like to stress the importance of leveraging the power of IOT and AI to monitor and manage the Shipping vessels which carry these containers. The next generation of ships will be electric, digital and connected that maximize the full potential of vessels and enables safer, more efficient and sustainable ship operations. There is the increasing need to connect the ship's crew with their technical and nautical departments. Within a shipping vessel there is the constant need to monitor energy production and consumption, improve vessel motion forecasting in changing weather and loading conditions, decision-making support while operating in different weather conditions, optimize mapping energy flows, measure fuel consumption, measure energy and power savings of products such as drives and motors and send the data to a Cloud platform. By using IOT and AI, it would result in increased availability, safety and efficiency for all types of vessel operations, ensure environmental compliance and recommend actions to optimize vessel performance throughout vessel operations or voyage.

Remote diagnostics of equipment like propulsion systems, electrical systems like generators, Switchboards, Power transformers, drives for marine applications, high voltage marine motors and turbo chargers inside shipping vessels is extremely important. Preventive & predictive continuous monitoring and combining online with manual monitoring is necessary. Prediction and remote services are taken to the next level by adding predictive analytics algorithms and cloud technologies. It is important to be able to predict failure by delivering predictive analytics algorithms which are implemented both onboard the vessel and in the Cloud. With ever developing cloud technologies it is possible to provide highly advanced and embedded analytics on the collected data, whether it is at the equipment, system or fleet level. This can go a long way in reducing maintenance cost by continuously monitoring equipment health status, reduction of production stops due to machinery failures and to optimize planned maintenance activities according to operational requirements, reduction of labor costs by automating data collection and enabling operators to focus on understanding the data and system status and reducing the need for the service engineer to be onboard.

Condition based maintenance of equipment inside a shipping vessel that would help in prediction of equipment failure modes and risks related to potential failures is possible by attaching the relevant sensors to the equipment and using reliable and secure connectivity to send the sensor data to an IOT platform that is cloud hosted. This would provide the relevant advice as to when to perform maintenance actions based on actual equipment condition and performance monitoring, advice whether maintenance and repair can be delayed to a later point. The benefits are Increased equipment reliability, Reduced maintenance cost as not all maintenance tasks are performed according to time-schedule and Increased availability of vessel as maintenance is done when operations allow for maintenance without disturbing business critical operations

Future trends

The rapid adoption of digital technology by tech savvy consumers can significantly impact shipping assumptions. The growth of the shipping industry is largely dependent on the GDP growth trends of countries, however there are other factors like increased urbanization, environmental factors like higher levels of pollution, climate change and most importantly the disruption of the logistics industry with disruptive technologies like AI, IOT etc. that has been having a huge impact on the economics of transportation of goods from one place to another.

Higher urbanization impact shipping routes; electric vehicles can have an effect on the shift to marine e-mobility; and, as the driverless automobile becomes a reality in the future, parallels with automation within the ships can be easily drawn. Car OEMs are increasing their R&D investment in making electric cars, whose design and manufacturing is far more simpler with fewer moving components, ease of control and updating and lower level of losses in energy conversions when compared to the conventional ICE engines.

Marine Electric- mobility

The imperative today is to optimize the usage of battery power and achieve higher levels of automation and autonomy. However the real value can be derived when it results in improved operational efficiency or enhanced safety, or both. The debate around autonomous ships and navigation has been going around for sometime. However most of these deliberations have not considered the fact that the drive and power trains of the ships also needs to evolve over time to accommodate the needs of an increasingly automated shipping business. Ships need to be able to self-heal and be able to continue to sustain its operation when faults are identified. With Electric systems, the ability to diagnose and do a reconfiguration securely can be done remotely. Increased levels of automation may be required where ships are operating on shorter distances close to shore and along routes that are repetitive, but that does not necessarily mean that these ships are not manned. Instead, a fully electric propulsion system, featuring batteries that can use the power at the shore side for recharging would definitely result in the need for continuous maintenance (for eg filter changes), which could be remotely supported by an over the air update or by ad-hoc visits by the service crew. The displacement of crews inside ships is not imminent as you would still need the crew for maintenance of machinery, day to day administration, communication calls etc. While navigation safety is extremely important, in the context of a fully digital technology enabled connected ship the focus should be on how Electric propulsion can automate certain aspects of the functionality of ships that will lower operating costs, improve safety and has no negative environmental impact.

Electric platform for Connected and intelligent ships

We are already seeing the increased use of IOT sensors connected to the various subsystems within a shipping vessel, and are generating a lot of data to help optimize operations within a vessel and help achieve just-in-time delivery with much lower energy consumption. The use of powerful Cloud-based analytics tools and AI and Machine Learning algorithms to help in preventive maintenance, predict equipment failures and more importantly rectify remote equipment problems exists today. With IOT sensor deployment costs coming down significantly, it is anticipated that use of Robotics and 3D printing for lifecycle management will enable automatic and autonomous service operations in the not so distant future.

Technologies like LIDAR (Light Detection and Ranging), Computer Vision, and powerful positioning data captured by high resolution satellite imagery can help in accurate navigation and thus providing a very precise 360 degree view of the shipping vessel in a real world scenario similar to the Advanced Parking assistance systems we see today. This ensures the elimination of blind spots and prevent accidents that can cause significant damage.

In the near to immediate term, the use of these disruptive technologies will help the crew in achieving faster turnarounds within a port and also allow for lower speeds to the next destination that will improve fuel efficiency, help in faster regulatory compliance and improve business impacting ship functions such as maneuvering and mooring. The use of these technologies will augment support crews in their role as guardians enabling to intervene whenever efficiency, safety or environmental responsibility is compromised.

Conclusion

In conclusion, I would like to state that the pressure to digitally optimize processes, using IoT solutions is coming from everywhere – Politics, Press, Shareholders, Customers and Suppliers. The key differentiator in a highly competitive market is improved customer experience and hence getting the right product to the right customer at the right time, right place and right condition in the right quantity and at the right cost (*the famous 7Rs of logistics*) is absolutely imperative. The Shipping and Container Manufacturing companies have to come to the realization that using IOT technology is a strategic necessity for their very survival and growth.

Reference:

1. PWC report – “The World in 2050”
2. United Nations Report – “The World Population to 2300”
3. The World Trade Report 2018
4. A report titled “ How Digital Trade is transforming Globalisation “ written by Lund and Maynika from Mckinsey

About the author



Sunil David has 26 years of experience in the IT and Telecom industry and is currently the Regional Director (IOT) for AT&T India , and is based in Chennai. He is responsible for building the IOT strategy for the India and the ASEAN regions.

Sunil was recognized by the World Marketing Congress in Nov 2017 as one of the 50 Most Influential Digital Marketing Leaders across India . Sunil has spoken at more than 50 Industry forums in India and abroad organized by leading industry bodies like COAI, CII, IAMAI , Cyber Media, NASSCOM , ASSOCHAM ,Geospatial , IET , Singex , Konnect Worldwide etc) and Educational institutions including IIM Shillong, IIT Delhi , IIT Madras, SITM Pune , in the past 2 years on topics related to IOT , AI , Cyber Security , Digital Transformation etc . Sunil has also written articles related to Digital Transformation , Disruptive Technologies, 5G, IOT Security for leading B2B publications from ADI Media and CIO Review that has a wide circulation among the CIO community in India.

Apart from his responsibilities with AT&T , Sunil is also a Honorary member of the FICCI TN Tech Panel and CII TN CTO Forum working on initiatives to drive Digital Technology adoption within the Industry . unil is also in the Advisory board and an Investor in a Start up based in Chennai that is focused on Skills development and Cyber security training and consulting. He is also part of the NASSCOM Diversity and Inclusion (D&I)Council, TN chapter.

Sunil has a Bachelor’s in Electronics and Communications Engineering from Karunya Institute of Technology , Coimbatore and a Master’s Diploma in Business Administration from Symbiosis Institute of Management studies (Distance Learning) , Pune.

The Nine Pillars of Digital India

