The Future of Supply Chain – Data Logging Via Internet of Things (IoT)

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ABSTRACT-

In the era of 1990, the computers connected via internet were very less around 30,000 to 40,000 but as the time gets changed the numbers gets increased to around 3 million in the year of 2000, and after a decade in 2010, the digits of million gets converted to 2 billion around the year of 2010, and after some time in 2016, around 2 out of 10 people is capable and using the smart home appliances like automatic washing machines, water purifiers, air conditioner, Smart bed, Smartwatches, and many more home Appliances. In 2017, the people become habituated to iPhone's "Siri". There are many more such applications that are changing our lives.

The future of entire world is only Internet of Things (IoT), that will transform the real-world objects to an intelligent virtual objects like after a decade mainly in the period of 2030 to 2040, your smart appliances may inform you about what steps to be taken at a required time and it may also inform you about what is need of them. IoT is mainly a system of web associated objects ready to gather and exchange data or we can also say that internet of things (IoT) is a worldwide system foundation with self-designing capacities dependent on principlesand interoperable communications protocols

This paper mainly focusses on the future of supply chain – data logging via the internet of things (IoT). Data logging is the process of data collection and storage over a while to analyze specific trends or to records the data based events/actions of a system, network or IoT environment. And apart from this, the data logging also allows information security (is) and auditing staff to analyze system access information and identify suspicious activities

The uses of data loggers are required for a multiple of reasons, frequently to ensure compliance with industry-specific regulations, and quality and environmental control procedures. As the time is changing and technology is also changing day - by – day and due to this the data logging is influencing the supply chain in the form of warehouse, logistics trucks delivering the products, to supermarkets chillers in retail environments, new cutting edge monitoring solutions on the market provide opportunities that incredibly streamline the procedure, and many more.

As a result, an enormous amount of data being generated, stored and being prepared into helpful activities that can — "command and control" the things to make our lives with a lot simpler and more secure. For solving up these problems the methods used like the makings of projects, using a mix of public and private infrastructure also can help protect data, using an independent infrastructure such as cellular service to send data, LTE-M and LTE-NB use existing cellular towers and it provides much broader coverage.

The IoT based applications have huge advantages and will help people and various organizations in makings of smart homes, smart cities, efficient use of electricity and energy, better management and healthcare, wearables, connected car, security, road safety, cost-efficient business operations, etc.

This all is “The Internet of Things” applications and this is the Future.

Keywords: Internet of Things, Supply Chain, Data Logger

Introduction

Internet of Things (IoT) is powered by the combination of analytics, mobile computing and cloud services. Asset tracking is also influenced by IoT which is providing such gadgets to make better decisions, saving money and time. Asset tracking, which gives them the tools to make better decisions and save time and money. Newer asset tracking solutions replaced the traditional bar code scanner with radio frequency identification (RFID) which provides more essential and usable information when paired with other IoT technologies.

Warehouses are also not untouched by the capabilities of IoT where inventory monitoring, stock level distribution are taking help from new models.

Networks powered IoT technologies are useful in minimizing the human error when it comes to inbound and outbound packages as it provides several scales to scan different parameter like size, weight, density, etc. based on this collected data, accuracy can be ensured by shipping collaboration software with expected and actual received inventory.

IoT Key to Efficiency

- *Operational efficiency:* Deficiencies that occurred at a real-time can be traced quickly or rectified. Companies are affected by slowdown or delay that cost them money can be identified.
- *Inventory management:* IoT Devices provides automation to the organizations for inventory updates that when to reorder or restocked. This eliminates the delay and provides the product as per the customer's expectation on time.
- *Customer service:* IoT devices are reducing the time amount from requests to respond. On time data accessibility is required to match up with the customer's expectations also the accurate delivery date time notifications are demanded by the customer as to where their product during the transit.
- *Loss management*: IoT devices make use of sensors that can sense almost all possible loss events that can occur with the product during the transit and if any such event occurs with the product that can be traced that at what point of time, place and factor that has contributed to merchandise loss.
- *Visibility:* A much better understanding of the product that exactly what amount of time and place product is stayed, equipped Supply chain management professionals with the data they require to make better decisions. Earlier, companies would get only occasional updates and outdated reports and it would be too late to make any real changes or adjustments.

Examples of IoT Transforming Supply Chain

- *New Jersey Transport Authority (NJTA)* – Undoubtedly IoT provides tools for cost-cutting in the long run. The NJTA is working with IBM to deploy 3,000 sensors along the New Jersey [1]. Turnpike [2] – one of the busiest roadways in the U.S. The data this produces is utilized by the crisis administrations and traffic management operators so they can get to a mishap quicker, and decrease congestion development.
- *Amazon* – Amazon handles their orders uniquely regardless of their shapes or size with the help of robots and AI system; they use Wi-Fi-connected robots [3] to identify products by reading QR codes from built-in cameras. Workers of Amazon works in coordination with the robots and IoT devices. The priority of the product is identified by the AI systems, humans perform restocking and packaging while the rest of the work is performed by the robots.
- *Volvo* – For shipping the ordering components to vehicles across the globe Volvo utilizes the cloud services with IoT technology to enhance its logistics of the supply chain. The company established a relationship with Microsoft, which involved trialing its mixed reality headset, HoloLens [4]. It is the company that believes that their headset can help in transforming car design with a better relationship with the customer.

IoT and Big Data

The number of internet users and connected devices are increasing rapidly and influencing our daily life to incorporate with the Internet of Things (IoT) and Big Data. IoT devices share a huge amount of data as they are the Physical devices that are connected to the internet.

According to a study by Gartner [5], the revenue generated from IoT-enabled services and products will exceed $300 billion by 2020.

For any organization, well-analyzed data is at most priority and IoT is generating a huge amount of data. To analyze that hugely generated data from IoT devices Big Data analysis and analytical tools are required. Big Data analytics tools help to generate and store the insight from the information received from various sensors of IoT devices.

Predictive analytics is possible with several machine learning algorithms that use the patterns and trends observed from the vast amount of data generated by IoT sensors. Predicting the problem before it happens, so that it can be fixed is possible with Big Data Analytics. The risk of damage and waste can be minimized with Big Data leads. Thus the IoT services with Big Data creates ample opportunities to enhance customer relationship.

The following statistics from Gartner [6] shows how IoT and big data is revolutionizing our everyday lives:

- By 2020 every person will create 1.7 MB of data every single second.

- There are 3.5 billion Google searches per day and 400 hours of new YouTube video added every minute.
- The number of IoT connected devices is forecast to reach up to 30 billion by 2020.
- IoT investment is expected to reach $58.14 trillion in the next 15 years.

IoT & Big Data in the Supply Chain

According to a report from Transparency Market Research [7], the global supply chain and logistics market are set to exceed $15 trillion by 2023.

Although there is rapid growth in the supply chain industry, still there are not that many field innovations happening and the companies still lacking efficiencies.

Based on a report by Zen Cargo [8], supply chain inefficiencies cost businesses nearly USD 2 Billion in the UK alone.

The traditional outdated process in the supply chain is very complex involving controlling and monitoring product flow row material to final product delivery with a point to point communication that relies on e-mail and phone communication. While the controlling and monitoring of the product is very crucial. This can cause inefficiencies as the speed of supply chain is slow-down by the big network of point-to-point communications.

"IoT is on the rise towards restructuring the entire process by which supply chains operate."

A smart network ecosystem of people, process and data through sensors and actuators, that is consistently collecting, measuring and distributing real data, is the power of the Internet of things. This real data gives its benefits to the supply chain providing visibility in every process within the supply chain.

Why the Internet of Things Matters to the Supply Chain?

IoT devices are a major advantage in aspects of supply chain management:

- Visibility and tracking of real-time shipment and inventory
- Stakeholders can easily plan supply and demand as they know when they can expect to receive and process goods
- Early identification of issues with lost or delayed goods
- Keeping raw materials and processed goods in optimal conditions provides enhanced quality management.
- Assurance of goods location in rest or motion as per stakeholder.
- Better storage and distribution of products.

IoT Enabled Data Loggers in Supply Chain

Technology is advancing at a rapid rate and companies still working with obsolete technologies are holding back. The same scenario is prevalent in supply chain industries. Traditionally, data loggers were having significant drawbacks although they were widely used in supply chains and covers basic cargo monitoring needs.

The old **traditional data logging technology** widely used in the supply chain with electronics devices (data loggers) used to log location-based environmental data was considered as state of the art innovative technology of the time but with the time that was affected with new trends and became obsolete. Traditional data loggers were replaced by IoT enabled solutions providing more vital real data with wider visibility.

IoT enabled devices vs. traditional data logging technology…

1) *Intelligent vs Non-Intelligent Analytics*

The key component of IoT enabled data logging technology is the analytics, providing information on shipment, help in making decisions, future predictions and exposing risks. It can generate intelligent reports based on performance management with various quality checks in less time, such technology empowers the business with better decision making ability. On the counter side, the traditional data logging technology using few independent electronic devices is not that intelligent that it can generate such future prediction reports on its own. Such devices are used for collection and data storage, the older data logging devises are not bothered about the predictions on shipment and related risk management neither with the financial management.

2) *Instantaneous Data Exchange + Analytics vs Limited Data Accessibility*

The power of IoT enabled devices is in its sensing, analytics and communicating the real data with all of its related stakeholders instantaneously. The IoT enabled devices to make use of a cloud based dashboard and provides the information to all related parties in real-time. Whenever cloud dashboard updates, all parties get to know with the recent information, which makes easy communication between them. On the other hand, old data loggers are not capable with such capability and communication technology of sending real-time data to all. Here data is stored in one device which along with the shipment. That data can be exchanged only when it is extracted from the device.

3) *Automatic Data Transfer vs. Manual Setup*

The IoT enabled technology transfers the data on the go which enables the problem-free quality condition monitoring of the product. Without any delay, the product reaches the destination it will be delivered to the buyer. Here no other means of IT infrastructure is required for data transfer and analysis as all the process is completed by the means of automation over the cloud. Whereas data extraction and analysis are not like that much easy in traditional data logging technologies since here dedicated software with data wiring is required to be installed at the

destination to extract and analyze the data, sometimes this cause problem in case of quality condition monitoring as the extra time needed for data extraction and analysis.

4) *Real-Time Data Stream Vs. Data Availability Post Shipment*

Any disruption with the product can lead to affect customer satisfaction and business operation, IoT enabled devices provides all real-time updates related to the shipment and enables you to react against such disruptions. The traditional data logger technology is unable to act with real-time data as it provides the details only after the shipment reaches the destination. Traditional data loggers are not capable to reveal important conditional measures sometimes which are of utmost priority.

The IoT Transport Data Logger

TDL or the Transport Data Logger gives transparency in the supply chain process. TDL is moved with the shipment and measures several parameters like temperature, shock, and tilt. Different measures on those parameters can be settled and if any of the parameter is breached then that will be traced in the supply chain. TDL also facilitates data visualization through mobile applications.

Benefits of the Transport Data Logger

- *Efficiency:* Easy to use and configure, easy integration without the pre-requisite of the logistic chain.
- *Condition Monitoring:* 360-degree approach of TDL with condition monitoring makes it more transparency in the supply chain. When any parameter threshold is exceeded, the TDL acquaints with verifiable proof of possible primary and secondary damage.
- *Simplicity*: IT is a reliable, versatile, simpleand cost-effective delivery monitoring device.
- *Transparency*: The TDL creates trust between parties and provides data for enhancing the logistics process. It offers proof of a fail-safe transport chain.

Future of supply chain with IoT

IoT today: an information flood that carries constant reaction to changing client needs and economic situations with late gauges of 28 billion IoT associated gadgets worldwide by 2021 [9] the main thing IoT will do is add to the blast of data driving organizations' information intricacy challenge [10]. Simultaneously, IoT will challenge supply chains to open up to a new plan of action and operational potential outcomes. These are empowered by IoT information streaming once more from clients as an immediate contribution from organized sensors joined to conveyed items, just as from a huge number of outside sellers. [11] A foundation of this vision is that prescient investigation will caution organizations to issues rising with their gadgets in client use, and afterward, important inventory network procedures can be marshaled to react to the client — potentially even before the client becomes mindful of the issue. Supply chains reacting to changing client needs progressively adequately change items into "items as-an administration" — another advanced plan of action.[12]

IoT, tomorrow: wise, self-arranging supply chains It is a little reasonable jump from items as-a support of shrewd, self-sorting out supply chains. As production network forms and their crude materials and segments become instrumented with IoT sensors, the sign they send about the condition of those procedures can be investigated by progressively proficient AI frameworks.[13] Joining that information with data about the different clients for whom the store network's yield is predetermined, such frameworks could choose for themselves how to work and react progressively to evolving conditions.

References

[1]:https://www.govtech.com/fs/New-Jersey-Turns-to-Internet-of-Things-to-Improve-RoadwaySafety.html

[2]:https://www.govtech.com/fs/New-Jersey-Turns-to-Internet-of-Things-to-Improve-RoadwaySafety.html

[3]:http://www.informationweek.com/strategic-cio/amazon-robotics-iot-in-the-warehouse/d/did/1322366

[4]:https://www.media.volvocars.com/global/en-gb/media/pressreleases/169675/volvo-cars-todevelop-next-generation-automotive-technologies-with-microsoft

[5]:https://www.gartner.com/en/newsroom/press-releases/2017-02-07-gartner-says-8-billionconnected-things-will-be-in-use-in-2017-up-31-percent-from-2016

[6]:https://www.google.com/search?q=gartner+iot+study

[7]:https://www.prnewswire.com/news-releases/global-logistics-market-to-reach-us155-trillionby-2023-research-report-published-by-transparency-market-research-597595561.html

[8]:https://www.google.com/search?q=ZenCargo+study+supply+chain+inefficiencies+cost+businesses+nearly+USD+2+Billion+in+the+UK+alone

[9]: "IoT Will Surpass Mobile Phones as Most Connected Devices," InformationWeek, 4 August 2016, © 2016 UBM.

[10];Sheng, Z., Yang, S., Yu, Y., Vasilakos, A., Mccann, J., & Leung, K. (2013). A survey on the ietfprotocol suite for the internet of things: Standards, challenges, and opportunities. IEEE WirelessCommunications, 20(6), 91-98.

[11] Theoleyre, F., & Pang, A. C. (Eds.). (2013). Internet of Things and M2M Communications. RiverPublishers.

[12] Coetzee, L., &Eksteen, J. (2011, May). The Internet of Things-promise for the future? Anintroduction. In IST-Africa Conference Proceedings, 2011 (pp. 1-9). IEEE. International Journal of Computer Science & Information Technology (IJCSIT) Vol 10, No 2, April 2018.

[13] Ji, Z., &Anwen, Q. (2010, November). The application of internet of things (IOT) in emergencymanagement system in China. In Technologies for Homeland Security (HST), 2010 IEEEInternational Conference on (pp. 139-142).

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