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**THE SHIPPING CONTAINER AS A DIGITALIZATION
CATALYST**

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Expected year of graduation: November 2017

Table of Contents

| | |
|---|----------|
| Background | 3 |
| Container road map for the intermodal transport digitalization | 3 |
| Internet of Things | 3 |
| Big Data Analytics | 4 |
| Blockchain..... | 5 |
| Physical Internet | 5 |
| Conclusions | 6 |
| References | 7 |

Background

In a continuous effort for correctly addressing customer needs while at the same time reducing operational costs, the entrance of digitalization in the intermodal transport is very much needed and requires additional support on the hardware side, more precisely shipping containers.

From the visionary introduction of the “box” by Malcolm Mclean in 1956, the container has shaped the world economy but has been limited due to his success. Such an innovative item had failed to be reinvented based on the beauty of the simplicity and practicality attached to it.

Nowadays considering how focus are supply chain providers to the final customer makes sense that trends that should guide innovation has to be related to environmental friendly products, real time traceability, self-service, reverse logistics, customized products and fast delivery. Some of these trends are enhanced by the introduction of the e-commerce.

The task of adapting containers to the new trends could be eased by repeating one of the important factors that developed and maintained valid the containers until our days, standardization. The results achieved by ISO and BIC in terms of standardization needs to be replicated or updated in case of an additional application given to containers. The use of the BIC LOCodes powered with the use of BOXTECH and ACEP databases has the potential of being enhanced with real time information regarding the physical condition and position of a container.

Additional to the creation of leaner and agile platforms, digitalization in the intermodal transport is meant to create safer, more secure and sustainable transport of goods.

Container road map for the intermodal transport digitalization

Considering the magnified importance related to the proper use of containers, the description of the following ideas which are all applicable to the use of containers will provide with a theoretical road map for the progressive implementation of the intermodal transport digitalization.

Internet of Things

This concept raised from the capacity of connecting every physical device to the Internet, with the functionality of having that device exchanging information with people and other devices (Burrus, 2014). This trend has become the milestone for the third age of internet and has high expectations of connecting 50 billion objects by 2020 (World Economic Forum, 2015).

The use of mobile sensors together with improved internet satellite connectivity and advances in cloud connectivity provides with the right environment to have containers supplying and receiving relevant information.

Is being argued that the way physical objects are moved, stored, realized, supplied and used throughout the world is economically, environmentally and socially inefficient and unsustainable (Montreuil, 2014). A statement very accurate and validated with the report given by FAO mentioning that one-third of food produced for human consumption is lost or wasted. A high level of waste is assigned to post-harvest handling and storage (Gustavsson, Cederberg, Sonesson, Otterdijk, & Meybeck, 2011).

Maersk Group has proven that the use of sensors that could trigger responses in a container, based on internal atmosphere conditions is a reality. The introduction of StarCare™ has increased the lifetime of post-harvest products such as bananas as long as 50 days. Even when this container is not an IoT example, it has proven that the adaptability of sensors that could monitor temperature and gases inside the container is feasible and economically viable. The combination of this gadget together with the recently delivered Maersk Line Remote Container Management which adds a GPS, sim card and a modem to the container, closes the gaps and provides a fully connected container, hence IoT ready.

All the additional concepts that enhance a digitalized intermodal transport platform requires mandatorily to be IoT accepted.

Big Data Analytics

Expecting a larger amount of data pushed by the introduction of IoT, it is expected that this data stored in clouds could help in improving inefficiencies and reduce cost based on observed trends. The process of mining into this large amount of data is considered big data analytics. An accepted definition considers big data as a massive collection of digital data that is so large and complex to make difficult it's processing by using traditional data management tools and techniques (Marozzo, Talia, & Trunfio, 2013).

The reception of large amounts of data from containers in real time will facilitate the introduction of operations research techniques but more precisely the real-time application of solutions for the academically known network routing optimization problem and empty container repositioning problem. The solution of both of these problems requires from a feed of information about the actual demands and the amount of supply the vessel has in terms of empties and loaded containers. The result is expected to provide with an optimal solution that reduces the steaming time, reducing the operational

expenses caused by bunker consumption but at the same time creates a significant impact on emission reductions.

In concern with container handling safety and fulfilling the International Convention for Safe Containers in regards with the continuous physical assessment of container conditions, BIC agreed in operating a Global ACEP Database. This database finds with the introduction of container live streaming information and the optionality of determining trends based on big data analytics, the opportunity to offer a change in the way containers are verified based on detected malfunctions by the use of IoT sensors considering internal atmospheric pressure levels, internal temperatures, metal oxides levels, etc.

Blockchain

The joint venture between APM Maersk and IBM catches the logistics industry attention. It is of great concern the number of transactions done in the movement of a container, considering the always higher security and smuggling risk. This concern is validated by APM Maersk that states with an example that a shipment of refrigerated goods from East Africa to Europe that can go through nearly 30 people having 200 communications between them (Chavez-Dreyfuss, 2017).

By involving just the necessary participants in a transaction including customs and security agencies, the risk of having a breach of information diminishes. At the same time since every transaction is recorded in a ledger¹ by a single irrefutable block², the transaction and ownership of a container will be irreversible and safe of fraud.

The creation of blockchain represents an important step towards the use of a global semi-standardize secure platform very much needed in the concept of collaborative logistics from which the next idea raises.

Physical Internet

The introduction of the PI concept trigger for the underutilization of space in containers, the empty steaming distances and the increasing concern of CO2 emissions. It is being argued that based on an actual performance there is an average utilization of 42.6% of space, meaning that most of what is transported is air and packaging (Meller, Lin, & Ellis, 2012).

¹ Ledger: also known as distributor ledger, is a database that keeps track of who owns a specific asset (Oerle & lemmens, 2016).

² Block: a database printed record in a blockchain that by design cannot be altered. Each block contains a timestamp and a link to a previous block.

The concept replicated the digital internet, where the transmission of information is done by consolidating that information in labeled packets constructed for a specific transmission and dismantled once it reached his destination. The application in the physical concept relies on the construction of PI containers that reproduce the function of the “packets” of the digital internet, but instead of transporting information it is meant to transport cargo. The enhancement of an interconnected platform augmented by IoT and the use of collaborative networks boost the consolidation of this PI containers into ISO standard containers. For developing this level of hyper connectivity, the IoT, Big data analytics and collaborative P2P³ systems such as what Blockchain can develop should be a central part of the operations structure.

This idea goes completely related with the transformation of collaborative open business. The use of common containers, warehouses, and manufacturing plants aims to reduce the number of physical assets and make a better utilization of the remaining “common” assets.

The expected impact is of having an opportunity cost of \$65.8B in the US alone, a reduction of \$100B/yr. in wasted fuel and lost time and a reduction of \$233.8 Tg CO₂ (Meller, Lin, & Ellis, 2012).

Conclusions

The use of the container has proven to be successful since his inception, based on his simplicity and global standardization.

As the rules of the trade are changing so rapidly, in part enhanced by the closeness of the final customer to the manufacturing and transport of their products, the need of introducing more sustainable, customizable and better utilizable containers has become a necessity.

The introduction of concepts such as Internet of things, big data analytics, Blockchain and Physical Internet are among some general solutions applicable to the use of the container in order to reach the level of business digitalization. There is a great expectation that based on digitalization the creation of safer, more secure, sustainable and at the same time profitable products will become a reality.

³ P2P: Peer to Peer.

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