

ELECTRIFICATION, AUTONOMOUS DRIVING, BLOCKCHAIN AND IN-HOME DELIVERY: GAME-CHANGERS IN TODAY'S WORLD OF TRANSPORTATION AND LOGISTICS

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1. INTRODUCTION

The world of transportation and logistics has changed much over the past 100 years and continues to change at a rapid pace. One hundred years ago in 1918 the highway and air transport industries were all in their nascent stages as rail and water transport moved the majority of freight around the world. At that time, the final mile from train depot to either consumers homes or to other businesses was still mostly handled by horse drawn carriages as improved internal combustion engines and vehicles were just starting to emerge and the supporting infrastructure was gradually being developed.

Fast forward to 2018 and the picture is drastically different. This article briefly summarizes three categories of change agents to global supply chain management that managers should consider as they plan their business strategies for 2018 and beyond. These categories include 1) the electrification of transportation, 2) the impact of information technology on transportation and business models (autonomous driving, blockchain and in-home delivery) and 4) the turbulence of rising nationalism in global politics.

2. ELECTRIFICATION

One hundred years ago, rail and water were the primary means of long-distance freight transportation for businesses around the world while

horse and buggy were used to manage the final mile of supply chains. At that time, however, emerging technologies in the internal combustion engine and in air travel were giving rise to completely new modes of transportation that would ultimately transform and globalize supply chains. Over the next one hundred years, these technological developments coupled with significant infrastructure investments by governments around the world enabled highway and air transportation to transform the ability of firms to move goods efficiently and effectively around the world for both inbound and outbound freight. Today in 2018, however, the current disruptive forces in transportation and logistics reside not necessarily in new modes of transportation, but more in refinements of propulsion technology such as electrification.

Most major automotive OEMs have published targets for electrification of their vehicle fleet and some have gone as far to commit to complete electrification of their vehicle fleets. Here are some example announcements made in the past 12 months:

- In July 2017, Volvo announced that every vehicle launched in 2019 and beyond would have some form of electrification (Volvo Press Release 2017).
- In October 2017, General Motors announced that it would launch 23 new all-electric vehicles by 2023 as part of its vision of a world with “zero crashes, zero emissions and zero congestion” (GM Press Release, 2017).

- In January 2018, Daimler announced that it would introduce 10 new all-electric vehicles by 2022 (Marklines, 2018)
- In March 2018, Nissan pledged to launch eight new electric vehicles and to have sold one million total electrified vehicles by 2022. (Greimel, 2018)

Despite this recent wave of global public announcements and commitments by automotive OEM's, public opinion as expressed by current vehicle sales does not necessarily reflect a robust acceptance of electrified vehicles across all countries. In the USA, for example, just under 200,000 electric vehicles were sold in 2017, representing only 1.16% of the 17.25 million total vehicles sold last year. US Government incentives that help subsidize EV sales are quickly reaching their caps and there appears to be no intention by the Trump administration to renew or extend the subsidies. The impact that expiring incentives will have on EV sales in the US is yet to be determined. Sales of EVs in Brazil are also anemic, especially given Brazil's position as being energy independent with its vast sugar cane ethanol resources. Replacing the usage of locally grown ethanol with electricity to drive Brazilian cars and trucks will be a daunting task not only from an infrastructure standpoint, but also from a political standpoint given the strong sugar cane lobby.

The world's most populous country, China, is now leading the world in total electric vehicle sales. Already in the first three months of 2018, China had "...year-on-year doubling of electric vehicle sales to 102,000 in the first quarter, making the country by far the world's biggest EV market." (Greimel, 2018). Additionally, Chinese ride-sharing company, Didi, recently announced that it had formed an alliance with 31 automotive OEM's to produce low-cost electrified mobility solutions for China with a goal of 1 million electric vehicles in its China fleet by 2020 and increasing that number to 10 million by 2028. They currently have 260,000 EV's in their China fleet. ." (Greimel and Jian, 2018)

While Europe has the second largest number of EV's on the road after China, specific country incentives and resulting EV adoption rates vary significantly across countries. In Norway, for example, EVs represented approximately 30% of all vehicle sales in 2016 while in that same year, Germany saw less than 1% of vehicles sales in the EV category (IEA, 2017). While consumer

environmental consciousness and other external factors such as the price of oil continue to impact EV sales, it appears that government incentives and policy represent the strongest influencing factor on EV adoption rates and sales. The automotive OEM announcements cited previously may be a portend of significant shifts in consumer purchasing behaviour or may be an attempt to achieve the needed economies of scale to support lower pricing so that EV sales can proceed without costly government incentives.

Either way, the debate continues regarding who owns responsibility for pursuing a cleaner transportation infrastructure. Should consumers be socially responsible agents to the degree that they pay higher prices for EVs to enable cleaner air that others who do not buy EVs can also enjoy? Should firms carry the financial burden by assuming less profit, or even financial losses to help more quickly usher in the era of EVs; or, should governments (i.e. tax payers) bear this financial burden for society instead? Ultimately, the global adoption of EVs will be a dance involving all three stakeholders.

While this discussion has focused on passenger vehicle electrification, it is also highly relevant to the inbound/outbound trucking industries as well. The ability for OEMs to develop lower-cost and higher performing battery technology will also impact trucking solutions. Tesla, for example, is leveraging its EV know-how in the development of an electric semi-truck that will have a range of over 500 miles. BYD, a Chinese-based EV manufacturer, has leveraged its car EV business to aggressively develop a portfolio of electric truck and bus solutions for municipality and local business needs around the world. In explaining their truck strategy, BYD executive Andy Swanton used the following figure to depict the market appeal, development readiness and profitability of various truck segments (figure 1).

3. INFORMATION TECHNOLOGY (AUTONOMOUS DRIVING, BLOCKCHAIN, IN-HOME DELIVERY)

While electrification of transportation is certainly changing the transportation landscape, developments in information technology present perhaps an even greater force for disruption in supply chains. Advanced data processing and programming capabilities coupled with new radar and lidar sensors,

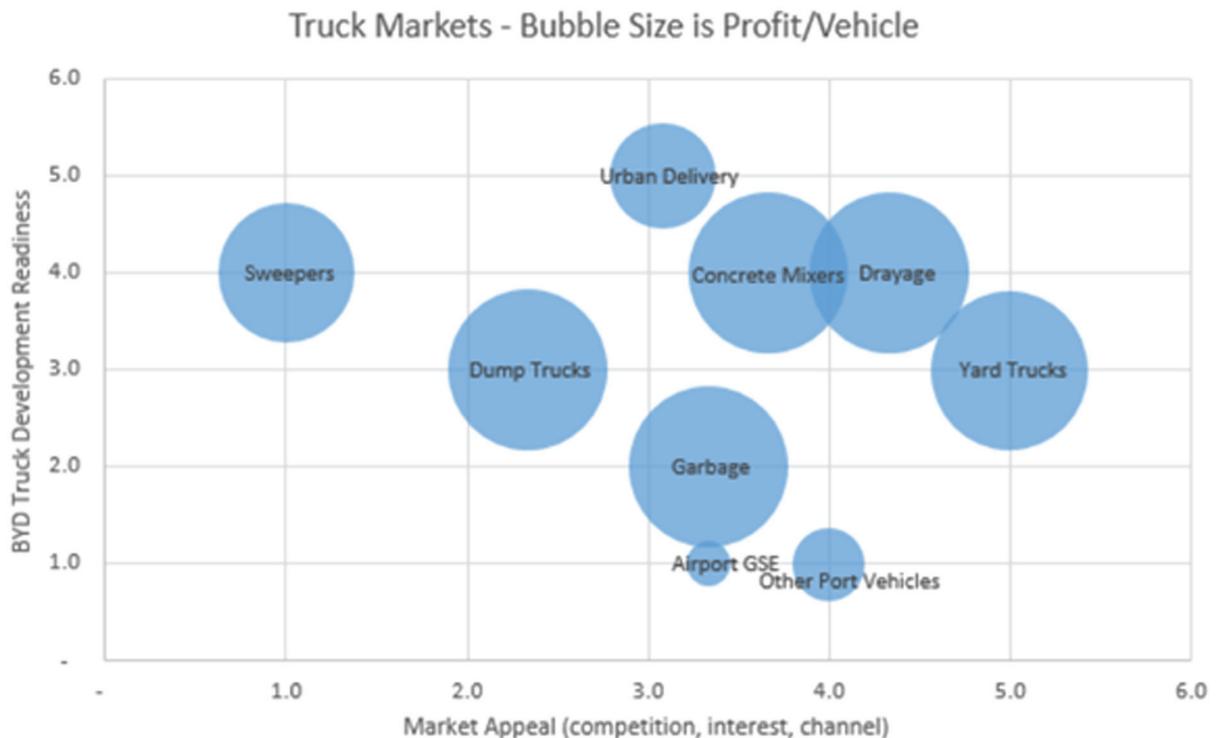


Fig.1: Electric truck adoption market analysis

Source: BYD Motors, Andy Swanton; accessed 6 May 2018 at

<https://tec.ieee.org/newsletter/july-august-2015/urban-trucks-will-eventually-all-be-electrified,-but-which-types-will-be-first>

for example, are enabling the development of both passenger and commercial vehicle autonomous driving systems. **Autonomous driving** systems are being tested in various areas around the world and hold much promise for economic benefit from both a safety and operating cost standpoint. The delivery time for commercial long-haul freight, for example, is constrained by human operators and the driving hours restrictions imposed by governments for such drivers. Autonomous driving could alleviate this constraint and also enable a reduction in operating cost for trucking companies. Autonomous driving, however, has encountered recent setbacks as some fatal accidents have highlighted flaws in the system and technology that need to be remedied.

Governments are also grappling with developing relevant regulation and liability guidelines. Take for example the situation of an autonomous vehicle that is in an inevitable crash situation where there are one of two options: either hit the wall in front of you thus injuring or even possibly killing passengers in the car, or swerve away from the wall and hit an elderly woman walking alongside the road. How will the algorithm for dealing with

this situation be developed? Who should write this code? Should the government dictate the rubrics for such code? Should the consumer be able to alter settings to their vehicle that would impact the outcome of this situation? Despite these challenges, the march towards autonomous driving continues as the promise of safer transportation and improved productivity overshadows the growing pains.

Another information technology development that is changing transportation and logistics is the **asset sharing industry** and its associated apps. Uber, for example, has mobilized over two million underutilized passenger vehicles in the world to provide a lower-cost transportation alternative to traditional cabs, thus increasing mobility in society. Didi Chuxing, a Chinese ride sharing platform company headquartered in Beijing, purchased Uber's China unit in August 2016 and in May 2017 started developing its own English version of its popular app. Currently serving 450 million Chinese customers, Didi is looking to start expanding into global markets and announced in late April 2018 that it is going to expand into Mexico (Gremiel and Yang, 2018).

Information technology is also enabling an entire new platform for both individuals and firms to engage in economic exchange – this platform is called **blockchain** and is the technological underpinning of new crypto-currencies that have taken the financial industry by storm. While blockchain has been used to create the well-known crypto currency of bitcoin, it is also being used to create entirely new platforms of economic exchange that reduce transaction inefficiencies. The essence of blockchain technology is the creation of a shared ledger that stores transaction records in a manner that links new blocks of transactions with prior blocks. Transactions are encrypted and can only be accessed by those with the permission to do so. Using blockchain to conduct business enables transactions to be private, immutable (tamper-proof) yet traceable when needed (Gupta, 2017).

Maersk, for example, is running a pilot project that uses blockchain to streamline the sea container importing process. The movement of a sea container from one country to another requires that multiple parties have access to the same information: shipper, buyer, freight forwarder, government tax agency. Currently, this information is managed in a complex sea of paperwork. Using, blockchain, however, Maersk is hoping to reduce the required paperwork and thus improve both speed and efficiency (Hackett, 2018). Walmart has a blockchain pilot project in China to establish traceability of its pork supply chain (Shaffer, 2017). The diamond industry is also exploring use of blockchain to create an immutable record of traceability so that end consumers can be assured that their diamond purchases were sourced from non-conflict areas (Irrera, 2018).

These few examples illustrate the varied applications for blockchain across various elements of supply chain management. As blockchain applications for supply chain management emerge and mature, old business models may need to be revisited. For example, given the increased supply chain visibility that blockchain enables, firms that rely on being an intermediary or a market-maker as their key value proposition may not survive unless that firm is adding value beyond its role as a market-maker. Blockchain applications may have the potential to significantly change the business strategy landscape over the next few decades.

In-home delivery is another new emerging service that is changing the rules of traditional supply chain

management through developments in information technology. Whereas the final mile of supply chains used to consist of getting a product to either a retail location or to the customer's front porch, in-home delivery consists of using a smart lock and security camera to allow a delivery person to open the door and deliver a package *inside* a home and then relock that door upon departure. In essence, the final mile is being redefined and extended into consumers' homes. Using a security camera, the delivery is recorded and streamed to the consumer over the Internet.

Amazon was the first major retailer to offer in-home delivery and launched its service in November 2017 (DelRey 2017). In-home deliveries are made with unbranded delivery vehicles and delivery persons who have a device that can activate a one-time use code provided by Amazon to access entry. Amazon developed the app that manages the entire transaction and receives the consumer's agreement to store a digital key code to their home so that they can generate one-time use codes for each and every delivery. What is interesting about this service is that it represents a new dynamic of trust that did not previously exist between the consumer, retailer and delivery agent. Consumers need to trust Amazon with storage and management of a key to their home and in turn trust that the delivery agent will not abuse their access to the home.

The Amazon model for in-home delivery has strategic implications for other companies looking to provide this service. First, those looking to so do must have an unequivocal level of trust with the consumer. Second, retailers need to understand that misbehavior by the delivery agent could put at risk more than the simple trust between consumer and delivery agent but may have a significant impact of the consumer's level of trust with the retailer themselves and could impact purchase behaviour and loyalty.

4. TURBULENCE OF RISING NATIONALISM

The electrification of transportation and the information technology revolution outlined in the prior sections provides the backdrop of an exciting and promising future for transportation and logistics. One more trend, however, needs to be mentioned in this article that can have a large and sobering impact on how businesses manage their supply chains – this trend is the increasing tendency for countries across the globe to sideline the global growth agenda in

deference to maximizing the well-being of their own country. This increasing wave of nationalism, beyond politics, is a real factor for supply chain planning since economic models used to optimize the cost equation when supply chains are established are no longer as stable as they once were. With little to no warning, a country can erect trade barriers and implement adversarial policies that firms can do nothing about unless redundancy has already been built into their system. The unpredictable nature of global trade policy is a new factor in today's world.

Post-World War II reconstruction brought with it an increased momentum for global cooperation as countries reached across borders to both rebuild and retool economies. The standardization of sea container dimensions helped accelerate these efforts and also fuelled the globalization of supply chains and trade. Despite some temporary recessions, the global economy and global trade has continued to increase decade after decade. The World Trade Organization has played an important role in facilitating the boundary conditions of global trade and has supported round after round of global trade negotiations that resulted in measured reductions in trade barriers across the board.

Today, however, some countries such as the USA and the UK are leading a change in tactics that favours bi-lateral deals as opposed to the traditional global rounds of trade deals and regional trade pacts. Many are watching how their largest trade partners (China, NAFTA and the EU) will react and if the rising tide of nationalism will be more of a permanent fixture. If so, then supply chains will need to design more flexibility through redundancy or contingency planning that will enable it to quickly react to adverse changes in import duties or export/import quotas.

5. CONCLUSION

While global trade is under attack today, other forces for globalization and increasing economic interdependency are on the rise, much of it being led by China. China continues to invest in infrastructure that will further enhance global trade with itself such as the 'silk road' that will better connect China with central Asia, Europe and the Middle East. China also continues to lead investment in Africa infrastructure projects and is a frequent arbiter in helping integrate former reclusive states into the global arena.

Despite turbulence in the geo-political landscape, there is much to be optimistic about. The march of technological progress continues unphased and so does the field of transportation and logistics. Looking forward to the next 100 years, there is no reason to doubt that the pace of innovation and progress will not abate. This article has outlined some key trends and factors that are shaping the future of transportation and logistics; the key question one must ask is how to best ride this wave of progress.

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