**THE FUTURE TO HIGHWAY LOGISTICS – A BLOCKCHAIN APPROACH**

The Freight & Logistics industry is an essential component of a nation’s economy, as it supports the nation’s quality of life aspirations. However, the industry’s contribution to the overall economy is shrinking due to several challenges that the industry is facing. Some of the problems that this industry face include:

* **Technology**

The revolutionizing of the industry has been brought about by the utilization of technology, largely for the better state of the industry. Tracking and automation have enabled the market players to achieve greater economies of scale, and this has been – and will remain- a major growth force for the sector. Drones, autonomous vehicles, and advanced telematics, which are the emerging technologies in this field have come to stay.

However, this technology still presents a significant challenge in the industry. Some of the barriers to the use of this technology are as follows:

* The lack of digital culture and training
* Skill shortages and insufficient talent
* Data security and privacy

A massive opportunity for the Freight & Logistics industry is the introduction of technology, but it comes along with cyber risks, which is an increasingly topical and serious issue in the industry. Cyber risks would therefore need to be combated in order to mitigate risks with cyber insurance.

* **Driver shortage and ageing workforce**

The Freight & Logistics industry is struggling to attract highly skilled employees. Highly-skilled employees with a vital range of technical skills are a scarce resource, and the Transportation & Logistics companies are lagging behind other sectors when it comes recruiting and attracting new talent. The industry is sometimes not seen as attractive or lucrative for job seekers, due to several benefits that are not obtained, unlike in the other sectors. Truck drivers are seen as a job for the aged (with an average age of 46 years), and therefore these jobs are not enticing to the youth of today.

* **Infrastructure**

The industry relies on the government to plan and fund major infrastructure, such as roads, railways, airports and ports. This would create opportunities for further efficiency gains, but the positive impact of infrastructure upgrades will not be evenly distributed across the sector. Port infrastructure upgrades and expansions will have a positive impact on competition, cost reduction and productivity, but ports have historically been bottlenecks during the infrastructure growth period. Efficiency gains in the road transport sector will be modestly felt too, as firms are likely to only benefit from improved routes and capacity.

These are just a few problems the industry faces. In order to mitigate some of these problems, this project seeks to achieve the following:

* Effective transport, tracking and monitoring of goods
* Minimizing financial risk in the industry
* Improve operator safety and lives of drivers
* Make the industry lucrative for drivers
* Make logistics industry more efficient

The contributions of our work can be categorized into three (3) areas, namely;

* **Insurance**

We employ a Blockchain-based, smart contract system in the issuance of insurance claims to parties involved in the industry. Smart contracts are programmable scripts that enforce policies (as the name suggests), based on stipulated rules in the contract. In our model, smart contracts capture insurance operations such as client registration, policy assignment, payment premium, claim submission, and refund processing. The entities in our model are the truck company and truck drivers, with the commodities being the goods transported and the trucks themselves.

In a scenario, that is mentioned in the next contribution (mapping system), smart contracts are invoked whenever there is an instance of an insurance claim.

On the assumption that a truck driver takes a longer route, but due to over-speeding gets involved in an accident, the smart contract is visited and the policies are reviewed before a conclusion is drawn as to whether a defaulting party receives an insurance package or not.

One may argue that a driver must speed up to make up for his mistake (taking the longest route to avoid tolls). In our system, a deep-learning model is incorporated to calculate and make for allowances that may be required for **Time of Arrival (TOA)** of vehicles, based on parameters such as either driver and/or weather conditions, that affect the times drivers take to arrive. If a truck arrives within the “calculated time”, and not as a result of over-speeding, tokens (as mentioned in the next section) are issued, and also in the case of when an unfortunate event occurs, insurance claims can be issued out. For a truck that arrives early, but outside its calculated time, the algorithm learns about any misconduct on the part of the driver. This aims to achieve driver safety, and reduce financial risks.

Due to the implementation of the Blockchain and the smart contracts, insurance fraud is curbed. This is due to the fact that, every detail is recorded on the Blockchain, and revisited should any problem arise. What’s more, there are several advantages of the Blockchain system, for which we decided to go with this technology. Some of these benefits include ensuring trust among the participants, immutability, security, scalability, traceability and transparency. At the end, a global sequence ID, which is core to the company’s objectives is developed.

* **Provision of a less sophisticated, flexible mapping system**

Unlike the traditional maps (provision of a single route) being used for navigation services by the drivers in the transportation of goods to their destinations, we improve the mapping system by the introduction of a multiple-route mapping system. When a driver keys in the destination address for the delivery, the mapping system, developed through an APP, provides multiple routes for which the driver will select the most attractive, cost-efficient route to follow to his situation.

Consider the following scenario:

1. A route from Chengdu to Xian is 2.5km wide and takes 1 hour, 30 minutes before a driver reaches the destination. However, there are toll-booths on the road, for which the driver must pay to be granted passage.
2. Another route from Chengdu to Xian, also given by the map, lasts for 2 hours, 15 minutes and is 5km wide. The advantage of using this route is that the driver doesn’t pay any toll fee but a great disadvantage is the use of more fuel.

The above two scenarios offer a degree of freedom to the driver as to which route is best for him to take. However, in the interest of the company, the driver should take the shortest path to the destination in order to reduce costs. In that case, the application monitors the driver actions taken in the course of the journey and at the end, incentives are awarded to drivers who comply with stipulated rules.

* **Credit/Point System**

Quite related to the second contribution is the credit system, where points or tokens or awards are given to drivers who comply with rules stated by either the company or the insurance company. This incentive hopes to alleviate the driver shortage problem in the industry, as it plans to make the industry lucrative for all players involved.

An architecture of our model is given below.

