

L28-Genesis

L28's Genesis blockchain primal to steak project

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Prepared by
James Williamson

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Contents

Contents	2
1.0 Executive Summary	3
2.0 Introduction	4
3.0 Project Objectives	5
4.0 Methodology	6
5.0 Project Outcomes	13
6.0 Discussion	13
7.0 Conclusions / Recommendations	14

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1.0 Executive Summary

The L28 Steak to Primal blockchain project sought to overcome the transparency issues faced by Australian beef brands who don't control the end production of their beef in international markets. The major lack of transparency occurs with the breakdown of primal to steak. With little to no visibility of the end volumes of product sold using the National brand "Australian" or under the Australian establishment number and or the actual named brand, exporters are rightfully concerned duplication and substitution of beef could occur.

As an exporter ourselves the team at Latitude 28 Produce were early adopters of traceability technologies. In order to provide the best solution for our known problems we have always opted to develop custom solutions in house. Knowing firsthand the problems faced when exporting to China we were well placed to understand the complexities of applying an end-to-end traceability solution. The biggest challenge we face is being able to have autonomous remote monitoring and product controls applied to the 3rd party factories processing our primals into retail packs. We sought to solve the issue of accurately mapping steak to primal using several photo and video data points.

To achieve an accurate mapping of steak to primal in an international 3rd party facility the system needs to be simple and maintain production efficiencies for the international plant to adopt it. The project sought to separate the steak to primal mapping into two streams of photo matching and video monitoring.

Photo stations positioned post the weigh station at the Australian abattoir captured a photo of the cartons label face and the internal contents. These images were used to create a digital twin of the genuine article. The same station was replicated at the China factory. Passing the China photo station signified the opening of the carton for retail processing and captured the same replicated photos. Referencing the digital twin ensures the true and correct product had arrived at the international plant.

All image capture events were triggered by the scanning of the cartons unique QR codes. The scan was also committing the users action to the Ethereum blockchain. The scan event was also used to map the CCTV video footage of the production event against the products UID storing the breakdown of the primal to retail pack for auditing if needed.

On top of the photo matching and video mapping weight controls were also implemented to prevent a duplication event of more retail weight being produced than what had been imported. The weight drawn down enabled the inheriting of the cartons supply chain story to be appended to the retail packed steak.

The project design was a success but BETA testing the processing of the tracked primals from Australia at the China plant was impeded due to Covid restrictions. The mock testing at the plant highlighted several issues with the system. The major issue faced was Chinese Internet service providers don't provide dedicated and stable IP addresses. The rotating of IP addresses prevented the L28 Genesis web app from accessing the CCTV network video recorder. This prevented real time monitoring and real time appending of the steak to primal video against the carton and product UID on the L28 system.

Network issues and data transfer limitations when sending data back to Australia formed most issues at the plant. The GPS accuracy of the field app varied greatly from Provence to Provence causing time out errors. This was overcome by reducing the GPS accuracy of the app.

2.0 Introduction

The Genesis L28 primal to steak project sought to track the production of retail packed steaks inside a Chinese processing factory back to the primal it was cut from. The retail packed steak would then inherit the supply chain journey of the primal that was tracked from the Australian abattoir.

The Journey of the primal from Australia is tracked via multiple independent parties committing actions to the unique identifying data (UID) in the form of a QR code attached to the primal carton.

In the project each primal had actions committed by independent permissioned users of the genesis blockchain application by scanning UID's. The permission to commit actions was determined via the user having an account and password allowing them to log onto the blockchain field app. Actions by permissioned user were hashed and committed directly to the Ethereum main net from the field app.

Each action captured- Date, Time, UID, de-Identified username, Action committed, GPS coordinates.

Example of action

```
{"time":"2021-11-02T06:25:47.490172Z","cartonID":"655a64ba-1303-4ba0-92e5-fb16b9e83a0b","cartonCode":"CAR01284","productID":"b86ac273-726a-4cff-8f8f-8dd61bfa89b6","productCode":"P07698","entityName":"天津轩诚报关有限公司","location":"31.XXXXXXXXX, 121.XXXXXXXXX"}
```

The project sought to map the conversion of primal to steak in the Chinese factory by using image and video data. The image and video data was collected via custom photo stations (referred to as Robot jig 1 and 2) and CCTV cameras. The image and video data prevented substitution of product. The weight drawn down of retail pack weights against primal carton weights prevented duplication.

In the event were more retail weight was produced than what was imported the brand owner would be notified in the production report.

An example of a typical actions applied to a primal/steak UID.

- Primal processed - Abattoir
- Primal dispatched - Abattoir
- Received at logistics centre - Freight forwarder
- Exported - Freight Forwarder
- Imported - Chinese Customs Agent
- Covid Tested - Import agent
- Received at retail packing facility - Domestic Factory
- Opened for Processing - Domestic Factory
- Retail Packed - Domestic Factory

3.0 Project Objectives

The project objectives are to develop and demonstrate to AMPC staff the L28 Genesis systems approach to offering a cost-effective and robust primal to steak, and steak to primal, traceability system, within a demonstration facility. The project will demonstrate the following key criteria, the process, ability to trace forward and trace back, “alert of non-traced product (primal and steaks), the cost effectiveness and the systems robustness to operate in an international facility.

3.0 The Process

L28 will demonstrate how the third party cutting room will use the process and what equipment is needed to be in place to ensure robustness/reliable/bullet proof solution.

3.1 Trace Forward and Trace Back

L28 will demonstrate an interface that shows which steak each primal has been sourced from.

3.2 “Alert” of Non-traced product (primal and steaks)

L28 will demonstrate the alert procedure and method the system used to identify the duplication of product. The system will alert the Australian management system of the error and the data supporting the identification of the duplication event.

3.3 Cost Effective and effective

L28 intends to develop a methodology and system that can be replicated at minimal cost to the international processor (demonstration facility) and with minimal changes to the international facilities current systems and production processes whilst maintaining the L28 Genesis systems ability to track and trace the primal to steak.

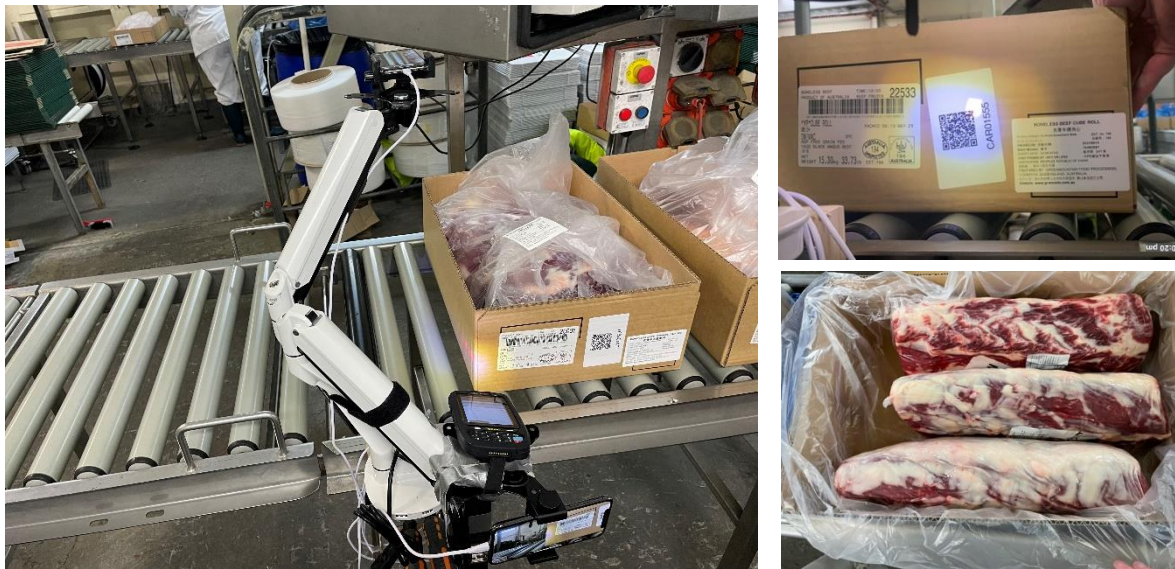
3.4 3.2 Robust primal to steak traceability system

L28 intends to develop a robust system by working within the confines of an established Chinese value adding room. Working within these confines ensures that the system must and can achieve the required useability to ensure willingness to adopt. Further to this it maintains that the digital infrastructure can exchange data between the international establishment and the Australian management system.

4.0 Methodology

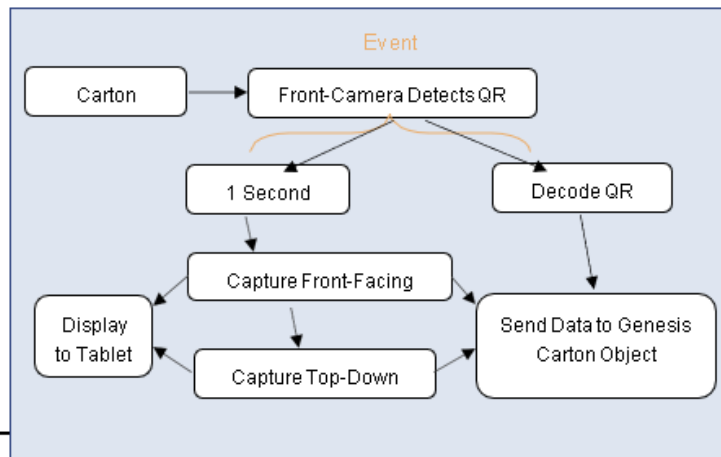
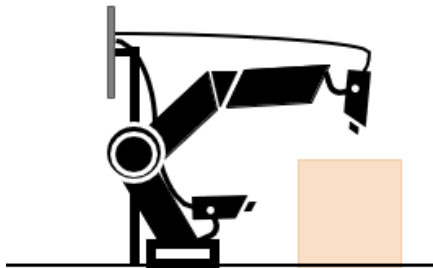
The next steps are a chronological sequence of steps of how the end-to-end system tracked steak to primal and steak to Australia.

- 4.1.1 Australian abattoir scan station scans the UID triggering a Carton interior photo and carton label photo. Weight of carton is appended to the UID and will be compared on arrival to China factory.

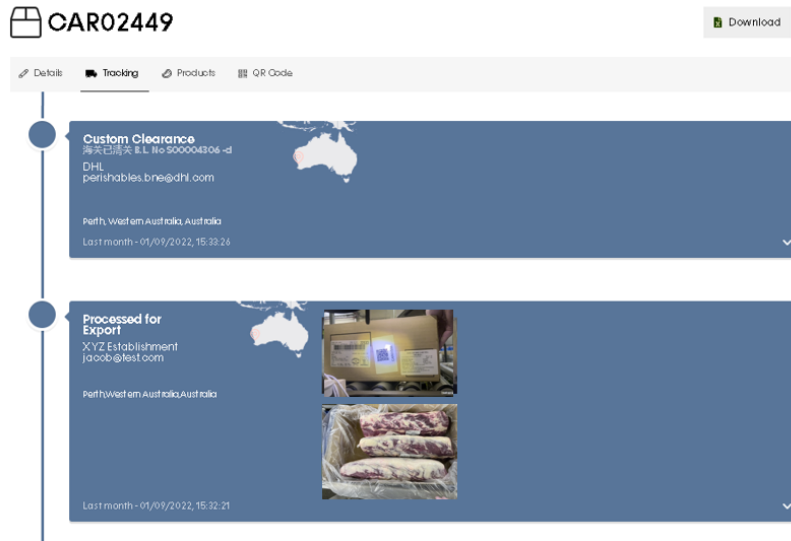


Hardware Requirements

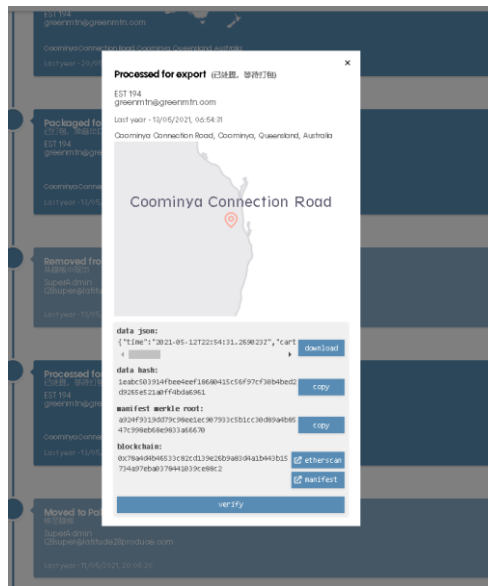
- 1 Android Tablet
- 2 USB Cameras



4.1.2 Photos stored against Carton UID creating a carton digital twin for reference.



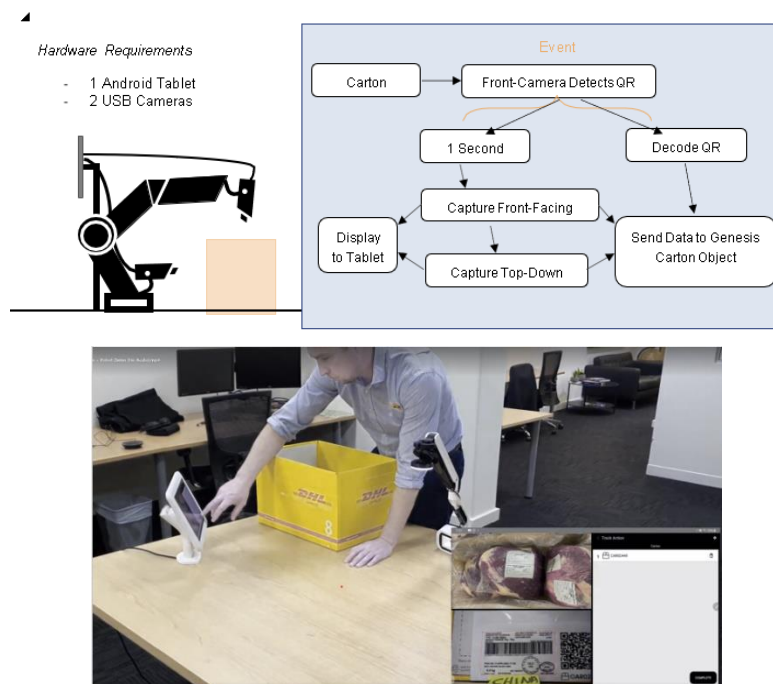
4.1.3 Blockchain Action committed by Australian Abattoir



4.1.4 Multiple actions committed by permitted users of the blockchain application tracking the movement of the carton from Australia to China.



4.1.5 Scan of carton UID at Chinese factory via Robot Jig 1 replicates carton photos captured in Australia at the abattoir scan station.



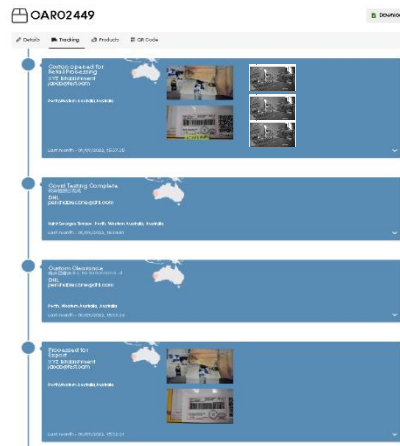
4.1.6 Photos Stored and available for comparison against Australian digital twin.



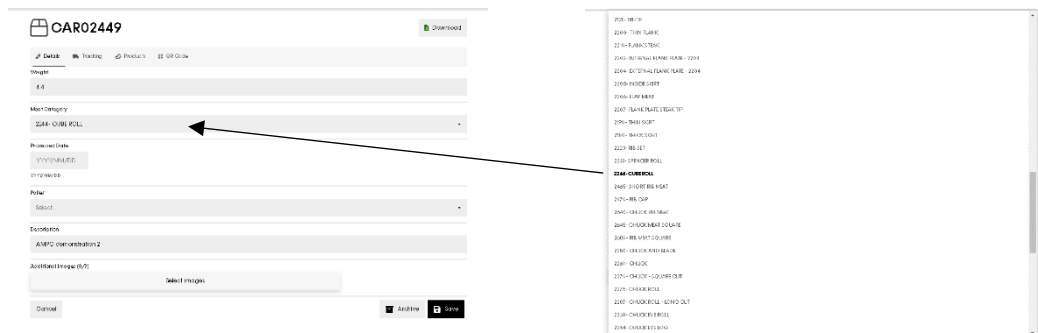
4.1.7 China scan of UID commits the blockchain Action Opened for Processing



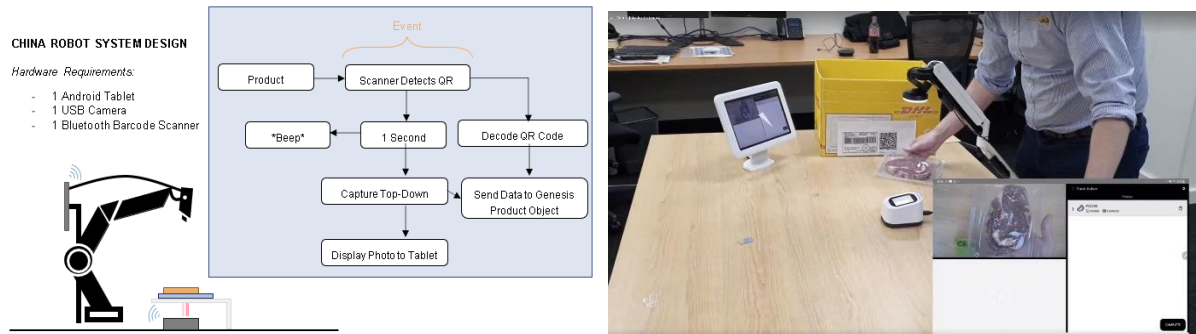
4.1.8 Scan of the Carton UID activates Genesis web app to splice the CCTV video against the time stamp and stores file against carton UID. The action assigned to the scan is mapped to the relevant CCTV cameras at the China factory.



4.1.9 The assigned action opened for processing signals to the system that meat type XYZ from carton XYZ is available for retail production. Retail products created from that meat type draw their weight down from that carton until weight is exhausted.



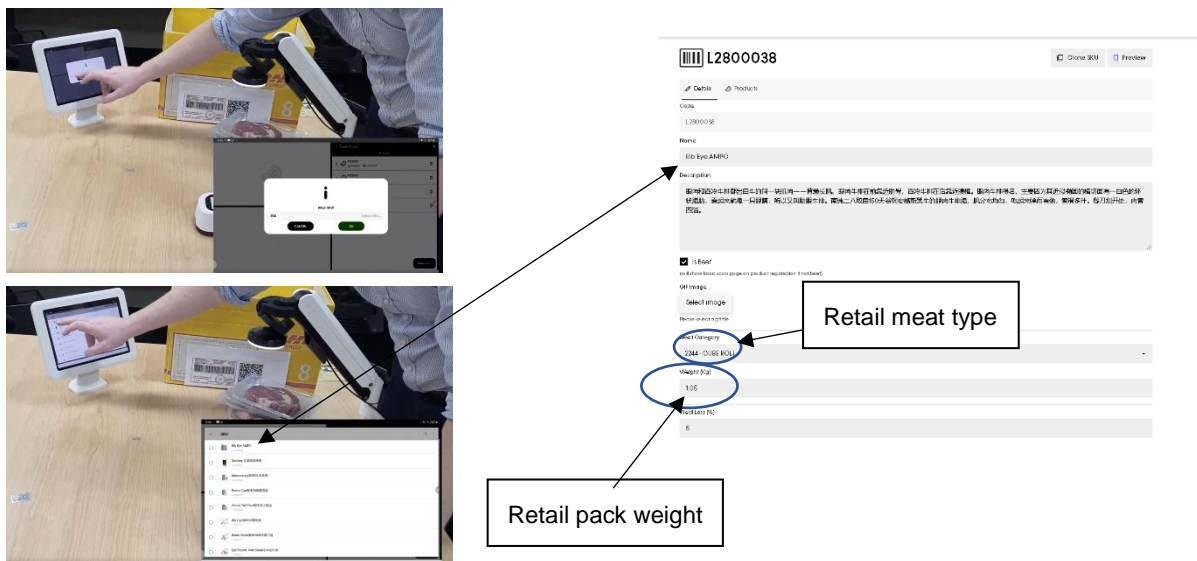
4.1.10 The primal is opened and moved to the cutting table. Movement is captured by the CCTV cameras. Steaks are cut and tray packed with a retail QR code attached to the product. Retail product QR code UID is scanned by Robot Jig 2.



4.1.11 Retail SKU type appended to the scanned QR UID by the factory user once carton is packed with multiple tray packed steaks.



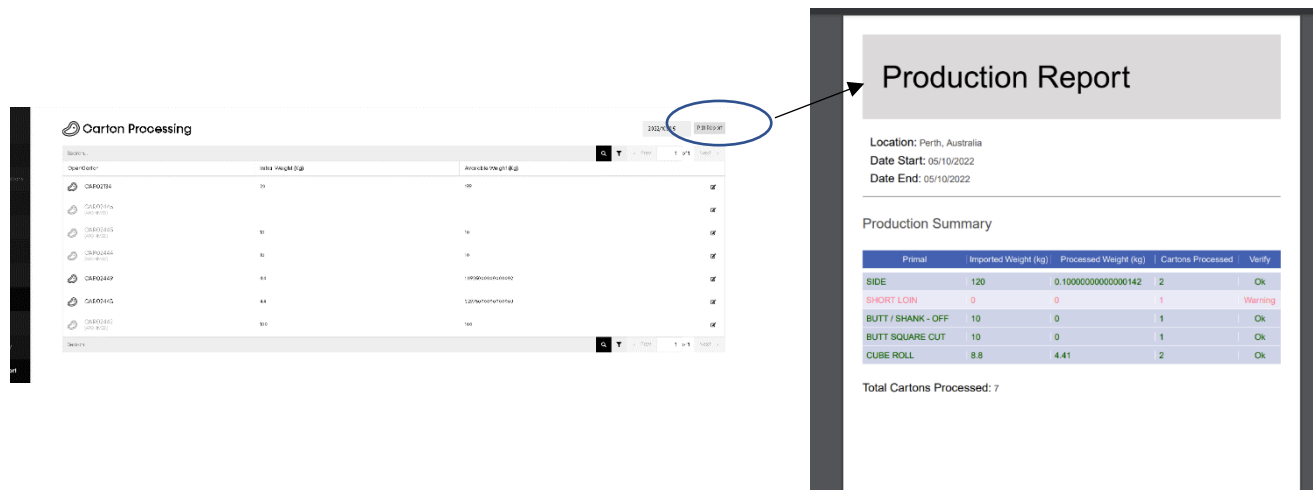
4.1.12 Retail weight of Meat type XYZ drawn down from the last opened carton of the same Meat Type identified by the scan at Robot Jig 1.



4.1.13 Blockchain story of the last opened primal carton that the retail weight was drawn down from is inherited by the retail product.



4.1.14 End of day production report notifies brand of any retail weights that exceeded the amount of opened weight for that meat type.



5.0 Project Outcomes

The project was successful in developing the end-to-end system. The project was not successful in completing the BETA trial at the Chinese factory.

The trial was impeded because the original Chinese factory with the integrated CCTV cameras installed was decommissioned. The factory was shut down because of Chinese Covid restrictions placed on processing of international meat. There were several successful mock trials completed at the plant but the primals that were tracked from Australia on the Genesis system were unable to be processed at this factory.

6.0 Discussion

The system did provide a robust system for tracking steak to primal inside an international factory. The project was made extremely difficult because Australian staff could not be present in China. This created inefficiencies and delays because of relying on Chinese technicians at the factory.

The major technical inhibitor faced by the project was a result of Chinese internet service providers not providing dedicated IP addresses. Without a constant and dedicated endpoint for the CCTV network video recorder storage the Genesis web app could not run-in real time. This prevented the Genesis Web app from being able to splice the video in real time and store the conversion of steak to primal against the carton and retail pack UID. A dedicated IP service was able to be purchased from the ISP providers, but costs varied from 20,000 to 40,000 AUD per annum. These costs would be an inhibitor if the cost was going to be passed on to the Chinese factory.

The CCTV solution did provide a low cost easily adopted digital capture point, but the video quality was limited. All Chinese factories approached were willing to share CCTV footage with brand. The common use of CCTV for reviewing manufacturing processes means this is a viable and accepted data sharing format.

The other technical difficulties faced was different provinces failed to get GPS coordinates from the field app devices. It was rigorously tested across multiple China locations with no definitive reason identified why certain areas would easily give GPS coordinates and others would not. This was overcome by reducing the GPS accuracy.

7.0 Conclusions and Recommendations

The project proved to be extremely difficult because of Covid related issues preventing access and putting additional restrictions on the processing of international meat. It can be concluded that the system would require additional features built to reduce the need to transfer image and video data out of China for real time monitoring. A daily upload to enable post production auditing is currently achievable.

Other difficulties that could become more problematic overtime is the restrictions China is placing on Ethereum nodes. It could be considered more optimal in the future to post smart contracts to alternate public blockchains that are not being restricted in China.