

## BeefLedger

Fighting food fraud with technology: blockchain, IoT, NFC and more

### **THE PROBLEM: FOOD FRAUD**

#### How confident are you in the foods you eat?

Few things anger consumers more than discovering their food isn't the genuine article – and for good reason. We all expect the food we buy to be what it claims to be, and there can be significant health implications if it's not. It's one thing to eat <u>lasagne that contains horse meat rather than beef</u>, or to buy <u>falsely labelled</u> <u>Manuka honey</u>; these are crimes, but they're unlikely to injure anyone.

Not so for the <u>six babies who were killed and 300,000</u> who were injured in China by baby formula containing melamine. Melamine was added to help low-quality formula pass quality tests – it's high in nitrogen, which is a key indicator of protein levels.

Food fraud is also a significant source of economic risk; PricewaterhouseCoopers has estimated that food fraud costs the global economy some <u>US\$50 billion annually</u>. Customers want to have confidence in the safety and quality of their food. Being able to communicate to customers that they can trust in what they're buying opens up a lot of opportunities for smart businesses.

Adam Gibson Transport and Logistics Risk Engineer, NTI

It's a big deal, and it hurts Australian producers and consumers alike.





#### BEEFLEDGER

We all know that beef is an important Australian export. Better still, Australian beef has a global reputation for quality, thanks to our strict quarantine laws and rigorous standards.

Meat Standards Australia (MSA) is a grading system that <u>ensures the</u> <u>quality of Australian beef</u>. Developed to improve the consistency of our beef and sheepmeat, it "takes into account all factors that affect eating quality from the paddock to plate".

China is Australia's <u>top beef export</u> <u>market</u>, according to figures from Meat and Livestock Australia (MLA), accounting for some 24.5% of our output, and commanding premium prices thanks to its high quality.

BeefLedger is a <u>technology solution</u> (and a company) dedicated to protecting this reputation by providing complete traceability of every shipment from paddock to plate.

It combines state-of-the-art technologies including blockchain, the internet of things (IoT), near-field communication (NFC) chips, QR codes and radio-frequency identification (RFID) tracking to provide transparency and streamline transactions across the entire supply chain. Best of all, it means purchasers – currently in logistics companies and restaurants, but perhaps one day restaurant diners too – can scan a QR code on a package of produce and see immediately that it's genuine.

Substitution is a big issue in China. Ox and buffalo are sometimes sold as beef, so being able to use an app on your phone to validate a shipment is a big advantage.

Adam Gibson Transport and Logistics Risk Engineer, NTI

### **BLOCKCHAIN**

#### What makes BeefLedger unique is its use of blockchain

**Blockchain is a 'distributed** ledger' technology, akin to a large, decentralised database. That is, it stores information (data) in a series of 'blocks' linked together in a 'chain' that provides a complete and publically available history of the item in question.

A block has three parts: information about the transaction (including time, date and value), cryptographically protected 'keys' to identify the participants (buyer and seller) and a unique identifier (to distinguish similar transactions from each other).

Blockchain uses a network of computers called nodes, operated by the chain's participants (e.g. users of a digital currency like Bitcoin, or an industry solution like BeefLedger). Each holds copies (i.e. a ledger) of all the chain's transactions.

When a participant wants to make a transaction, such as buying a product, every node in the network uses a cryptographic algorithm to compare the user's unique 'public key' with the 'private key' included in the transaction instructions. If a majority of the nodes okay it, the new block is approved and added to the chain.

The fact that the ledger information is distributed across many nodes, combined with the use of algorithmic 'keys' to secure transactions, is what gives blockchain much of its power, flexibility and security.

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**Blockchain makes the logistics** chain more efficient because you're not relying on paper, and it gives everyone more visibility into transactions.

It's a global technology, and it's developing fast ... we're excited to see what we can do with it.

Andrew Kidd, Head of Marine, NTI



BeefLedger uses QR codes, RFID tags and counterfeit-resistant stickers with rare earth metals, replicated across every level of packaging, as well as individual devices for GPS and tracking so we can trace every package of beef from farm to fork.

Adam Gibson, Transport and Logistics Risk Engineer, NTI

#### **TRACKING TECHNOLOGIES**

BeefLedger uses many tracking technologies to provide the data needed to keep the Blockchain current as well as monitoring the goods' quality and location. These include:

#### → RFID tags

Radio-frequency identification chips are included in livestock ear tags, giving access to information about an animal's ownership and history. They are also used to track boxed packages of steak.

#### ➔ NFC chips

Near-field communications chips are also used to track packaged steaks.

#### → QR codes

Especially in China, QR codes are used to identify shipments and connect to information about a package's provenance.

#### ➔ IoT sensors

Internet of things-connected sensors transmit information about vehicles' movements and itineraries, conditions inside shipping containers, and more.

#### → Rare earth metal labels

Packages are tagged with labels containing rare earth metals – as these are extremely difficult to produce, let alone forge, they provide another layer of security for packages of beef.

Taken together, these technologies further ensure BeefLedger is protecting the final product's integrity at every stage of production.

#### **TECHNOLOGY ON TRIAL**

In 2018, NTI sponsored BeefLedger's first full trial – running from a cattle station in Mt Gambier, Victoria to an abattoir in Casino, NSW for processing and then shipping to Shanghai, China.

Partnering with <u>Queensland University of Technology</u>, <u>Food Agility</u>, Astra and <u>LinkeyChain Intelligent Technology</u>, the trial was an opportunity to put the entire BeefLedger solution to the test:

- 1 Cattle were identified by RFID tag at Mt Gambier.
- 2 The truck journey to Casino was monitored.
- **3** After processing, boxes of steak were packed at Casino.
- 4 NFC chips were added to each box and scanned to show their point of origin.

- 5 Rare earth stickers were added to each box for security.
- 6 QR codes were attached to each box to assist with processing and transactions in China.
- 7 Geotab RFID tracking was used to monitor the location and progress of each package.



Data in transit is often held by shipping companies, who might be reluctant to share it, for example if a freezer goes off.

As technology gets cheaper, there's a case for clients to use it and get more accurate documentation as a result.

Adam Gibson, Transport and Logistics, Risk Engineer, NTI



#### **BEEFLEDGER HITS THE ROAD**

The road journey held special interest, as BeefLedger presented an opportunity to fill in what's normally a 'data gap' for logistics operators.

That was the key reason for sending the cattle to an abattoir so much further away than usual – to test and optimise data collection.

The data provided valuable insights. For example, the driver broke the speed limit a few times and complied with all requirements around driving hours, rest stops and logbook upkeep.

The cattle arrived with minimal bruising (a testament to good driving) and, thanks to the longer-than-usual trip, lost a little more weight than usual.

In other words, the trip was noneventful, with a highly professional driver delivering the cargo in excellent condition. BeefLedger's equipment worked as expected, generating and transmitting data in real-time and maintaining the blockchain's integrity.

This type of data-gathering has significant implications for transport and logistics beyond BeefLedger. Transport operators are hungry for data to help them improve driver safety, optimise efficiency and protect goods in transit.

Similarly, insurers can use such data to better understand risks, develop appropriate policy responses, propose safety measures and predict hazards in advance. With all the data we gathered, we found that how you drive the truck makes a difference ... a good transport provider can upsell your service.

And we found the NFC slowed packing at Casino, so that's something to optimise.

Adam Gibson, Transport and Logistics Risk Engineer, NTI



#### **SHIPPING TO SHANGHAI**

Once the cattle were processed, the beef was packaged into boxes, mostly 5kg packages containing five steaks. The packages were then tagged, labelled and loaded into shipping containers for transport to Shanghai.

We turned all the telematics on for shipping so we could learn what to monitor, what justified an alert in the supply chain and what needed real-time updating. Protecting the chain of responsibility is important, and the data we recorded is critical for compliance.

Adam Gibson, Transport and Logistics Risk Engineer, NTI

There were five requirements for the shipping technologies; they all needed to be:

- → Easy to install.
- ➔ Reusable.
- → 3G network-compatible.
- ➔ Able to store information while out of network range.
- ➔ Able to show where and when an event happened.

BeefLedger's tracking devices were around the size of a small TV remote and proved perfect for use with fresh and frozen products. They monitored temperature, location and humidity, which eliminated doubt around temperature faults.

Critically, they provided live monitoring during transport and were small enough to be hidden inside pallets and packages for security.

Once the packages arrived in China, they were unloaded and delivered to their final destinations, where the receivers scanned the QR codes and were able to verify delivery and view the entire chain of transactions.

# The information provided full proof of the goods' provenance and transaction history.



#### WHAT'S NEXT?

#### BeefLedger passed its first test with flying colours.

Chinese consumers want to enjoy Australian beef and are willing to pay premium prices for genuine products; BeefLedger can provide the certainty they require.

From NTI's perspective, the trial provided a wealth of data, and it's now being pored over by the insurer's data team to decide what to use, how to use it and whether any more should be gathered.

Ultimately, this may result in changes to NTI's product mix, including policies tailored to specific producers, suppliers and other industry players.

The data should also assist in claim resolution, help reduce fraud and reward companies for good business practices, compliance with regulations and focusing on safety and security.

BeefLedger's success is showing other industries how blockchain, mobile technologies and data analytics can revolutionise how they make, market, and manage their products.



In the future, there are lots of applications. We could move to just-in-time insurance. We'll know more about customers' risk exposures and be able to offer more tailored policies.

And insurers will be able to buy more tailored reinsurance policies ... where before we'd have to make assumptions, soon we'll be able to rely on accurate, real-world data.

Adam Gibson, Transport and Logistics, Risk Engineer, NTI







To find out more about **BeefLedger** visit the website: https://beefledger.io/

To find out about our **Marine Protect products** visit our product page: https://www.marineprotect.com/products

