Chapter 18
An Exploratory Study on Blockchain Application in a Food Processing Supply Chain to Reduce Waste

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ABSTRACT

This chapter aims to explore the feasibility of using blockchain in the beef supply chain to reduce waste. A mono-method, qualitative, inductive, single case study approach was taken on a cross-sectional scale from June 2018 to August 2018, with two individuals interviewed: a beef and a blockchain expert. The case study also involved observations, a field visit, and other secondary source data. Beef is a high demand, valuable food product with a limited shelf life. By using blockchain in conjunction with RFID and sensor technologies, farming and processing stages in the beef supply chain can be streamlined. Firstly, using the technology to monitor the animals on the farm and during transportation can reduce the amount of water and energy wasted. Secondly, blockchain can be used to establish exactly when and where the meat is cut and packaged, improving the accuracy of information between supply chain entities, resulting in improved inventory management, specifically more accurate delivery times and lengthened product shelf lives.

INTRODUCTION

Beef Supply Chain and Waste

The British meat market consists of poultry, beef, pork, lamb and others. Beef is a high value, high demand food product, with global popularity and its supply chain is complex. Cattle are raised on beef

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farms from 3 months to 30 months dependent on breed and market demand. When they reach the required age, they are sent to the abattoir and processor, where they are butchered, boned, and processed into different beef products, such as mince, steak, burger, joint, stir fry, etc. then the processed products are packaged and labelled (Mishra & Singh, 2016). There is a preferential bias in developed countries like the UK towards the more expensive cuts of beef such as the hindquarters, for example sirloin and rump steaks (Traill, 1997). This carcass imbalance causes an oversupply of the lower-value forequarter cuts, which is a problem for beef processors. This issue is especially prominent because of the foodservice industry, where high-value cuts of meat are a common menu component. Food suppliers tend to over-produce to be able to cope with demand at short-notice, to avoid the possibility of being delisted from large retailers (Parfitt et al., 2010).

WRAP (2007) estimates that each household throws away edible food worth £4.80 to £7.70 each week, which adds up to £15,000 to £24,000 in a lifetime. Whilst the UK Food Standards Agency has published a figure, estimating that food fraud, such as the Salmonella Peanut Butter Outbreak in 2009 and the Horsemeat Scandal of 2013, costs families £1.17 billion a year (National Food Crime Unit, 2017). Moreover, food waste that is sent to landfill that produces methane and carbon dioxide in its decomposition, which contributes to global warming. Also contributing to the negative environmental impact of food waste, are natural resource depletion and embedded carbon from previous life cycles of food before it becomes waste. There is also the ethical note in terms of food waste, which is the lack of balance between food waste and food poverty. The World Health Organisation (WHO) estimates 420,000 people die and a tenth of people fall ill each year after eating contaminated food (National Food Crime Unit, 2017). The two most advantageous options for food waste reductions according to Papargyropoulou et al., (2014) are food surplus prevention and reduction of avoidable food waste, as waste is largely from by-products and unsold prepared food products.

Blockchain Technology

Blockchain is a decentralised, distributed ledger and a single database where every member with access has an identical copy, allowing every database entry to be shared. Continual crosschecking also ensures the integrity of existing entries. One party does not own it and records made in the database are permanent and unalterable (Abeyratne & Monfared, 2016).

Blockchain technology is known to improve visibility, productivity and security for businesses. A blockchain ledger acts as a single location where all members of the business supply chain record their actions. It simplifies record keeping, it is updated in real-time and it is readily accessible by all parties with permission. As a distributed ledger, blockchain allows many kinds of business transactions to be decentralised, preventing any one party from exclusively owning all the information within the supply chain. This enables reductions in cost and complexity, facilitates faster transactions and disintermediates the supply chain. Businesses carry legal liability for their services and products and are therefore, with blockchain, more interdependent than ever before (Johnson, 2018).

Blockchain is already popular in financial business, but only since 2016 has blockchain had the ability to work in a supply chain function. The technology is increasing in popularity and IBM currently has 400 companies trailing their blockchain service including Unilever, Nestlé, Tyson Foods and on the largest scale, Walmart (Supply Management, 2017a). However, doubts about the operational feasibility of blockchain have been highlighted in Supply Management (2017b) such as blockchain is decentralised and there is uncertainty about who will pay for it.