Evolving risk management systems

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__Louise Manning__ and __Peter Wareing__ consider evolving challenges to risk management systems in the food industry and identify options to help organisations manage their own spectrum of risk(s) and remain resilient.

Introduction

The current reality is that food supply chains are global, complex and sometimes opaque. Food supply chains are also highly reactive, as regulatory, market, technical and social requirements keep evolving and sourcing links become increasingly fluid. In addition, the challenges that present risk to food products and food companies also shift. Some challenges are historic, for example, food safety and food crime, but others are new and contemporary. In the future, evidence suggests that the speed of change will accelerate even faster, requiring businesses to be more resilient and agile. This is the first in a series of planned articles and papers on the theme of risk management in food supply chains.

Resilience is the ability of a supply chain to absorb market and regulatory shocks and remain operational and functioning[1]. Supply chain resilience is affected either by internal factors or by external factors outside the control of actors within the chain, e.g. floods, harvest failure, animal disease and so on. Three elements influence resilience:

- *control factors* including protocols, policies, procedures, and systems;
- *supply and demand factors* that create disturbance to the multi-directional flow of materials, product, finance and information; and
- *processes*, such as transport, communication and infrastructure[2].

Therefore, risk reduction strategies that drive resilience must be embedded within the norms of ‘the way we do things’, and as a result drive agility and adaptive capability, and reduce, or where possible, eliminate risk[3].

Risk management

The Food Law Code of Practice (England)[4] defines risk as: 'the chance or probability that a person will be harmed or experience an adverse health effect if exposed to a hazard'. Risk analysis involves three components:

- risk assessment,
- risk management and
- risk communication[5].

Thus, it is important to reflect on the wider context of risk management systems by being informed via risk assessment processes underpinned by effective risk communication. Effective risk management requires multidisciplinary insights and constructive engagement between food chain actors to develop an integrated supply chain approach using appropriate risk management tools to improve business resilience and in so doing reduce risk[6]. The recently reissued ISO 31000:2018 Risk Management Guidelines[7] describe risk management simply as the 'coordinated activities to direct and control an organisation with regard to risk', and further states that 'controls are any process, policy, device, practice or other conditions and/or actions which maintain and/or modify risk'. The Guide describes the eight principles of risk management as:

1. Customised to the organisation
2. Integrated into all organisational activities
3. A structured and comprehensive approach
4. Inclusive - ensuring appropriate and timely involvement of necessary stakeholders
5. Dynamic - considering internal and external factors that influence risk
6. Aware of any limitations in the available information (information asymmetry)
7. Aware of the social (human and cultural) factors that influence risk

8. Driving continuous improvement.

Risk management approaches should maximise the degree of risk reduction, whilst ensuring that the measures undertaken are efficient, effective in managing the risks, not restrictive and balance the cost of ensuring compliance with the derived benefits[4],[8],[9]. Hajmohammad and Vachon[10] identify four different risk management strategies:

a) risk avoidance
b) risk assessment
c) monitoring-based risk mitigation using performance criteria e.g. supplier approval monitoring procedures and
d) collaboration-based risk mitigation based on determining mutual responsibilities for risk management and collaborating on mitigating risk.

Developing a risk register in combination with contingency or disaster recovery strategies can alleviate the impact of risk but may not be agile enough to react quickly in the event of a sudden supply chain 'shock', or an emergent, previously unknown risk[3]. As a result, there are a number of supply chain risks that compete for supply chain resources to either manage or eliminate them. The traditional supply chain response to managing and mitigating risk includes adopting insurance, information sharing or outsourcing risk to other supply chain actors[11]. However, power dynamics in the food supply chain means that information, including evidence of risk mitigation and control, is not always equally shared and this information asymmetry weakens the ability to develop effective risk management systems throughout the supply chain and wastes resources in duplication of verification (assurance) efforts, especially for small and medium sized enterprises (SMEs).

Overcoming information asymmetry

Information is only of value when it meets specific stakeholder needs and can be processed and used by its target users[12]. Further, Verbeke argues market failures arise when sellers have more knowledge than buyers about likelihood of safety issues arising, food safety control capability, provenance, traceability, product attributes, process attributes or nutritional content, i.e. that information is asymmetrically distributed. This means that for effective risk management to occur, information asymmetry must be overcome so that the required information is available and representative, the characteristics of the information are clearly defined, the information relates to specific food batches and is ultimately truthful. Moral hazard is the risk that in a transaction, one party is not acting in good faith through the provision of partial or misleading information[13].

What are the options for reducing information asymmetry?

One option being put forward to reduce asymmetry is the application of distributed ledger technology, such as blockchain (Figure 1). This technology could be a disruptive innovation that promotes security, reliability and transparency in food supply chain interactions, and its use could lead to enhanced food safety controls[14]. Distributed ledger technology can be applied as a tool to integrate data across supply chain risk management systems, including inputs from multiple supply chain actors, such as temperature sensors, GPS locators, video cameras, radio-frequency identification (RFID), barcodes / QR codes, as well as product analytical test data, labelling declarations and site certifications relating to foodstuffs, their packaging, and location. This would permit real-time tracking to confirm product status, and the time and location of specific actions[15]. With sufficient resource and if it was cost-effective, retailers, food service companies and manufacturers can verify food safety and food quality data in real-time across their supplier base.

Table 1. Advantages of using Blockchain technology (Adapted from Kshetri[13])

Supply chain performance criteria	**Blockchain contribution**	**Additional supply chain dimensions caused by adoption of Blockchain**
Cost	If technologies have already been adopted within the supply chain, there is zero or low marginal cost to generating blockchain code.	There is a cost to embedding the technologies within the chain and this may become a cost to market entry for SMEs
	Reduced cost of product withdrawals and recalls through increased ability to locate affected batches and also being able to communicate more efficiently with the consumer in the event of a product recall.	The cost reduction depends on the complexity and efficiency of systems already in place in a given supply chain. The degree of required utility of Blockchain depends on whether the withdrawal or recall is for a single material or multiple ingredients in a complex product.
	Reduced cost of secure digitally signed documents.	Eliminate paper records that then need to be digitalised to be shared. Requires a level of digital competency that may need cross-industry investment to acquire.
	Reduced regulatory compliance costs	Auditable data can be provided for regulatory and private organisations to verify.
Speed	Increased speed of interactions and communication across the supply chain. Network effect will increase speed if the whole supply chain engages with the system.	Digital interactions rather than traditional paper based, or electronic interactions should be faster. However, legislation needs to keep pace so that digital interactions are admissible as evidence in court and can be used by regulators to take forward prosecutions. Reticence to engage if it is not a regulatory or market access requirement will reduce speed of access
Information asymmetry	Access to supply chain data that can be used to assess quality criteria, product integrity and traceability information by businesses, regulators and consumers	A more integrated communication system should improve equity of access *to* information, but the system is reliant on the integrity of people inputting the data.
Increased governance of supply chain	Increased capability to store and retrieve information will drive the hunger for more information to reduce risk i.e. recording information because we can.	Data swamping could add transaction costs for businesses in meeting supply chain and regulatory governance requirements.
Trust	More digital accountability for supply chain data as provenance of information is verifiable.	Supply chain certification processes should be more streamlined. Again, it relies on the integrity of individuals inputting data as with paper-based systems.

With suitable secure permissioned access agreements, regulators could also undertake real time verification of business activities. The advantages of using such technology include:

more effective incident responsiveness, reduced cost and increased speed of transactions in the supply chain, the ability to overcome information asymmetry and improve trust between stakeholders (Table 1).

Conclusions

Global supply chains are a complex ecosystem based on trust especially where elements of the chain are currently opaque in terms of practices and risk management controls. Effective risk management should drive improved supply chain resilience. Distributed ledger technology, such as blockchain, has value in development of frictionless borders as a means to more effectively control and reduce cost of trans-global trade. It can increase the transparency and governance of supply chains through greater access to information generated by food businesses, however it will require secure permissioned controls and careful design to work in the complex food chain ecosystem. The enhanced ability to store information might improve timeliness for process and product verification, but conversely lead to data swamping for supply chain actors, regulators and those organisations undertaking third party verification. Tools to identify trends and non-conformance will be needed to translate data into intelligence. Through the use of decentralised information platforms, a broad range of technologies can be integrated into an effective management system. As a result, information asymmetry may be reduced, leading to improved supply chain trust. However, it is important that the rules and standards that are set by the industry at inception are transparent and open to all, otherwise the derived benefit will not be equitable for all supply chain actors.

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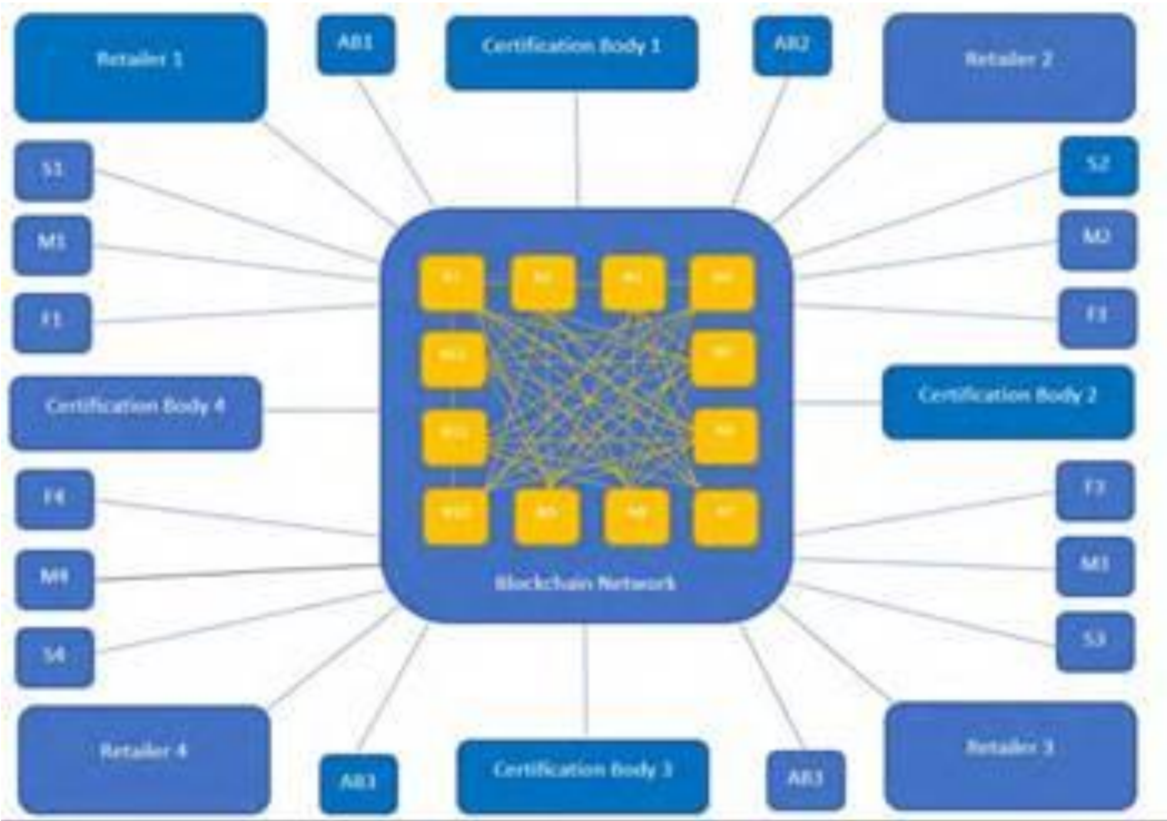

Figure 1. Diagram of Blockchain Network (Source: www.primority.com)

Keywords: risk, management, resilience, analysis, information, asymmetry

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