

SUPPLY CHAIN FOOD CRIME & FRAUD: A SYSTEMATIC LITERATURE REVIEW OF FOOD CRIMINALITY

L. Fassam¹, S.Dani² and M. Hills³

¹ Northampton Business School, University of Northampton, Northampton, UK

² Business School, University of Huddersfield, Huddersfield, UK

³ Northampton Business School, University of Northampton, Northampton, UK

ABSTRACT

There is a growing awareness by businesses, consumers and Governments of the need to understand and police food crime and fraud - underpinned by an extensive evidence of the scale of the challenge of food fraud and food crime. To achieve a cross-functional appreciation of these topics will require a multi-disciplinary approach and a process of collating and mapping information to facilitate support to both academics and practitioners. This paper uses the systematic literature review process (Denyer and Tranfield, 2006) to navigate through and provide a gap analysis from multidisciplinary sources of literature with the keywords 'food fraud' and 'food crime'. The focus of the paper is on considering the variables known to affect these two domains and subsequently the information available to help understand and secure the food supply chain. The analysis of the literature found demonstrates divergence in views across different research areas (particularly in terms of articles versus peer reviewed research), and in doing so identifies areas for future research.

INTRODUCTION

Modern organisations have received much attention on the subject area of Supply chain risk management (SCRM), which is a significant field of study for both researchers and practitioners alike (Sodhi et al, 2012). However, the extensive scope of current SCRM research, allied to a lack of industry specific focus that spans abundant numbers of global business sectors, engenders indecision and trepidation in terms of how to holistically secure Supply chain operations are (Sodhi & Tang, 2012).

Therefore, the traditional view of SCRM greatly underestimates the scale of real challenges to their security, and principally (merely) encapsulates aggregate event-driven cause and effect relationships, which restricts an organisation's ability to comprehend vulnerability in their operations in order to mitigate risk (Bacon, 2014; Christopher and Lee, 2004; Punter, 2013). Complexity and a lack of SCRM appreciation is magnified when coupled to increased interest in and concern from businesses, Governments and consumers to understand the vectors of food supply-chain criminality. This when seen in the context of the anticipated 50% increase in food demand by 2030 (House of Commons International Development Committee, 2013), and intensifying global trends in food criminality, lead the authors to argue that the 'perfect storm' is brewing for today's global society.

Although food criminality is concomitant with the risks that any supply chain is exposed to, Spink and Moyer (2011) suggest that effective mitigation strategies will arise from a multi-disciplinary approach (e.g. consumer activity, food law and food science). Therefore, in order to achieve a cross-functional appreciation of research, the current extensive body of knowledge ('food fraud' 7,623 articles, 1,456 peer reviewed & 'food crime' 9,839 articles, 1,150 peer reviewed) requires collating and mapping to facilitate its use to support academics and practitioners in achieving an all-inclusive value chain approach to combating food criminality. This will require focusing on the gaps in current research to eradicate the opacity and lack of comprehension of SCRM in the global food supply chain marketplace.

The purpose of this paper is to explore the current evidence base in the areas of supply chain 'food crime' and 'food fraud'. The process will explore topics covered

within academic literature and compare and contrast these against live themes that are developing within the industry and popular press to identify areas of future research.

LITERATURE REVIEW - TRADITIONAL SCRM

The lack of a focus on the significant challenges to global supply chains is supported by the Organisation for Economic Cooperation and Development (OECD), who explicate supply chain risks as encompassing infectious disease, natural disaster, technology or terrorism/crime. These are measured as aggregate events, fostering greater ambiguity within the SCRM field about antecedent drivers of the risk event itself (OECD, 2003). In an attempt to espouse a greater understanding of supply chain risk, the Allianz risk register (Allianz, 2014) categorises supply chain events, asserting that the majority of business disruption can be directly related to supply chains.

Nevertheless, these conclusions do not yield clarity around cause and effect relationships that could be leveraged by academic and practitioner communities alike to develop a deeper understanding of how to practically achieve SCRM mitigation to some acute forms of risk. Nevertheless, Allianz's register allows academia and industry to identify developing themes in the SCRM field of study such as fraud and terrorism, now a top 10 risk and an area that comprises 25% of overall business risk.

The rise of fraud & terrorism as a business risk is further validated by a report from the risk management group Kroll, who conclude that 70% of global organisations encounter criminality in the guise of fraudulent activity, with 67% of these instances involving at least one insider. Furthermore, 56% of European companies were exposed to supply chain fraud in 2012 versus 77% in 2013 (Kroll, 2014), conveying an appreciation as to why Forbes 500 company chief executives and World Economic Forum are reported to have serious concerns over resilience supply chains (World Economic Forum, 2013).

LINK BETWEEN SCRM AND FOOD SUPPLY CHAINS

Our analysis of the literature indicates that within the areas of business risk and resilience, publications focus on aggregate event-driven cause and effect relationships. Events in the food supply chain over the past two years has evidenced a disconnect between outcomes of research and actual impact. Little is being done to limit the exposure to risk and provide support to the food businesses of Europe, of which a majority are food manufacturing companies, with the UK food manufacturing alone comprises 310,000 food businesses, 3.8 million employees and £96 billion (7.3% GVA), (European Commission, 2014). In a bid to close the gap, DEFRA (2013) cites the need to embrace collaborative practices that augment nutrition, safety and quality of food products through enhanced innovative platforms which leverage research tools to understand and foster development of global food security databases, predominantly for the SME.

Compounding the issues around traceability in food supply chains, Nelleman et al (2009) claim that 1.3 billion tonnes of food disappears without trace within food supply chains annually. This finding, which elicits questions as to *where* does this food disappear and - if we cannot track what goes out of the food supply chain - how can we be sure about what comes in? They [Nelleman et al., 2009] further report how, upstream in food supply chains, under-developed regions have commenced efforts to curb risk by prohibiting food exports. However the Africa Research Bulletin (2013) argues that this has only driven threats and risks to food security deeper underground, fostering greater black market cross-border trading and allowing legislation to fund the threat they are trying to avoid and strengthening the traceability challenge around food supply chains. Perhaps this black market issue and the possibility of increasing rather than reducing opacity, is why DEFRA has been reticent to engage in tougher regulation relating to food

supply chain traceability, citing concerns over price and nutrition being a higher priority for the public than food crime (DEFRA, 2013).

This lack of a cohesive understanding relating to current research and methodology is stifling accountability and traceability within the global food supply chain and is an area that academia and practitioners need to understand building upon and strengthening current research.

METHODOLOGY

The systematic literature review (SLR) process employed in this research, provides a structured understanding and research gap identification for prospective researchers (Denyer & Tranfield, 2006). Further supporting the need for adopting the SLR approach, Tranfield et al (2003) claim that masses of subjective and often inconsistent literature resides within fields of study and through this process [systematic literature review] clearer identification of gaps and data will become prevalent. In doing so, systematic classification of current literature was carried out which deployed an iterative process of define, interpret and perfect across many databases manually assessing significance of literature (Clark & Oxman, 2001; Tranfield et al, 2003).

The keywords used for the SCRM search were "Governance", "Inventory", "Procurement", "Resilience", "Risk" and "Traceability" all prefixed by the term "Supply chain". FSCRM while using the same pre-fix [Supply chain] employed "Food crime" and "Food fraud" as the search criteria. These keywords were selected owing to the authors preceding experience in the SCRM discipline, coupled to wider dialogue with academics and practitioners within the Supply chain field of operation.

In the case of this Systematic literature review (SLR) a variety of databases and journals were initially screened and in order to maintain relevance to the subject field, inclusion criteria was concentrated on the Association of Business Schools (ABS) journal listings due to their global acceptance, impact and standing in business research.

The final phase of screening appraised outputs from the UK Governments report into Supply chain Food criminality (Elliott, 2014). A comparison was made of SCRM keywords against those contained in the report to indicate relevance with current practitioner versus academic output to gain an understanding of the research gaps, which were categorised as either food crime (e.g. counterfeiting) and food security (e.g. food shortages).

PRESENTATION OF FINDINGS

Significant research areas of SCRM concern inventory, procurement and risk (Fig.1) practices. However within the food supply chain risk management (FSCRM) sphere there is insufficient correlation to risk management (Table 2), which is of concern, given the acknowledgement of the role of inventory and procurement strategies in mitigating supply chain risks (Sodhi & Tang, 2012).

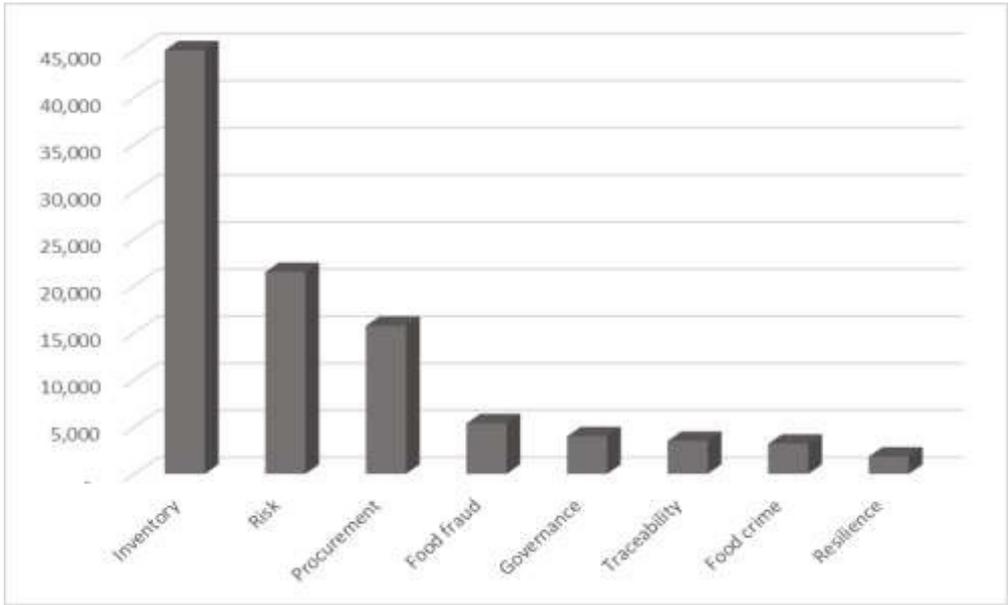


Fig.1: Supply chain journals by type and number

Furthermore, the amount of published academic research associated with the topics of supply chain food fraud and food crime's relatively low when compared to those articles published within the business and popular press (Fig.2). A clear divergence between the two [Press & Academia] suggests a need for academia to support the needs of business and Governments in the area food criminality and the impact on the supply chain. It should be noted that the increased press interest has been on the rise since the horse meat scandal of 2013, and the trend is still ascending and something that should not be overlooked by academia.

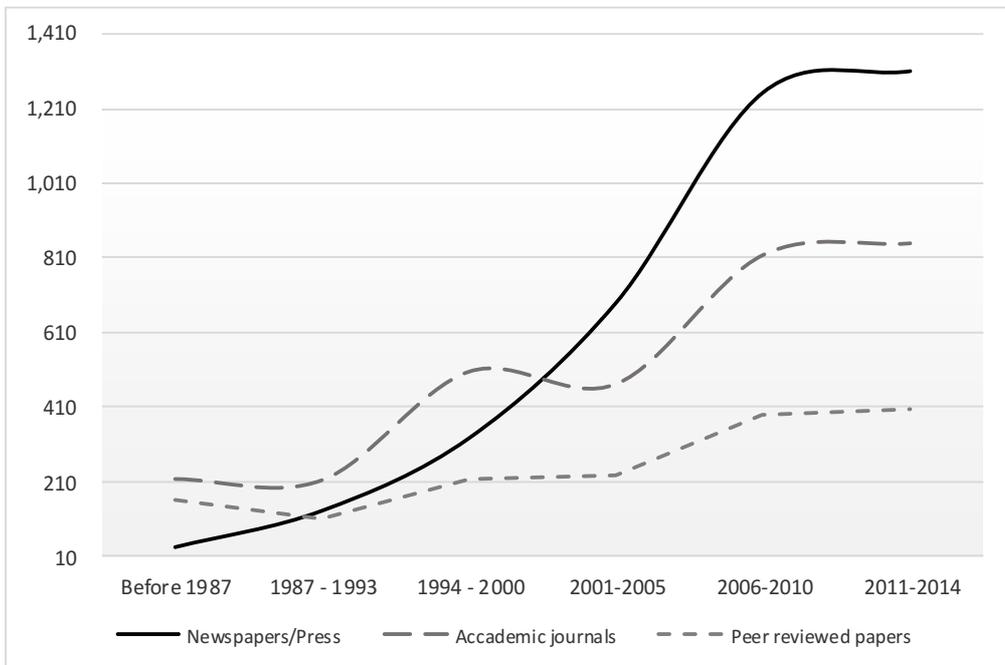


Fig.2: Academic research versus business and tabloid publication 'Food crime'

Topic	Count	Percentage
Crime	155	18%
Sociology	128	15%
Public Health	80	10%
Economics	73	9%
Food	71	8%
Obesity	61	7%
Food Supply	39	5%
Criminology	34	4%
Diet	34	4%
Violence	33	4%
Criminal Law	21	2%
Fraud	19	2%
Food Safety	18	2%
Food Contamination	17	2%
Adolescents	15	2%
Food Industry	13	2%
Food Inspection	10	1%
Food Law	10	1%
White Collar Crime	10	1%

Table 1: Themes within peer reviewed 'Food crime' journals

It is one thing recognising the clear divergence between academic and business literature on this topic, but quite another to examine existing research to investigate current SCRM thinking to support further research in the field of FSCRM. Therefore when the topics of 'supply chain food crime and fraud' are explored, an identifiable abundance of topics pertaining to areas of public health and diet are observed, validating the DEFRA position (DEFRA, 2013) that the public are more anxious about matters of diet and security of supply rather than criminality. Furthermore, one could argue that if academia is not cognizant of current market trends (Fig.1) then incorrectly targeted research could be driving opinion and thus creating inconsistent and less relevant focus areas for FSCRM.

Topic	Count	Percentage
Business logistics	10,520	14%
Supply Chain Management	8,321	11%
Supply Chains	7,082	9%
Transportation Management	6,203	8%
Experiment/Theoretical Treatment	5,435	7%
Management Research Network	4,505	6%
Management/Marketing	4,462	6%
Risk management	3,622	5%
Operations research	3,416	5%
Experimental/Theoretical	3,318	4%
Inventory control	2,622	4%
Supply Chain	2,496	3%
Purchasing	1,544	2%
Stockpiling	1,254	2%
Demand	1,165	2%
Electronic commerce	1,134	2%
Retail trade	1,087	1%
Inventory	920	1%
Production management	738	1%

Table 2: Key themes in traditional SCRM not within the 'Food crime' field of study

Perhaps the most surprising elements concerning FSCRM is the lack of relation to traditional SCRM models and theories. The Chartered Institute of Procurement

and Supply (CIPS, 2013) cite the importance for industry to be more transparent when it comes to trading and educating supply chain partners in the need to identify fraudulent activity such as bribes. However, areas that underpin the defense mechanisms in SCRM are devoid within the FSCRM arena, arguably identifying another gap that academia and practitioner should focus research efforts on closing.

RECOMMENDATIONS FOR FUTURE RESEARCH

A change in the manner in which food supply chains are investigated is essential, particularly in the underrepresented SME sector (99% of European food businesses are SME's). At present a high priority area for DEFRA is to cultivate research that delivers a framework for businesses to collaboratively understand and mitigate against food supply chain risk. Elliott's (Elliott, 2014) Government report supports this notion, but as yet academia offers little solution as to how we plug this knowledge gap with supply chain professionals in protecting food supply chains from the outsider threat. Likewise, it certainly hasn't considered consumer and activist concerns or needs, that companies may struggle or be unable to deliver, for example, achieving assurance that there is total supply chain security against fraud / adulteration.

The areas of inventory, procurement and risk management practices which are identified and observed in current SCRM research - and supported by globally leading professional bodies (CIPS & CILT) - are at this time limited within the FSCRM literature. These variables are necessary to mitigate supply chain risks and build resilience, within food supply chains and hence require further targeted research. It has been muted by Governments and Intelligence agencies that criminals see the food supply chain as an easy target (Economist, 2014), and it is incumbent on academics and practitioners to step forward collaboratively, deploying allied research in the identified areas (inventory, procurement and risk) to combat this external threat to food supply chain integrity and bridge an apparent gap between research and practice. Lack of Trust and an Increase in Opportunistic behavior in the upstream food supply chain are two variables that require further research. This should also be studied within the auspices of potential legislative tools, the use of new technological systems and a framework of the factors that increase Food Fraud/ Crime and those which can help reduce it (Fig.3).

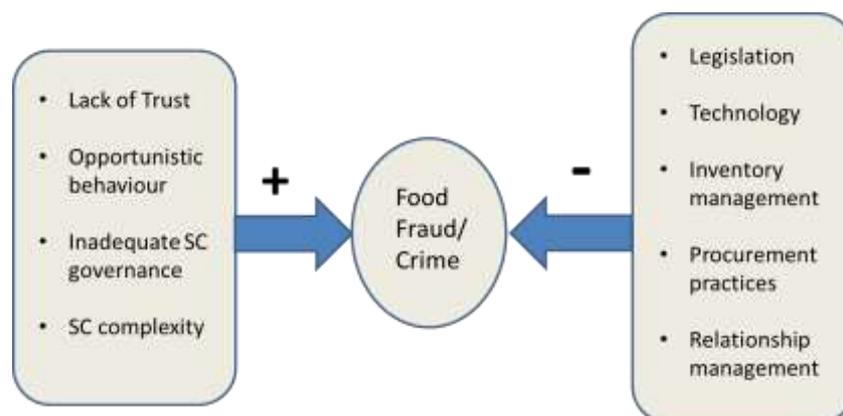


Figure 3: Factor relating to Supply chain crime

It is worth noting that a year on from the Elliot report little change is seen in the landscape of supply chain food crime (Noble, 2014) and we argue that much of this is attributed to the lack of understanding across tiered networks. It is also observed from the literature that the focus in the food crime and fraud research is more on security of supply rather than mitigation of risk and criminality. The drivers for change will be initiated through targeted research that will increase engagement and raise the profile of food supply chain risk mitigation strategies.

Finally, there is a further challenge in this area with confusion over terminology - as highlighted by the Elliot report (Elliott, 2013) - where US led systems prefer the use of 'fraud' and European based research adopts 'crime', which creates another divergence of topics within the research. The divergence of terminology use is creating confusion in the system and the authors support the need for academia and practitioners to utilise the term 'food crime' in order to build and strengthen a coherent body of knowledge.

In conclusion, much has been learnt over the years within traditional SCRM that can translate across many sectors including food however none of these seem to have been adopted by researchers charged with adapting tools and techniques. The clear divergence between academic journals, practitioner and news articles in food crime and public interest requires further research to raise awareness and delivery of a body of knowledge in FSCRM.

REFERENCES

- Africa Research Bulletin (2013) 'Food security', Africa Research Bulletin: Economic, Financial and Technical Series, 50 (2), [Online] Available: <http://onlinelibrary.wiley.com.ezproxy.northampton.ac.uk/doi/10.1111/j.1467-6346.2013.05053.x/full> (Accessed: 10th January 2015)
- Allianz (2014) Allianz Risk Barometer. *Allianz* [online]. Available from: http://www.agcs.allianz.com/assets/PDFs/Reports/Allianz-Risk-Barometer-2014_EN.pdf (Accessed 20th Jan 15).
- Bacon, B. (2014) Supply Chains – with complexity comes uncertainty. *Supply Management* [online]. Available from: <http://www.supplymanagement.com/blog/2014/11/supply-chains-with-complexity-comes-uncertainty> (Accessed 20th April, 2015)
- Christopher, M., Lee, H. (2004), "Mitigating supply chain risk through improved confidence", *International Journal of Physical Distribution and Logistics Management*, Vol. 34 No. 5.
- CIPS (2013) 'Ethical and Sustainable Procurement' [pdf], Chartered Institute of Purchasing and Supply. Available at: http://www.cips.org/Documents/About%20CIPS/CIPS_Ethics_Guide_WEB.pdf (Accessed: 5th January 2015)
- Clarke, M. and Oxman, A.D. (Eds) (2001), *Cochrane Handbook for Systematic Reviews of Interventions*, The Cochrane Collaboration, Oxford Library, John Wiley & Sons, Chichester.
- DEFRA (2013) Food chain evidence plan: Food policy, competitiveness, growth & food security, 2013/14. [Online] Available: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/221070/pb13916-evidenceplan-food-chain.pdf (Accessed: 1st May 2015)
- Denyer, D., Tranfield, D. (2006) 'Using qualitative research synthesis to build an actionable knowledge base', *Management Decision*, 44 (2). [Online] <http://www.emeraldinsight.com.ezproxy.northampton.ac.uk/doi/pdfplus/10.1108/00251740610650201> (Accessed: 6th January 2015)
- Dumas A (1988) "Silent Designers", in Clark PA & Starkey KP Organization Transitions and Innovation-Design, London:Pinter.
- Economist (2014) 'A la cartel', *Economist*, 15th March 2014 [Online] Available from: <http://www.economist.com/news/britain/21599028-organised-gangs-have-growing-appetite-food-crime-la-cartel> (Accessed: 10th April 2015)

Elliott, C. (2014) 'Elliott Review into the Integrity and Assurance of Food Supply Networks – Final Report', *HM Government*, July 2014, [Online] Available from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/350726/elliott-review-final-report-july2014.pdf (Accessed: 13th November 2014)

European Commission (2014) Sustainable food, [Online] Available: <http://ec.europa.eu/environment/eusds/food.htm> (Accessed: 15th January 2015)

House of Commons International Development Committee (2013) 'Global Food Security: Government Response to the Committee's First Report of Session 2013-2014', (HC 626, 2013-14), [Online] Available: <http://www.publications.parliament.uk/pa/cm201314/cmselect/cmintdev/176/176.pdf> (Accessed: 12th February 2015)

Kroll (2014) '2013/14 Global fraud report: who's got something to hide?', April 2014, [Online] Available: <http://fraud.kroll.com/wp-content/uploads/2013/10/Kroll-Global-Fraud-Report-2013-2014-WEB.pdf> (Accessed: 10th April 2015)

Nelleman, C., MacDevette, M., Manders, T., Eickhout, B., Svihus, B., Prins, A., Kaltenborn, B. (2009) 'The environmental food crisis – The environment's role in averting future food crises', United Nations Environment Program, [Online] Available: http://www.unep.org/pdf/foodcrisis_lores.pdf (Accessed: 8th January 2015)

Noble, D. (2014) 'Grim Convenience', *Supply Management*, 13th March 2014. [Online] Available from: <http://www.supplymanagement.com/blog/2014/03/grim-convenience> (Accessed: 12th April 2015)

OECD (2003) 'Emerging risks in the 21st century', OECD Publication services. [Online] Available: <http://www.oecd.org/governance/risk/37944611.pdf> (Accessed: 20th March 2015)

Punter, A. (2013) *Supply Chain Failures*. London, UK: Alrmic.

Sodhi, M., Tang, C. (2012) *Managing Supply Chain Risk*. New York, USA: Springer.

Sodhi, M.S., Son, B.-G., Tang, C.S. (2012), "Researchers' perspectives on supply chain risk management", *Production and Operations Management*, Vol. 21 No. 1

Spink, J., Moyer, D. (2011) 'Defining the public health of food fraud', *Journal of Food Science*, 76 (9). [Online] Available from: <http://onlinelibrary.wiley.com.ezproxy.northampton.ac.uk/doi/10.1111/j.1750-3841.2011.02417.x/pdf> (Accessed: 6th January 2015)

Tranfield, D., Denyer, D., Smart, P. (2003) 'Towards a methodology for developing evidence informed management knowledge by means of systematic review', *British Journal of Management*, 14 (3) [Online] Available from: <http://onlinelibrary.wiley.com.ezproxy.northampton.ac.uk/doi/10.1111/1467-8551.00375/pdf> (Accessed: 8th January 2015)

World Economic Forum (2013) 'Building Resilience in Supply Chains', (REF150113 – 2013), [Online] Available: http://www3.weforum.org/docs/WEF_RRN_MO_BuildingResilienceSupplyChains_Report_2013.pdf (Accessed: 10th April 2015)