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Total Quality Management & Business Excellence

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/ctqm20

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To cite this article: Funlade Sunmola, Patrick Burgess & Sigrid Wertheim-Heck (2024) Challenges and hotspots in food supply chain quality management practices, Total Quality Management & Business Excellence, 35:11-12, 1296-1330, DOI: 10.1080/14783363.2024.2367607

To link to this article: https://doi.org/10.1080/14783363.2024.2367607

Published online: 14 Jul 2024.

Total Quality Management, 2024
Vol. 35, No. 12, 1296–1330, https://doi.org/10.1080/14783363.2024.2367607

Challenges and hotspots in food supply chain quality management practices

Funlade Sunmola[a*], Patrick Burgess[b] and Sigrid Wertheim-Heck[c]

[a]*University of Hertfordshire, Hatfield, UK;* [b]*Aeres University of Applied Sciences, Dronten, Netherlands;* [c]*Wageningen University, Wageningen, Netherlands*

Food supply chains face many challenges, including those associated with supply chain quality management practices. Supply chain quality management practices are activities and processes adopted to achieve quality goals. The practices can be quite challenging, especially for food supply chains that are sustainability-oriented, such as those found in alternative food networks. This paper introduces a notion of supply chain quality management practice hotspots to capture incidences of quality management practice challenges that manifest in food supply chains. An approach for identifying supply chain quality management practice hotspots is developed in the paper and illustrated with multiple case studies. Findings show that incidences of supply chain quality management practice hotspots exist in practice, and practitioners perceive the notion of supply chain quality management practice hotspots to be valuable, especially in providing insights into supply chain processes and use as a basis for performance improvement. The paper indicates that the severity of supply chain quality management practice hotspots is influenced by the importance placed on supply chain processes, supply chain practices, and the severity of the quality management practice challenges the supply chain faces. Implications of findings and recommended areas of future work are presented.

Keywords: food supply chain; quality management practice; challenges; hotspot; supply chain processes

1. Introduction

There is a trend in the food industry towards increasingly embracing sustainability. An example is the emerging alternatives to global food provisioning systems that foster networks of sustainability driven stakeholders, such as short food supply chains, urban food systems, local food systems, organic food, and fair trade (Goodman et al., 2012). These alternatives are known as alternative food networks (AFNs) and are characterised by environmentally friendly production and distribution, social equity, and fair economic considerations for producers and consumers in food supply chains (Forssell & Lankoski, 2015). The trend towards AFNs is partly due to consumer quality and sustainability needs (Fonte, 2010; Ling & Wahab, 2020) and consumer confidence in quality management (Ling & Wahab, 2020). In supply chains of AFNs, quality is being demanded through bottom-up, embracing participatory approaches around personal relationships, direct communication, and embedded information over products, place of production, and processes (Brunori, 2007), with a need to meet business and government level

*Corresponding author. Email: f.sunmola@herts.ac.uk

quality requirements (Aung & Chang, 2014). In both the alternative and global food supply chains, supply chain quality management (SCQM) plays an important role. SCQM combines two main concepts, i.e. supply chain management and quality management (Foster Jr et al., 2011), bringing quality to a supply chain-wide perspective. SCQM can lead to improved quality performance, improve supply chain integration, and enable consumer-driven value addition created through upstream and downstream linkages in the supply chain (Foster, 2008; Song et al., 2017). SCQM and its associated practices are essential to food supply chains (Quang et al., 2016; Siddh et al., 2020; Soares et al., 2017).

SCQM practices are activities and processes adopted to achieve quality goals from producers to consumers (Quang et al., 2016). The practices focus on internal quality and external quality throughout a supply chain (Kaynak & Hartley, 2008; Zeng et al., 2013). Examples of SCQM practices highlighted in the literature include quality leadership (top-level management), customer focus, IT-enabled organisation, supply chain integration, supplier quality management, customer quality involvement, supply chain information sharing, supply chain cooperation, quality control, and continuous improvement (Abdallah et al., 2021; Burgess et al., 2023; Soares et al., 2017).

In global food supply chains, practices are well-defined by top-down, abstract guidance, and structural assurances (e.g. ISO, BRC, GLOBALGAP), built to support high-quality food production and processing and have been shown to improve performance and impact on organisational sustainability (Siddh et al., 2021). SCQM practices in structural assurances and abstract guidance systems may only partially support the stakeholders' needs or performance in the alternative food supply chains. In AFNs, consumer quality perceptions create value (Jarzębowski & Bezat, 2018). Quality in supply chains of AFNs has been addressed with emphasis on consumer preferences (Witter et al., 2021), consumer motivation (Watts et al., 2018), consumer satisfaction (Carzedda et al., 2018), transparency (Bertello et al., 2020), and sustainability (Jarzębowski et al., 2020; Michel-Villarreal et al., 2019).

Inherent in SCQM generally are quality management practice challenges, some of which can significantly impact performance. The challenges may arise from farming resource shortages, lack of transparency and traceability, product quality problems, communication, information sharing, production planning and control, and collaboration breakdown, amongst others (Sharma et al., 2019). SCQM practice challenges may not manifest uniformly across supply chain processes, with some concentrated in specific process areas of the chain. In this paper, concentrations of SCQM practice challenges in specific process areas of a supply chain are referred to as SCQM practice hotspots. More specifically, this paper defines SCQM practice hotspot as SCQM practice that presents a substantial challenge in the specific practice area(s) of the chain occurring with the potential to impact supply chain quality management performance. This paper aims to explore incidences of sustainable supply chain quality management practice hotspots in the real world and discuss implications. The research questions posed in this paper are twofold.

RQ1: How can we leverage data for the purpose of identifying supply chain quality management practice hotspots in real world settings?

RQ2: What are real world examples of supply chain quality management practice hotspots in food supply chains?

The significant contributions of this research are as follows. (1) A notion of SCQM practice hotspots is presented and an approach is developed for a constructive identification of the hotspots in supply chains, (2) The approach is demonstrated with applications to multiple case studies. (3) The value of the SCQM practice hotspots notion is highlighted through perceptions of interviewed supply chain managers participating in the multiple case

studies. (4) It is uncovered that the levels of supply chain quality management practice hotspots, as conceptualised in this paper, are dependent on the importance placed on supply chain processes, supply chain practices, and severity of the quality management practice challenges faced by the supply chain.

The remainder of the paper begins in Section 2 with a research background and highlight of related work. This is followed in Section 3 by the methodology adopted in the study. A method of identifying and assessing SCQM practice hotspots is put forward in Section 4. Section 5 contains case studies drawn from food supply chains in AFNs. The case studies are used to illustrate example instances of SCQM practice hotspots in the real world. Also contained in Section 5 is a discussion of the case study results. Section 6 presents the implications of the findings. Section 7 concludes the paper and recommends areas of future work.

2. Background and related work

2.1. *Alternative food networks*

Sustainable food supply chains aim to support the control of social, environmental, and economic activities and processes within a supply chain. AFN can be viewed as a class of sustainable supply chains (Kessari et al., 2020). AFNs are being developed to offer substitute products compared to those in the global food network (Michel-Villarreal et al., 2019). Defining characteristics of AFNs include (1) closer relationships and reduced distances in the supply chain, (2) the employment of sustainable and holistic production methods such as organic and fair trade, (3) the size of business-level stakeholders, and (4) the ability to create traceability, transparency, and end-to-end visibility from farm to fork (Jarosz, 2008). AFNs have been classified to span from 'strong' to 'weak', where a strong AFN focuses on embedded information and building trust through close relationships, while a weak AFN is significantly less so (Kajzer Mitchell et al., 2017). Strong AFNs often deploy a short and local food supply chain strategy aiming towards food system re-localisation (i.e. bringing food provisioning from a global to a local level). Short food supply chains focus on reduced distances and embedded information from producer to consumer, where local food systems are often bound to a specified geographical area (Kneafsey et al., 2013). A weaker AFN may adopt organic or fair-trade production methods but does not necessarily strive to reduce distances, thus selling through mainstream channels like large retailers, resembling more industrialisation (Watts et al., 2017).

Within the AFN are quality conventions, representing the standards, norms, and values necessary for stakeholders in each network. The quality conventions fall under two main categories: (1) link to producer, place, and production, and (2) (bio)process (Goodman & Goodman, 2009; Kneafsey et al., 2013; Renting et al., 2003). There are several aspects associated with each of the two categories. Regarding the link to place, production, and producer, designation of origin refers to connecting and tracking products through the supply chain to the producer and potentially their input suppliers (Dries, Peerlings, & Van De, 2019). Cottage and farm foods are those made/processed at the designated location (farm) and sold directly to the consumer (Osei Tutu & Anfu, 2019). Speciality foods are often perceived to have high quality and value addition and are typically limited in quantity (Bardone & Spalvēna, 2019). On-farm processing refers to the forward-vertical integration of producers, processing raw materials into value-added products. Traditional food links to culture and region and must be produced and processed in specific ways. Labelling schemes like the product of geographical indication are often used to communicate traditionally in more extended supply chains (Vergamini et al., 2019). Seasonality reflects the need to consider production, harvesting, and supply

availability throughout the year. Regarding links to bioprocess, key considerations are integration (e.g. vertical integration of supply chain processes), organic production methods, natural foods, the perception of healthy and safe food, and free range.

Trust between stakeholders is salient in AFNs (Mancini et al., 2019). Direct and personal buyer-supplier relationships and transparency throughout the supply chain are significant in creating trust regarding the quality and safety of processes and products (Lindh & Olsson, 2010). Consumer focus is essential for AFNs as consumers often drive quality, reflecting on consumer-driven supply chains. This also links back to the movement toward AFNs for higher perceived levels of quality and sustainability (Goodman, 2003). The involvement of consumers is a recognised priority amongst managers in food supply chains and may improve the understanding and shaping of the supply chain practices and information shared throughout the chain (Lu et al., 2020). A substantial focus on quality conventions shows the need for product quality (like freshness, taste, and health). Product safety is important and reflects the need for quality governance to support perceptions of safer foods. Consumers may demand a variety of products, including organic products (Schreiner et al., 2013)

2.2. *SCQM practices and challenges*

SCQM is a systems approach to enhance quality performance, stimulate innovation, integrate supply chain members, and enable consumer-driven value addition created through upstream and downstream linkages in the supply chain (Foster, 2008). There exists a variety of tools that can help support supply chain quality management and practices (Foster et al., 2011), and they include process tools (i.e. benchmarking), basic tools (i.e. data analysis), statistical tools (i.e. control charts), supply chain tools (i.e. supplier development), design tools (i.e. prototyping), and management tools (i.e. leadership). A recent review by Sadeghi Moghadam et al. (2021) examined various tools, methods, and models that can aid in managing the quality of supply chains. There were useful insights in the reported study and practice challenges arising from the study can be inferred. This reinforces the need for approaches that can assess such challenges and their resulting hotspots. Associated is the emerging concept of quality 4.0, which recognises a trend towards digital technologies in quality management, and is of importance for future research (Mahdikhani, 2023). Examples of emerging technologies in the field include IoT and blockchain technologies (Ben-Daya et al., 2020; Burgess et al., 2022), with implications for supply chain quality management practice challenges.

SCQM practices are essential across the food industry geared towards enhancing safety, reputation, recall procedures, and quality perceptions for improved performance (Song et al., 2017). SCQM performance has been reported in the literature to improve customer satisfaction, sustainability, supplier management, and competitiveness (Chiarini, 2017; Song et al., 2017; Zhang et al., 2020).

Generally, SCQM involves internal and external practices to enable supply chain quality performance, enhancing customer satisfaction, supplier management, supply chain relationships, and competitiveness. SCQM practices identified in the literature include supplier quality management, top management leadership and commitment, human resource management, quality of information and information system management, supply chain integration, customer focus, process management, logistics management, quality control, and continuous improvement, see Table 1. Burgess et. al. (2023) reported a review of SCQM practices in sustainable food networks and highlights the myriad of supply chain quality management practices in food supply chains.

Table 1. Examples of SCQM practices.

Source	SCQM Practices
Abdallah et al. (2021)	Supplier quality management; Customer quality involvement; supply chain information sharing' supply chain new product cooperation; Supply chain continuous improvement
Soares et al. (2017)	Leadership; Customer focus; supplier focus; IT-enabled organisations; Integration.
Kim-Soon et al. (2020)	Leadership; customer focus; employee management; supplier management; process management; quality control; continuous improvement.
Jabbour et al. (2011)	Supply chain integration; information sharing; customer service; customer relationships; supplier relationships; and postponement.
Siddh et al. (2018, 2021)	Top Management Leadership and Commitment to Quality; Supplier quality; Quality of Human Resources; Quality of information and information technology; quality of supply chain integration; internal quality (process quality and logistics quality management); Risk management; traceability
Mellat-Parast (2013)	Trust; Governance; Information management; Process integration; cooperative learning. Top Management Support; Information systems; Employee involvement; Product and service design' customer satisfaction.
Hong et al. (2019)	Strategy and Leadership; Integration; Supply chain relationship management; Supply Chain Resilience
Wiengarten et al. (2010)	Information quality; information sharing; Alignment; Decision making
Kuei et al. (2001)	Top management leadership; Training; Product design and quality; Process quality and management; Information sharing; Customer focus; employee relations; supplier selection; supplier participation.
Lim et al. (2022)	Supply chain integration; quality leadership; supplier focus; customer focus; information sharing, transparency, and postponement.
Soares et al. (2017)	Customer focus; Supplier focus; Supply chain integration; Leadership.
Phan et al. (2019)	Supplier Quality; Information technology; information sharing; supplier involvement; Supply chain relationships and partnerships and relationships; Top management leadership; Strategic Planning; Process Control; Quality data/information, Design for quality; Continuous improvement and learning, training, and rewards; customer focus.
Zeng et al. (2013)	Top management support; Strategic planning; Quality information; Process management; Work force management; Product design process; Long-term relationships with suppliers; supplier involvement in product development; quality rather than price focus in selecting suppliers; supplier certification; suppliers' involvement in quality improvement; Customer focus; quality control.
Burgess et al. (2023)	Supplier quality management practices; Top management leadership and commitment practices: Human resource management practices; Quality of information and information system management; Supply chain integration; Customer focus; internal quality management; continuous improvement; and quality control.

Inherent in SCQM practices are challenges that can impact performance. Challenges can be understood as something that, by their nature or character, serves as a call to make a special effort, a demand to explain, justify, or difficulty in undertaking. Challenges in SCQM have been reported in the literature. For example, Zhu et al. (2008) noted that creating organisational learning and soliciting management support to reach desired performance levels are key challenges manifesting in green supply chain management practices. Basnet et al. (2006) identified supplier geographical distance and a lack of

sophisticated information systems as key challenges. Table 2 highlights examples of reported SCQM practice challenges in the food industry.

Several practices and practice challenges related to supply chain quality management have been reported (Burgess et al., 2022, 2023), such as supplier quality management. Supplier quality management considers aspects relating to selecting and managing suppliers that meet and maintain desired performance levels. The literature reports considerations for relationships and criteria for securing and managing suppliers, such as information sharing, supplier performance, strategic alliances, and supplier motivation (e.g. Sang Chin et al., 2006). Supplier quality management has been shown to influence performance in organisations and across supply chains (Firmansyah & Siagian, 2022; Salimian et al., 2020). In AFNs, finding suppliers who can meet unique selection criteria can be challenging due to the growing consumer demand and limited suppliers based within, for example, specified geographical areas (Escorcia-Caballero et al., 2020). Supplier quality management in AFNs is closely linked to the geographical indication of production and provenance and sustainable production methods (e.g. organic production) (Escorcia-Caballero et al., 2020; Mancini et al., 2019), and the link may pose some challenges to SCQM practices, including where there are seasonality issues. Provenance includes the information and understanding of the geographical origin of a product, in addition to demonstratable transparency from the producer to the end consumer (Wallace & Manning, 2020). Demonstratable transparency also reflects the desire to reduce social and physical distances and provide embedded information (Sellitto et al., 2018).

Table 2. Examples challenges in supply chain quality management

Source	Focus	Challenges
Zhu et al. (2008)	A study on the factors of organisational learning and management support in the context of supply chain practices adoption.	Promoting organisational learning and developing a drive for management support.
Singh and Kumar (2020)	Identifying strategic issues of supply chain management due to globalisation in SMEs	Technology upgrading challenges to compete with prominent players, Price and quality, Limited resources, and measuring performance.
Sarrico and Rosa (2016)	An introduction to supply chain quality management in education	Integration between stakeholders.
Mondal and Samaddar (2021)	The paper explores the dimensions of human factors for integrating data-driven supply chain quality management practices.	Dynamic nature of supply chain processes and coordination. Human nature and supply chain collaboration, Ethical considerations, and Complexities related to innovation and flexibility.
Chukwu and Adibe (2022)	A study on the quality of practices in supply chain management of cold chains in line with the World Health Organisation.	Infrastructure challenges, Governmental challenges.
Zeng et al. (2018)	Research on SCQM in the construction industry in China.	Supplier and material quality and consistency
Bastas and Liyanage (2018)	A systematic review on sustainable supply chain quality management.	Sustainability management

Knowledge and reputation management are also essential practices for the AFN concerning supplier quality (Mancini & Arfini, 2018; Oñederra-Aramendi et al., 2018). Emerging technologies (i.e. blockchain and IoT) show promise for the AFN through enhanced information sharing, traceability, transparency, immutability, trustlessness, non-repudiation, and decentralisation (Burgess et al., 2022). While emerging digital technologies can benefit supply chains in AFNs, their adoption brings a variety of practice challenges (Yadav et al., 2020).

2.3 *Underpinning theory and research gap*

The meaning behind the term practice varies across academic disciplines. In a social context, a practice has been defined as 'Practice is doing, but not just doing in and of itself. It is done in a historical and social context that gives structure and meaning to what people do. In this sense, practice is always social practice' (Wenger, 1999). The term practices in areas such as supply chain and quality management is instead defined as 'the set of activities undertaken by an organisation to promote effective supply chain management for improved performance' (Li et al., 2005, 2006). Such variance in the meaning or definition of practice heavily influences the theoretical underpinning of a research design.

This paper focuses on SCQM practices, i.e. those practices in an organisation or supply chain that may influence SCQM performance. It draws from the practice-based view (PBV), investigating those practices that may significantly impact performance within a supply chain, including in alternative food supply chains. PBV is a theoretical foundation that explains firm performance variations based on imitable and transferable practices (Bromiley & Rau, 2014). PBV examines activities or practices that can be adopted across organisations and suggests that standard practices can influence performance and may be applied to assess performance across supply chain stakeholders. PBV also explains performance differences through imitable practices. This is because firms may need help understanding or using all the practices that can be useful to them. In the context of supply chains, the supply chain practice-based view SCPV acknowledges a relational view that supply chain practices impact performance and often go beyond company boundaries towards supply chain partners and networks. In summary, this paper acknowledges the SCPV, particularly in the thinking that supply chain practices impact performance.

The preceding literature suggests that SCQM and its associated practices are important for supply chains. These practices are essential for the supply chains to positively impact their supply chain quality performance. The literature also acknowledges challenges in implementing and managing SCQM practices. However, a research gap exists regarding the incidences and consequences of the challenges manifesting in supply chain processes. This is more so when the challenges create hotspots in the supply chain processes, impacting performance. This gap motivates the research reported in this paper. The methodological approach we use to address this is presented in Sections 3.

3. Methodology

The research methodology adopted in this paper is based on mixed methods and is divided into four stages.

Stage 1 – Literature Review of Supply Chain Quality Management Practices: A literature review is conducted to identify relevant supply chain quality management (SCQM) practices in sustainable supply chains, emphasising alternative food networks (AFNs).

The review was carried out in seven phases: selecting, understanding, comprehending, interpreting, analysing, synthesising, and evaluating (Jesson et al., 2011). The initial stages of the review involved identifying and selecting relevant literature using (1) selected databases, namely Scopus, Science Direct, and Emerald Insight, and (2) specified keywords, namely 'Alternative Food Networks', 'Supply Chain Management', 'Quality Management', 'Practices', 'Challenges', and 'Food supply chain'. Boolean operators in All text were used between themes, i.e. ('Supply Chain Management' OR 'Quality Management') AND ('Practices' OR 'Challenges'). This is followed by a focused search for papers to include in the review using the search strings 'Supply Chain Quality Management Practices' OR 'Supply Chain Quality Practices' centred on Title-Abstract-Keywords fields. The search resulted in 37 papers. Exclusion criteria were applied to eliminate duplicates, non-English language papers, non-journal papers (e.g. conferences, book chapters), and those that did not explicitly contain SCQM practices. Finally, a snowballing technique was used to identify additional papers based on the references listed in the identified papers. The specific inclusion and exclusion criteria are in Box 1 below. Based on the review process and Overall, 14 papers were selected for review.

Box 1. Search criteria literature review.

Inclusion criteria:
General Criteria: English documents only. Peer-Reviewed. Shows contribution. From 2000 to 2023.
1st Screening: Does the article contain information about at least two key research terms, e.g. Food Supply Chain Management AND Practices, or Quality Management AND Practices?
2nd screening: Does the article identify an SCQM practice or set of SCQM practices?
Exclusion criteria:
Non-English Language. It needs to fit the scope of research by identifying SCQM practices in supply chains.

Section 2.2 presents the fourteen papers, and the selected papers were used to identify a list of SCQM practices for this study.

Stage 2 – Fuzzy Logic Approach to Assessing SCQM Practise Hotspots: Fuzzy logic is a mathematical approach that can facilitate the handling of uncertainties in information, thus allowing for degrees of truth between absolute true and false values. It provides flexibility in handling subjectivity and has been shown to be a useful approach to solving real-world problems (Klir & Yuan, 1996).

A fuzzy logic approach is adopted in this paper for several reasons, drawing upon reported advantages of the approach. An important advantage of fuzzy logic is the use of linguistic representation in models and algorithms, as it facilitates the capturing of data from respondents in a natural way (Zadeh, 1975). Fuzzy logic offers the ability to overcome issues when adopting classical logic approaches through set boundaries. It supports decision-making and analysis where research may have uncertain environments and has been shown to provide accurate findings under this uncertainty (Pospíchal, 1996). In supply chain research, evaluating performance is complicated as many indicators are possible and evaluations can be subjective to the respondent; there is also a high degree of uncertainty within supply chain management problems that warrant the use of a fuzzy approach to data analysis. It allows researchers and managers to make enhanced judgments, for example when evaluating a supply chain. Other important elements of fuzzy logic relate to generality, the concepts of precision and computation with imprecise probabilities (Zadeh, 2008).

Fuzzy logic method is used in this paper in the development of an assessment model for sustainable supply chain quality management practice hotspots. A questionnaire is used to collect data for the assessment from informants of the case studies. The questionnaire has three main parts. The first was to collect demographics data on the participants. The second part was to gather the informant's importance rating for two constructs, namely SCOR processes (Supply Chain Council, 2017), and SCQM practices. The two constructs form the basis for the SCQM practice hotspot assessment. The third part assessed the extent of the challenges attributed to each SCQM practices in each of the SCOR processes. Linguistic variables were used for capturing ratings. Triangular fuzzy numbers (TFNs) composed of a lower (l), middle (m), and upper number (u) were used to represent the values of a fuzzy event. A TFN is represented as triplet $\tilde{a} = (a1, a2, a3)$ where $a1$, $a2$, and $a3$ are real numbers and $a1 \leq a2 \leq a3$. The TFNs used in this study are shown in Tables 3, 4, 5, and how they feature in the assessment method is described in Section 4.

Stage 3 – Multiple Case Studies: Supply chain research often deals with unstructured issues and problems suited to exploratory research design, and case study offers advantages in such scenarios (Yin, 2011). The case study approach is a popular form of data collection, especially regarding qualitative methods. Rashid et al. (2019) provide a guide to conducting a case study and describe four phases: foundation, pre-field phase, field phase, and reporting phase. This study adopts a multiple-case study approach to develop an understanding of a phenomenon i.e. supply chain quality management practice hotspots, within a specific context and over a specified period. The case studies were selected from supply chains of AFNs, covering micro, medium, and large enterprises. The network of this study's researchers was used to search for participating organisations initially. The chosen organisations and resulting cases were Dutch-based, including two local and short food supply chains and one international organic supply chain.

Stage 4 –: Semi-Structure Interviews: Semi-structured interviews with relevant managers within the chosen case studies were held to understand the SCQM practice challenges they experience and how the challenges manifest into SCQM practice hotspots. The semi-structured interview was done over a video call through Microsoft Teams, in which all recordings were stored securely in a password-protected environment. Interviews were transcribed, and inductive analysis was applied. The inductive approach facilitates the identification of patterns to highlight generalisable themes. The interviews were held separately for each case study, and each of the interviews took approximately 60 minutes. The case study companies nominated their informants for the interviews.

Table 3. Level of challenge

Label	TFN
Little To No Challenge	(0, 0.5, 1.5)
Very Little Challenge	(1, 2, 3)
Fairly Little Challenge	(2, 3.5, 5)
Medium Challenge	(3, 5, 7)
Fairly High Challenge	(5, 6.5, 8)
High	(7, 8, 9)
Very High Challenge	(8.5, 9.5, 10)

Table 4. Level of importance/significance.

Label	TFN
Very Low Importance/Significance	(0, 0.05, 0.15)
Low Importance/Significance	(0.1, 0.2, 0. 3)
Fairly Importance/Significance	(0.2, 0.35, 0.5)
Medium Importance/Significance	(0.3, 0.5, 0.7)
Fairly High Importance/Significance	(0.5, 0.65, 0.8)
High Importance/Significance	(0.7, 0.8, .09)
Very High Importance/Significance	(0.85, 0.95, 1)

4. SCQM practice hotspot assessment model

The SCQM practice hotspot model put forward in this study consists of seven main steps shown in Figure 1 below.

The starting point is to constitute an SCQM practice hotspots assessment quality circle to be responsible for decisions relating to the choices of the scope of the assessment, data collection and analysis, and the assessment results. The quality circle will establish managerial implications of the identified SCQM practice hotspots, make recommendations and draw conclusions. This foregoing is Step 1 of the assessment model. In Step 2, research is conducted to establish a list of relevant SCQM practices that will feature in the assessment. This can be in the form of a literature review supported by other methods such as interviews, existing corporate documents etc. In Step 3, the SCQM practice hotspots assessment quality circle validates the list of SCQM practice hotspots model compiled in Step 2 and specifies the supply chain processes to focus on in the assessment. The circle's experience of their supply chain would be important in establishing the relevant practices and processes to study.

Step 4 is data collection, and this is in three parts involving the collection of data regarding (1) the perceived importance of each of the supply chain quality management practices listed for the assessment, (2) the perceived level of challenges experienced in each of the supply chain processes of interest, and (3) the perceived level of challenges experienced in the supply chain given the practices and processes. Data is collected using the linguistic variables described stated in Tables 3 and 4 above.

In Step 5, the task is to calculate a severity index of SCQM practice hotspot (FPHSI), for each of the SCQM practices and SCOR processes mappings of the supply chain using the following algorithm.

For each selected SCQM practices

For each selected SCOR Process

Table 5. SCQM practice hotspot levels.

Label	TFN	Color code
Little to no Hotspot	(0, 0.5, 1.5)	Green
Mild Hotspot	(2, 3.5, 5)	Blue
Moderate Hotspot	(3, 5, 7)	Yellow
Severe Hotspot	(5, 6.5, 8)	Brown
Extreme Hotspot	(8.5, 9.5, 10)	Red

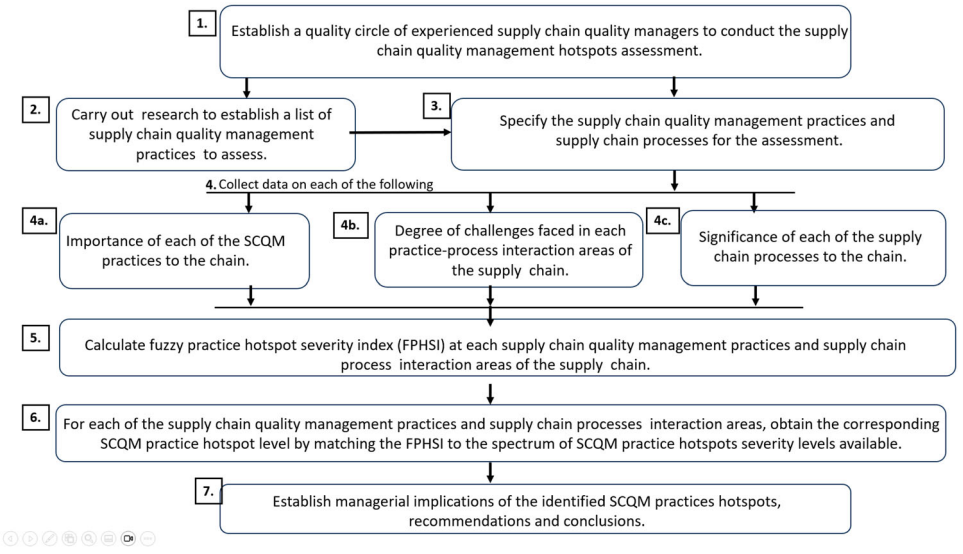

Figure 1. SCQM practice hotspot assessment model.

Calculate the FPHSI for the SCQM practice in the SCOR process using the fuzzy product formulae shown in Equation 1, with three parameters, namely, the SCQM practice importance, the SCOR process significance, and the associated SCQM practice challenge occurring in the SCOR process.

$$\tilde{a}*\tilde{b}*\tilde{c} = (a1*b1*c1,\ a2*b2*c2,\ a3*b3*c3) \tag{1}$$

In Step 6, the SCQM practice hotspot level at each of the SCQM practices in the SCOR processes of the supply chain is calculated by matching the FPHSI obtained in Step 5 to the SCQM practice hotspot levels listed in Table 5 encompassing five levels of SCQM practice hotspot levels i.e. Little or no hotspot, mild hotspot, moderate hotspot, sever hotspot, and extreme hotspot. The Euclidean distance method is used for the matching of the calculated FPHSI, see Equation 2. The vertex method is used to calculate the distance between two fuzzy triangular numbers $\tilde{a} = (a1,\ a2,\ a3)$ and $\tilde{b} = (b1,\ b2,\ \text{b3})$.

$$d(\tilde{a},\ \tilde{b}) = \sqrt{1/3[(a1 - b1)^2 + (a2 - b2)^2 + (a3 - b3)^2]} \tag{2}$$

The match occurs at the minimum $d(\tilde{a},\ \tilde{b})$ point.

The SCQM practice hotspot assessment steps is applied to case studies documented in Section 5.

5. Case studies and results

5.1 *Case study profile*

The case studies in this research are Company X, Company Y, and Company Z, respectively.

Company X is a micro-scale organisation active only in the Netherlands. The supply chain of Company X is based on a concept known as a food truck, where the food truck represents outlets for which the supply chain sells its food products to consumers. The company allows customers to engage through their innovative digital platforms enabled by blockchain technology. The company sources their materials locally and transforms them from a raw form through various processing stages to a value-added product. Their blockchain technology provides traceability and transparency information to customers, including information related to geographical indication, food miles, nutritional value, and CO_2. The supply chain of Company X and its suppliers work together within a proximate AFN. Company X embraces food localisation, and its AFN comprises of short food supply chains. The company works with select suppliers within a specific geographical location for localisation. Company X uses their blockchain platform to tell the story of their products, processes, and stakeholders, enabling the company to provide direct information to consumers. A key aim of the blockchain technology of Company X is to hold the stakeholders accountable for their claims and to support trust, honesty, and supply chain relationships. The founder of Company X is the informant in this case study and has over 15 years of experience in the sector.

Company Y is a medium-scale supply chain organisation within an Alternative Food Network in Flevoland province, the Netherlands. The products in the supply chain of Company Y are wide-ranging, from fresh produce (including vegetables, fish, meat) to more processed goods such as fruit juice and ready-to-eat meals. Company Y is directly responsible for managing their supply chain stages covering production, processing, logistics and distribution, catering, wholesale, and retail. The company organises its sales through two main channels, (1) box scheme, where local products are sourced, packaged, and delivered to consumers within the province, and (2) via online sales, where consumers can shop directly from producers and processors and have products brought to several pickup points. Company Y works with over 80 supply chain members, including producers, processors, and organisations such as financial institutes, knowledge institutes, governmental organisations, and non-governmental organisations. Company Y is organised around face-to-face and proximate AFN types (Kajzer Mitchell et al., 2017). More prevalent in Company Y is the proximate type of AFNs. The informant representing Company Y in this study is the director of the company. The informant has over 15 years of supply chain management experience.

Company Z is a large-scale organisation that deals in organic products. Company Z employs over 500 people and is active in over 60 countries. The company sources materials consisting of various organic products, including dried fruit, drains, nuts, sesame, and cocoa. The company transforms the sourced materials through production processes into a value-added product and sells the processed foods to customers. The company started by focusing mainly on trading sourced organic food materials, selling the materials without further processing. The company gradually expanded its supply chain to cover the production processing stages of sourced organic food materials. The company is certified organic in the EU, USA, and Japan. Their certifications include BRC, GMP, Fairtrade, Naturland, EarthKosher and SGF. A vital goal of the company is to improve social sustainability and impact the livelihoods of producers and surrounding areas. Company Z can be classified as belonging to an extended AFN type, as it operates globally and includes various actors. Company Z belongs to an AFN, albeit it falls under a weak AFN classification. The informant representing Company Z in this study is a logistics manager whose role is in international trade (import and export) and logistics operation

of the company. The informant has been involved in the organisation for at least three years and had a rich overview of the supply chain and operational activity due to their role.

The profiles of the case studies and the informants are summarised in Table 6. At the beginning of each case study investigation, the rationale for the study and the research questions were discussed with the case study companies, and they confirmed their readiness to participate.

The case study companies agreed on the specifics of the two constructs of the SCQM practice hotspot assessment model, i.e. the list of SCQM practices and the SCOR processes to focus on (Step 3 of the SCQM Practice hotspot assessment model). The list of SCQM practices agreed for use in the assessments is shown in Table 7, drawing from the SCQM practices identified from the literature (Table 1). The listed SCQM practices are the key ones of interest to the case study companies amongst those identified in Table 1. The companies adopted the SCOR processes namely plan, source, make, deliver, return, and enable for the assessment.

5.2 *Case study results*

Step 4 of the SCQM practice assessment model was implemented for each of the case studies. Based on the response from the key informants, the importance of practices, significance of the supply chain processes, and extent of SCQM practice challenges experienced in the SCOR processes were collected and cross-tabulated as shown in Tables 8, 9, 10 for each case study respectively.

As an example, in Table 8, Case Study X rated planning (Plans) and continuous improvement to be of very high significance and fairly high importance respectively.

Table 6. Profiles of the case studies

	Company X	Company Y	Company Z
Size Classification of Company (Chong et al., 2019)	Micro	Medium	Large
Main Supplier Food Types	Fresh/Whole Foods (e.g. dairy, vegetables, meat, bread, eggs)	Fresh/Whole foods (e.g. dairy, vegetables, meat, bread, eggs) and processed (e.g. soft drinks, spreads and sauces)	Fresh/Whole Foods (e.g. dried fruit, coffee beans drains, nuts, sesame, and cocoa)
Type of Product/ Service	Food truck and blockchain platform.	Local produce through online Sales, Food box schemes	Processed and unprocessed organic products.
Home Country of Organization	The Netherlands	The Netherlands	The Netherlands
Number Countries Active	1	1	>60
Type of AFN	Proximate	Face-to-face, Proximate	Extended
Sales Structure	Business to Consumer	Business to Business and Business to Consumer	Business to Business
Informant Experience	>15	>15	3–5
Role	Director	Owner/Operator	Logistics and Supply Chain Manager

Table 7. List of SCQM practices adopted for the study.

SCQM Practices	SCQM Practices
Continuous Improvement	Risk and Security Management
Customer Focus	Supplier Quality Management
Human Resource Management	Supply Chain Integration
ICT and Digital Technologies	Supply Chain Relationship
Information Quality	Sustainable Supply Chain Management
Information Sharing	Top management leadership, commitment., and governance
Logistics Management	Traceability and Transparency
Packaging and Labelling Practices	Visibility
Postponement	Automation
Process Management	Laws Policies and Standards
Product and Service Design	Information Management
Quality Control and Certifications	
Resilience	

They recorded a very high continuous improvement practice challenge in the plan process. The rest of the table and those of Tables 9 and 10 can be interpreted similarly.

Next, Steps 5 and 6 of the SCQM practice hotspot assessment model were applied to the data in Tables 8–10, and the results are shown in Tables 11, 12, 13 for Company X, Y, and Z, respectively. The tables show the level of hotspots identified for the case studies. For example, in Case Company X the continuous improvement practice and plan process interactions highlighted in the preceding paragraph is evaluated by the supply chain quality management practice hotspots method (Section 4) as manifesting as a moderate hotspot (see Table 11).

The results in Tables 11–13 were analysed to explore their incidences within (1) context, process, people, and technology dimensions (see Figure 2), and (2) within the SCOR processes (see Figure 3). Context practices are considered to include leadership and top-level management commitments, and externally oriented practices. People practices are those that encompass managing employees and customers as individuals. Process practices are related to internal and external processes in the supply chain and technological practices are those associated with information, supply chain visibility, and automation.

Table 14. contains a summary of follow-up semi-structured interview results.

5.3 *Discussion*

The case study results presented in Section 5.2 show that SCQM practice challenges are a concern in SCQM, reinforcing the literature on practice challenges in supply chains (Chardine-Baumann & Botta-Genoulaz, 2014). Based on the results, the SCQM practice challenges can be categorised into two (1) SCQM practice challenges that are common to the three case studies explored, and (2) SCQM practice challenges that appear localised to each of the case studies. In the first category are challenges associated with supply chain collaboration and relationships, information sharing, and responding to customer demand. These findings align with the literature regarding food supply chain challenges in general (e.g. Ruteri & Xu, 2009). The challenges can be interrelated. For example, challenges such as information sharing, automation, supply chain relationships, and collaboration, impact supply chain visibility (Maghsoudi & Pazirandeh, 2016; Sunmola et al.,

Table 8. SCQM practice hotspot assessment data for Company X.

		Plan	Source	Make	Deliver	Return	Enable
		Very High Significance	High Significance	Fairly High Significance	Fairly High Significance	Fairly High Significance	High Significance
Continuous Improvement	Fairly High Importance	Very High Challenge	High Challenge	High Challenge	Fairly High Challenge	Medium Challenge	Medium Challenge
Customer Focus	High Importance	Very High Challenge	High Challenge	High Challenge	High Challenge	Low Challenge	Medium Challenge
Human Resource Management	Fairly High Importance	Fairly High Challenge	Medium Challenge	Fairly High Challenge	High Challenge	Medium Challenge	Fairly High Challenge
ICT and Digital Technologies	Very High Importance	Medium Challenge	Medium Challenge	Medium Challenge	High Challenge	Medium Challenge	Fairly High Challenge
Information Quality	Very High Importance	Fairly High Challenge	Very High Challenge	Medium Challenge	High Challenge	Medium Challenge	High Challenge
Information Sharing	Very High Importance	Medium Challenge	Medium Challenge	Medium Challenge	High Challenge	Medium Challenge	Fairly High Challenge
Logistics Management	Fairly High Importance	Fairly High Challenge	Medium Challenge	Medium Challenge	High Challenge	Medium Challenge	Fairly High Challenge
Packaging and Labelling Practices	Fairly High Importance	Fairly High Challenge	Medium Challenge	Medium Challenge	Very High Challenge	Medium Challenge	Fairly High Challenge
Postponement	Medium Importance	Medium Challenge	Medium Challenge	Medium Challenge	Fairly High Challenge	Medium Challenge	Fairly High Challenge
Process Management	Fairly High Importance	Medium Challenge	Medium Challenge	Medium Challenge	Fairly High Challenge	Medium Challenge	High Challenge
Product and Service Design	Fairly High Importance	Medium Challenge	Fairly High Challenge	Medium Challenge	High Challenge	Medium Challenge	Fairly High Challenge
Quality Control and Certifications	Fairly High Importance	High Challenge	Medium Challenge	Medium Challenge	High Challenge	Medium Challenge	High Challenge
Resilience	Fairly High Importance	High Challenge	Medium Challenge	Medium Challenge	High Challenge	Medium Challenge	High Challenge
Risk and Security Management	High Importance	Fairly High Challenge	Medium Challenge	Medium Challenge	High Challenge	Fairly High Challenge	High Challenge
Supplier Quality Management	High Importance	High Challenge	Medium Challenge	Medium Challenge	High Challenge	Medium Challenge	High Challenge

Supply Chain Integration	High Importance	High Challenge	Medium Challenge	Fairly High Challenge	Fairly High Challenge	Medium Challenge	Very High Challenge
Supply Chain Relationship	High Importance	Fairly High Challenge	Medium Challenge	Fairly High Challenge	High Challenge	Medium Challenge	Very High Challenge
Sustainable Supply Chain Management	Very High Importance	High Challenge	Medium Challenge	High Challenge	High Challenge	Medium Challenge	Very High Challenge
Top management leadership, commitment, and governance	High Importance	Very High Challenge	Very High Challenge	Very High Challenge	Very High Challenge	Fairly High Challenge	Very High Challenge
Traceability and Transparency	Very High Importance	Very High Challenge	Very High Challenge	Fairly High Challenge	High Challenge	Fairly High Challenge	High Challenge
Visibility	Very High Importance	High Challenge	High Challenge	Fairly High Challenge	Fairly High Challenge	Fairly High Challenge	Fairly High Challenge
Automation	Fairly High Importance	Fairly High Challenge	Medium Challenge	Medium Challenge	Medium Challenge	Fairly High Challenge	Fairly High Challenge
Laws Policies and Standards	High Importance	High Challenge	Fairly High Challenge	Fairly High Challenge	Medium Challenge	High Challenge	High Challenge
Information Management	Very High Importance	Very High Challenge	High Challenge	Very High Challenge	High Challenge	Very High Challenge	High Challenge

Table 9. SCQM practice hotspot assessment data for Company Y.

		Plan	Source	Make	Deliver	Return	Enable
		Very High Significance	Very High Significance	Fairly High Significance	Very High Significance	Medium Significance	High Significance
Continuous Improvement	High Importance	High Challenge	Fairly High Challenge	High Challenge	High Challenge	Medium Challenge	High Challenge
Customer Focus	Very High Importance	Very High Challenge	Very High Challenge	Very High Challenge	Very High Challenge	High Challenge	Very High Challenge
Human Resource Management	Medium Importance	Medium Challenge	Medium Challenge	Medium Challenge	High Challenge	Fairly Low Challenge	Fairly High Challenge
ICT and Digital Technologies	High Importance	High Challenge	High Challenge	Fairly High Challenge	Very High Challenge	Medium Challenge	Very High Challenge
Information Quality	High Importance	Very High Challenge	Very High Challenge	Very High Challenge	Very High Challenge	Very High Challenge	Very High Challenge
Information Sharing	Very High Importance	Very High Challenge	Very High Challenge	Very High Challenge	Very High Challenge	Very High Challenge	Very High Challenge
Logistics Management	Very High Importance	Very High Challenge	Very High Challenge	Very High Challenge	Very High Challenge	High Challenge	Very High Challenge
Packaging and Labelling Practices	High Importance	High Challenge	Very High Challenge	Very High Challenge	Very High Challenge	Fairly High Challenge	High Challenge
Postponement	High Importance	High Challenge	Fairly High Challenge	High Challenge	Very High Challenge	Medium Challenge	Medium Challenge
Process Management	Very High Importance	Very High Challenge	Very High Challenge	Very High Challenge	Very High Challenge	High Challenge	Very High Challenge
Product and Service Design	High Importance	High Challenge	High Challenge	Very High Challenge	Fairly High Challenge	Very High Challenge	High Challenge
Quality Control and Certifications	High Importance	Very High Challenge	Very High Challenge	Very High Challenge	High Challenge	Very High Challenge	Very High Challenge
Resilience	High Importance	High Challenge	Medium Challenge	Fairly High Challenge	High Challenge	Medium Challenge	Medium Challenge
Risk and Security Management	High Importance	Medium Challenge	Fairly High Challenge	Very High Challenge	High Challenge	Fairly High Challenge	Very High Challenge
Supplier Quality Management	Very High Importance	High Challenge	High Challenge	Very High Challenge	Very High Challenge	Very High Challenge	Very High Challenge

Supply Chain Integration	Very High Importance	Very High Challenge	Very High Challenge	Very High Challenge	Very High Challenge	Very High Challenge	Very High Challenge
Supply Chain Relationship	Very High Importance	Very High Challenge	Very High Challenge	Very High Challenge	Very High Challenge	Fairly High Challenge	Very High Challenge
Sustainable Supply Chain Management	Very High Importance	Very High Challenge	Very High Challenge	Very High Challenge	Very High Challenge	Fairly High Challenge	Very High Challenge
Top management leadership, commitment, and governance	Very High Importance	High Challenge	Very High Challenge	Very High Challenge	High Challenge	Fairly Low Challenge	Very High Challenge
Traceability and Transparency	Very High Importance	Very High Challenge	Very High Challenge	Very High Challenge	Very High Challenge	High Challenge	Very High Challenge
Visibility	Very High Importance	Very High Challenge	Very High Challenge	Very High Challenge	High Challenge	Fairly Low Challenge	Very High Challenge
Automation	Very High Importance	Very High Challenge	Very High Challenge	High Challenge	High Challenge	Medium Challenge	Very High Challenge
Laws Policies and Standards	Fairly High Importance	Very High Challenge	Fairly High Challenge	Fairly Low Challenge	High Challenge	Fairly High Challenge	High Challenge
Information Management	High Importance	High Challenge	High Challenge	High Challenge	High Challenge	Fairly High Challenge	High Challenge

Table 10. SCQM practice hotspot assessment data for Company Z.

		Plan	Source	Make	Deliver	Return	Enable
		Very High Significance	Very High Significance	Fairly High Significance	Fairly Low Significance	Fairly High Significance	Low Significance
Continuous Improvement	Medium Importance	Very High Challenge	High Challenge	Fairly Low Challenge	Fairly High Challenge	High Challenge	High Challenge
Customer Focus	Fairly High Importance	Medium Challenge	Fairly High Challenge	Fairly Low Challenge	High Challenge	Medium Challenge	Low Challenge
Human Resource Management	Very low Importance	Very High Challenge	Fairly High Challenge	Very High Challenge	Very High Challenge	Low Challenge	Very High Challenge
ICT and Digital Technologies	Low Importance	High Challenge	Very High Challenge	Medium Challenge	High Challenge	Fairly Low Challenge	Very High Challenge
Information Quality	Low Importance	Fairly High Challenge	Very High Challenge	High Challenge	Very Low Challenge	High Challenge	Very High Challenge
Information Sharing	Fairly Low Importance	Fairly Low Challenge	Very High Challenge	Very High Challenge	Medium Challenge	Very High Challenge	Very High Challenge
Logistics Management	High Importance	Fairly Low Challenge	High Challenge	Fairly High Challenge	Fairly High Challenge	Low Challenge	Medium Challenge
Packaging and Labelling Practices	Fairly High Importance	High Challenge	Very High Challenge	Medium Challenge	High Challenge	Low Challenge	Low Challenge
Postponement	Fairly Low Importance	Fairly Low Challenge	Fairly High Challenge	High Challenge	Very High Challenge	Very High Challenge	Very Low Challenge
Process Management	High Importance	High Challenge	High Challenge	High Challenge	Low Challenge	Fairly High Challenge	High Challenge
Product and Service Design	Very low Importance	Low Challenge	Very Low Challenge	Fairly High Challenge	Medium Challenge	Very Low Challenge	Fairly High Challenge
Quality Control and Certifications	Very High Importance	Very Low Challenge	Medium Challenge	Fairly High Challenge	Low Challenge	Very Low Challenge	Very High Challenge
Resilience	High Importance	Low Challenge	Medium Challenge	Low Challenge	Low Challenge	Medium Challenge	Very Low Challenge
Risk and Security Management	Medium Importance	Very Low Challenge	Fairly High Challenge	High Challenge	Medium Challenge	Very High Challenge	Very High Challenge
Supplier Quality Management	High Importance	High Challenge	Very High Challenge	Fairly High Challenge	Fairly High Challenge	Very High Challenge	Very High Challenge

Supply Chain Integration	High Importance	Medium Challenge	High Challenge	Fairly High Challenge	Low Challenge	Low Challenge	Fairly High Challenge
Supply Chain Relationship	Very High Importance	Medium Challenge	Fairly High Challenge	Very High Challenge	Fairly Low Challenge	High Challenge	Medium Challenge
Sustainable Supply Chain Management	Low Importance	Fairly High Challenge	Very High Challenge	Very High Challenge	Very High Challenge	High Challenge	Very High Challenge
Top management leadership, commitment, and governance	Medium Importance	High Challenge	Fairly High Challenge	High Challenge	Medium Challenge	Fairly High Challenge	Low Challenge
Traceability and Transparency	Very High Importance	High Challenge	Medium Challenge	Very Low Challenge	Fairly Low Challenge	Very High Challenge	High Challenge
Visibility	Very High Importance	Medium Challenge	Fairly Low Challenge	Very High Challenge	Fairly Low Challenge	Very High Challenge	Very High Challenge
Automation	Very High Importance	Very High Challenge	High Challenge	High Challenge	High Challenge	High Challenge	Medium Challenge
Laws Policies and Standards	Very High Importance	Fairly High Challenge	Medium Challenge	Medium Challenge	Fairly Low Challenge	Fairly High Challenge	Very High Challenge
Information Management	Fairly High Importance	Fairly High Challenge	Very High Challenge	Fairly Low Challenge	Fairly High Challenge	Fairly Low Challenge	High Challenge

Table 11. SCQM practice hotspot assessment results for Company X.

	Plan	Source	Make	Deliver	Return	Enable	
Continuous Improvement	Moderate	Moderate	Mild	Mild	Mild	Mild	Mild
Customer Focus	Severe	Moderate	Moderate	Moderate	Little or no	Mild	Moderate
Human Resource Management	Moderate	Mild	Mild	Mild	Mild	Mild	Mild
ICT and Digital Technologies	Moderate	Mild	Mild	Moderate	Mild	Moderate	Moderate
Information Quality	Moderate	Severe	Mild	Moderate	Mild	Severe	Moderate
Information Sharing	Moderate	Mild	Mild	Moderate	Mild	Moderate	Moderate
Logistics Management	Moderate	Mild	Mild	Mild	Mild	Mild	Mild
Packaging and Labelling Practices	Moderate	Mild	Mild	Moderate	Mild	Mild	Mild
Postponement	Mild	Mild	Little or no	Mild	Little or no	Mild	Mild
Process Management	Mild	Mild	Mild	Mild	Mild	Moderate	Mild
Product and Service Design	Mild	Mild	Mild	Mild	Mild	Mild	Mild
Quality Control and Certifications	Moderate	Mild	Mild	Mild	Mild	Moderate	Mild
Resilience	Moderate	Mild	Mild	Mild	Mild	Moderate	Mild
Risk and Security Management	Moderate	Mild	Mild	Moderate	Mild	Moderate	Moderate
Supplier Quality Management	Severe	Mild	Mild	Moderate	Mild	Moderate	Moderate
Supply Chain Integration	Severe	Mild	Mild	Mild	Mild	Severe	Moderate
Supply Chain Relationship	Moderate	Mild	Mild	Moderate	Mild	Severe	Moderate
Sustainable Supply Chain Management	Severe	Mild	Moderate	Moderate	Mild	Severe	Moderate
Top management leadership, commitment, and governance	Severe	Severe	Moderate	Moderate	Mild	Severe	Moderate
Traceability and Transparency	Extreme	Severe	Moderate	Moderate	Moderate	Severe	Severe
Visibility	Severe	Severe	Moderate	Moderate	Moderate	Moderate	Moderate
Automation	Moderate	Mild	Mild	Mild	Mild	Mild	Mild
Laws Policies and Standards	Severe	Moderate	Mild	Mild	Moderate	Moderate	Moderate
Information Management	Extreme	Severe	Moderate	Moderate	Moderate	Severe	Severe
Process Hotspots	Moderate	Moderate	Mild	Moderate	Mild	Moderate	

Table 12. SCQM practice hotspot assessment results for Company Y.

	Plan	Source	Make	Deliver	Return	Enable	
Continuous Improvement	Severe	Moderate	Moderate	Severe	Mild	Moderate	Moderate
Customer Focus	Extreme	Extreme	Moderate	Extreme	Mild	Severe	Severe
Human Resource Management	Mild	Mild	Little or no	Mild	Little or no	Mild	Mild
ICT and Digital Technologies	Severe	Severe	Mild	Severe	Mild	Severe	Moderate
Information Quality	Severe	Severe	Moderate	Severe	Mild	Severe	Severe
Information Sharing	Extreme	Extreme	Moderate	Extreme	Moderate	Severe	Severe
Logistics Management	Extreme	Extreme	Moderate	Extreme	Mild	Severe	Severe
Packaging and Labelling Practices	Severe	Severe	Moderate	Severe	Mild	Moderate	Moderate
Postponement	Severe	Moderate	Moderate	Severe	Mild	Mild	Moderate
Process Management	Extreme	Extreme	Moderate	Extreme	Mild	Severe	Severe
Product and Service Design	Severe	Severe	Moderate	Moderate	Mild	Moderate	Moderate
Quality Control and Certifications	Severe	Severe	Moderate	Severe	Mild	Severe	Severe
Resilience	Severe	Mild	Mild	Severe	Mild	Mild	Moderate
Risk and Security Management	Mild	Moderate	Moderate	Severe	Mild	Severe	Moderate
Supplier Quality Management	Severe	Severe	Moderate	Extreme	Moderate	Severe	Severe
Supply Chain Integration	Extreme	Extreme	Moderate	Extreme	Moderate	Severe	Severe
Supply Chain Relationship	Extreme	Extreme	Moderate	Extreme	Mild	Severe	Severe
Sustainable Supply Chain Management	Extreme	Extreme	Moderate	Extreme	Mild	Severe	Severe
Top management leadership, commitment, and governance	Severe	Extreme	Moderate	Severe	Little or no	Severe	Severe
Traceability and Transparency	Extreme	Extreme	Moderate	Extreme	Mild	Severe	Severe
Visibility	Extreme	Extreme	Moderate	Severe	Little or no	Severe	Severe
Automation	Extreme	Extreme	Moderate	Severe	Mild	Severe	Severe
Laws Policies and Standards	Moderate	Moderate	Little or no	Moderate	Mild	Moderate	Moderate
Information Management	Severe	Severe	Moderate	Severe	Mild	Moderate	Moderate
Process Hotspots	Severe	Severe	Moderate	Severe	Mild	Severe	

Table 13. SCQM practice hotspot assessment results for Company Z

	Plan	Source	Make	Deliver	Return	Enable	
Continuous Improvement	Moderate	Mild	Little or no	Little or no	Mild	Little or no	Mild
Customer Focus	Mild	Moderate	Little or no	Little or no	Mild	Little or no	Mild
Human Resource Management	Little or no	Little or no	Little or no	Little or no	Little or no	Little or no	Little or no
ICT and Digital Technologies	Little or no	Little or no	Little or no	Little or no	Little or no	Little or no	Little or no
Information Quality	Little or no	Little or no	Little or no	Little or no	Little or no	Little or no	Little or no
Information Sharing	Little or no	Mild	Mild	Little or no	Mild	Little or no	Mild
Logistics Management	Mild	Severe	Mild	Little or no	Little or no	Little or no	Mild
Packaging and Labelling Practices	Moderate	Moderate	Mild	Little or no	Little or no	Little or no	Mild
Postponement	Little or no	Mild	Little or no	Little or no	Mild	Little or no	Little or no
Process Management	Severe	Severe	Moderate	Little or no	Mild	Little or no	Moderate
Product and Service Design	Little or no	Little or no	Little or no	Little or no	Little or no	Little or no	Little or no
Quality Control and Certifications	Little or no	Moderate	Moderate	Little or no	Little or no	Little or no	Mild
Resilience	Little or no	Mild	Little or no	Little or no	Mild	Little or no	Little or no
Risk and Security Management	Little or no	Mild	Mild	Little or no	Mild	Little or no	Mild
Supplier Quality Management	Severe	Severe	Mild	Little or no	Moderate	Little or no	Moderate
Supply Chain Integration	Mild	Severe	Mild	Little or no	Little or no	Little or no	Mild
Supply Chain Relationship	Moderate	Moderate	Moderate	Little or no	Moderate	Little or no	Mild
Sustainable Supply Chain Management	Little or no	Little or no	Little or no	Little or no	Little or no	Little or no	Little or no
Top management leadership, commitment, and governance	Mild	Mild	Mild	Little or no	Mild	Little or no	Mild
Traceability and Transparency	Severe	Moderate	Little or no	Little or no	Moderate	Little or no	Mild
Visibility	Moderate	Mild	Moderate	Little or no	Moderate	Little or no	Mild
Automation	Extreme	Severe	Moderate	Mild	Moderate	Little or no	Moderate
Laws Policies and Standards	Moderate	Moderate	Mild	Little or no	Moderate	Little or no	Mild
Information Management	Moderate	Moderate	Little or no	Little or no	Little or no	Little or no	Mild
Process Hotspots	Mild	Moderate	Mild	Little or no	Mild	Little or no	

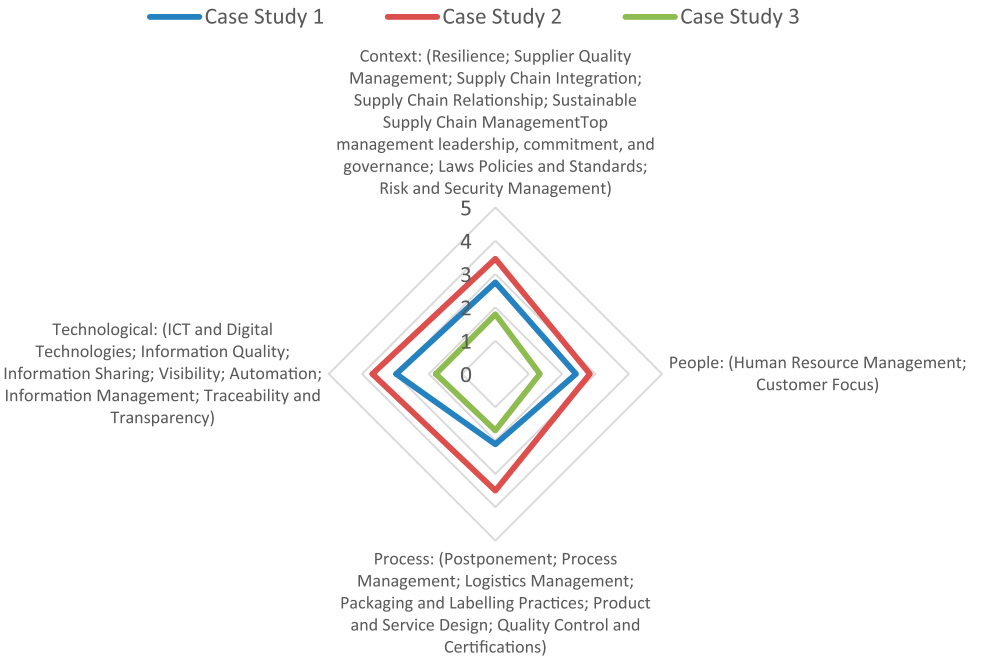

Figure 2. SCQM practice hotspot analysis based on context, people, process and technology groupings.

2023). Confronting SCQM practice challenges is essential in supporting performance within AFNs (Ghadimi et al., 2019). In the second category are SCQM practice challenges that are related to characteristics specific to each of the supply chains, such as those arising from supply chain design and supply chain management considerations. Generally, supply chain design is influential on how challenges manifest in supply chains (Wagner & Neshat, 2012). Examples found in the case studies of this research include the following. Company Z's organic food supply chain faces SCQM practice challenges around supply and raw materials authenticity. Examples of related challenges are acknowledged in the food supply chain literature (Mancini & Arfini, 2018; Oñederra-Aramendi et al., 2018). Another example of SCQM practice challenges reported in Company Z relates to certification requirements and consumers' understanding of what is considered organic. This is not entirely surprising due to the large size of the supply chain and its extended AFN. In contrast to Company Z, Companies X and Y face a SCQM practice challenge associated with product localness, amongst others. The two companies reported that their consumers cannot always distinguish a product's localness and that they are prone to lower profit margins in comparison to their global supply chain counterparts, which impacts in various ways their SCQM practices and performance.

The informants across the three case studies reported a loss of trust and consumer confidence as key consequences of the SCQM practice challenges they experience. For example, practices around quality, provenance, traceability, information, and transparency impact consumers' trust or distrust in AFNs, and can affect supply chain performance (Heron & Oglethorpe, 2013; Szűcs & Koncz, 2020). Sustainability of the supply chains is also alluded to by the informants in a variety of contexts, including loss of customer satisfaction, increased food loss, inability to sell products due to quality issues, product

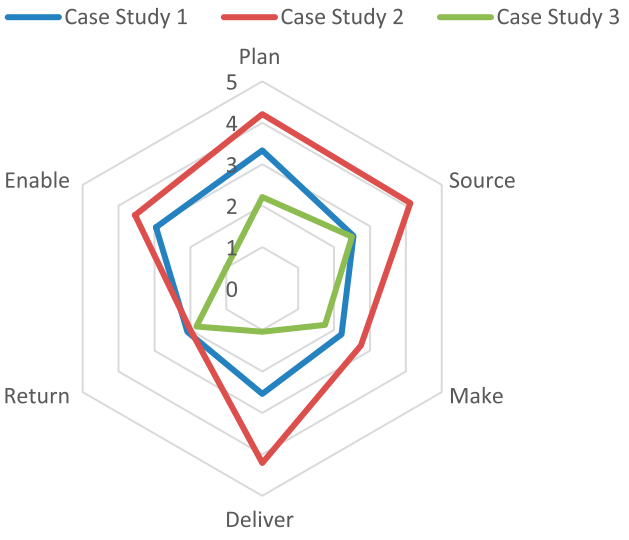

Figure 3. SCQM practice hotspot analysis based on supply chain processes.

Table 14 Interview Results (* is common across the case studies.)

	Case Study 1 (Company X)	Case Study 2 (Company Y)	Case Study 3 (Company Z)
Key Challenges	Collaboration, supply chain relationships, information sharing, responding to customer demand, and inconsistencies relating to supply and demand. *		
	Synchronisation of supply and demand, Managing the supply chain and logistics, Product management, Stakeholder management, Process management,	Difference in standards for organic and customer requirements. Supplier quality management and consistency.	Lower profit margins (lacking efficiency) Limited resilience Distinguishing and competing in local
Addressing Challenges	Enhanced communication, information and data sharing, digitalisation, agility, and flexibility. *		
	Improved forecasting	Flexibility, quality control, knowledge development	Defining local standards and establishing provenance.
Consequences of the challenges	Loss of trust and customer confidence. *		
	Food loss	Unable to sell a product, Penalties.	Consumer preferences are unmet.

returns and penalties, which the informants perceive as negatively impacting on social, environmental, and economic outcomes. Deficient supply chain, logistics and distribution management strategies can lead to issues of unsatisfied customers and potential losses of fresh produce.

The SCQM practice hotspots assessment model is useful in identifying SCQM practice hotspots in food supply chains. The participants in this study found the notion of SCQM practice hotspots beneficial, especially in providing insight into practice-process

interactions that may influence SCQM performance. The participants appeared to have an intuitive view of the severity of their SCQM practice hotspots and were delighted to see a model that supports them in self-assessing SCQM practice hotspot incidences in their supply chains. When the SCQM practice hotspots map (Tables 11–13) was presented to the informants, they agreed with the SCQM practice hotspots identified for their supply chains, and they were of the opinion that the findings shed important light on their SCQM practices. All the three case study informants believe that the SCQM practice hotspots model is helpful, particularly for conducting an in-depth assessment of SCQM practices, providing insights on SCQM practices areas for improvement regarding production, planning and control of their internal and external supply chain quality management activities, and in addressing the SCQM practice challenges they experience. There is an acknowledgement of the impact the recognition of the SCQM practice hotspots can have on innovation practices, particularly regarding knowledge creation processes. This is more so if the SCQM practice hotspots impact quality management practices that have significant direct impacts on knowledge-creation processes.

Patterns of SCQM practice hotspots across the case study companies explored are discernable. For example, traceability and transparency, process management, sustainable supply chain management, automation, supplier quality management, and supply chain relationships were common SCQM practice hotspot areas across the three case studies in this research. Food supply chains in both global and alternative food networks recognise the importance of these SCQM practices (Aung & Chang, 2014; Sellitto et al., 2018). Traceability, transparency and governance are critical in AFNs reflecting on a need to understand the origin and supply chain practices of food (Sellitto et al., 2018) and in supporting materials' ethnicity, authenticity, and locality (Carzedda et al., 2018; Prigent-Simonin & Hérault-Fournier, 2005; Stephens & Barbier, 2021). In addition to patterns between the three case companies, areas of differences in SCQM practice hotspots are identifiable. SCQM practice hotspots in more locally based, small-medium scale organisations, i.e. Company X and Company Y in this study, are top management leadership, commitment, governance information quality, sustainable supply chain management, and customer focus. Company X and Company Y are relatively young, micro, to medium size organisations. SCQM practices of these more locally based supply chains often emanate from trust mechanisms developed by personalised relationships and direct producer-customer interaction. These supply chains may need to deploy more consumer knowledge regarding the methods behind the product's origin and production rather than relying solely on trust (van Tilburg et al., 2007; Wertheim-Heck & Spaargaren, 2016), and this could help the supply chain in their efforts to address their SCQM practice hotspots. Managers in food supply chains sometimes attribute quality risks, e.g. food fraud, to low levels of visibility and uncertainty within current supply chains, calling for improved levels of information flow and transparency over practices in the supply chain (Ma et al., 2022). In the large-scale organic AFN-based Company Z, packaging and labelling practices are a concern because of the stringent and sometimes ambiguous regulations for organic food supply chains. It is, however, worth noting that SCQM practice relating to laws, policies, and standards is an area the informants felt they operate effective practice, amongst others. This is not surprising as recent political strategic roadmaps have supported local, short and organic food supply chains (Kapała, 2022). Implementing laws, policies and standards that prevent unfair trading practices, support organic and local production practices, and drive a need for traceability in the AFNs (Živković et al., 2022), whilst positively supporting SCQM practices and reducing incidences of associated SCQM practice hotspots. AFNs should

embrace the increasing development of laws, policies, and standards to better support practices and performance.

Figures 2 and 3 shed more light on the SCQM practice hotspot incidences identified for the case studies. In Figure 2, along the dimensions of context, people, processes and technologies, Company Z is found to have a lower severity of SCQM practice hotspots incidences, compared to Company X. Company X has a lower severity of SCQM practice hotspots incidences, compared to Company Y. Company Y is a medium-sized supply chain and may be grappling with several of the challenges it faces more than those of the other two case studies. This appear more so in the SCOR processes. Company Z has been in operation for a long time, compared to the other two companies studied, which may lead to a lower severity of practice hotspots recorded. In addition, Company Z is a large organisation that has integrated technology into their processes over the years and therefore faces lower levels of SCQM practice challenge in technological-related practices. Although Company X is micro-scale, it is technology-driven, integrating blockchain into its supply chain, and faces fewer challenges than Company Y. Company Y shows more pronounced SCQM practice hotspots than the other two case study companies, which might be related to the many members, products, and services that shape the network. Similar hierarchical results were observed in Figure 3 for the SCOR processes. However, regarding the returns SCOR process, the severity of the SCQM practice hotspots for the three case studies were found to be similar, i.e. mild. This result may be attributed to reduced intermediaries in the supply chain, especially in areas where waste seems to occur in abundance (i.e. wholesalers and retailers). Compared to global supply chains, alternative food chains have reduced intermediate stakeholders, focusing more on preventing residual flows instead of handling returns (Poças Ribeiro et al., 2019). Plan and Source were found to result in the highest severity of SCQM practice hotspots incidences, see Figure 3. The SCOR plan process can impact performance across all SCOR processes in supply chains (Böhle et al., 2014), and according to the case study informants this is so for their AFNs. In addition, the source process in the AFNs of the case studies proves challenging, more so in the SCQM practice hotspots regarding supplier quality management and efforts in reducing supply constraints to meet the downstream stakeholders' needs.

6. Implications for theory and practice

The SCQM practice hotspots assessment model presented in this paper has significant implications for theory and practice. Supply chain managers tasked with SCQM can use the model to identify and understand the main areas of SCQM practice hotspots within their food supply chains. Supply chains can adopt the model as a useful tool for identifying the key challenging areas of their SCQM practices and processes. However, using the tool can place additional demand on resources for collecting data required by the model for assessing the SCQM practise hotspots. Hence, support and commitment of top management in implementing the SCQM practice hotspot assessment model is essential. So also, is the need to motivate staff to use the model effectively, interpret the SCQM practice hotspots identified correctly and apply corrective actions. The SCQM practice hotspots model presents a building block for continuous improvement. Management can embrace this continuous improvement opportunity and provide associated teams with the knowledge, training, and skill acquisition needed by staff to accomplish this in AFNs. Barriers to continuous improvement arising from SCQM practice hotspots assessment may include resource constraints, a requirement for developing knowledge, training, skills,

experience, and investments. This can be quite demanding for AFNs, and choices in addressing these barriers may need to be justified using appropriate cost–benefit analysis.

The SCQM practice hotspots model presented in this paper is based primarily on self-assessment. Hence, managers need to recognise the possibility of implicit bias in the assessment. This approach may incorporate unconscious bias when assessing and interpreting SCQM practice hotspots. In response to the possibility of biased assessment, it is advised that the SCQM practice hotspots are interpreted with a critical eye by managers responsible for doing so.

Contextual factors can impact supply chain practices. Some of the SCQM practice hotspots may arise from challenges specific to a single organisation, and others may arise from industry-wide challenges. Those relevant across the industry may provide a benchmark for performance, and thus allow for transferable learning regarding the management of the SCQM practice hotspots. SCQM practice hotspots specific to a supply chain can often be linked to organisation-specific drivers and, therefore, may be critical for each case, and managers should draw upon their knowledge and experience of their businesses to address their SCQM practice hotspots. Managers should be aware of how these SCQM practices influence production planning and control. SCQM practice hotspots manifest in the planning stage. Design of the interfaces of production planning and control should recognise the consequences of the SCQM practice hotspots and how they should be managed and addressed.

There are various implications for managers involved in AFNs. In certain AFNs, particularly those that operate in local and short food supply chains, managers should keep an eye on potential SCQM practice hotspots that may significantly impact their performance. Laws, policies, and standards governing food supply chains have been mainly developed top-down. Deep considerations these regulations could make it easier for small-scale, informal actors to navigate pathways to the market. Another consideration is to improve the knowledge and information availability of downstream stakeholders regarding upstream production practices. AFNs that do not rely on face-to-face communication may benefit from digitalisation and technologies that can bridge the social gap between stakeholders in the supply chains. Supplier quality management is also critical for AFNs, and suppliers must be managed in a way that meets individual AFN needs, for example, organic production, local sources, and geographical indications.

There are several theoretical implications of the SCQM practice hotspots model and they include (1) choices of the SCQM practice hotspot categories and their boundaries which in this paper has little or no theoretical underpinning, (2) the static nature of the assessments, which focus at specific points in time, neglecting dynamic effects of the challenges, (3) deployment of appropriate continuous improvement techniques that are suited to SCQM practice hotspots management efforts, and (4) adoption of relevant digital SCQM technologies for automating and managing SCQM practice hotspots. The SCQM practice hotspots model sets a good foundation for new tools to help support SCQM, and the use of fuzzy logic alleviates some of the difficulties in collecting the data required. Automated techniques for collecting data will enhance the adoption, and ease of use, of the SCQM practice hotspots model.

7. Conclusion and future work

The purpose of the paper is to present an approach for assessing supply chain quality management practice hotspots and explore the implications of the practice hotspots in sustainable supply chains. The SCQM practice hotspots approach developed in this paper was

applied to three case studies actively engaged in alternative food networks. As noted in the discussion section (Section 5), the practitioners in the multiple case studies found the supply chain quality management practice hotspots approach especially useful and practical to their work which is indicative of the value of the notion. It did not come as a surprise that the several of the supply chain practice challenges are in the mind of the practitioners and severally indicated in the literature. What the practitioners' found particularly pleasing is the insights provided by the hotspots option prompting a potentially innovative way to improve their supply chains.

Overall, the results show the usefulness of the approach in identifying the practice hotspots. Several conclusions are drawn (1) the SCQM practice hotspots approach is valuable for identifying SCQM practices that may require extra attention to acheive desired level of quality performance. (2) Supply chain collaboration, supply chain relationships, information sharing, and responding to customer demand are SCQM practice challenges experienced by AFNs that often manifest into supply chain quality management practice hotspots. It is important to address these SCQM challenges promptly when they arise in order to avoid negative implications on performance. (3) SCQM practice hotspots do correspond with areas of significant SCQM practice challenges and are identifiable by the SCQM practice hotspot model presented in this paper. (4) The plan, source, and deliver SCOR processes can have significant influence on manifestations of SCQM practices hotspots. (5) The patterns of SCQM practice hotspot manifestations can differ from one supply chain to another, and (6) Digital technologies and automation can help in managing SCQM practice hotspots.

This research has some limitations. The approach of assessing the SCQM practice hotspots from the focal supply chain viewpoint is a limitation of this study. Although the informants of the cases studied are actively engaging with suppliers and customers, it would be beneficial to study the SCQM practice hotspots throughout the supply chain and engage broad range of stakeholders in the assessment process. This would provide insight into how the SCQM practice hotspots are assessed amongst network partners. Consumers' points of view are also important. A consumer study could help gain insight and create a bottom-up approach to assessing SCQM practices and defining the practices. The SCQM practice hotspots method presented in this paper provides only a snapshot view precluding the potentially dynamic nature of the process. Future research can be undertaking on the use of the SCQM practice hotspots model to support the development of SCQM practices and related continuous improvement programmes. Automating the SCQM practice hotspots assessment process would also be a fruitful future research area, particularly incorporating a dynamic view of the SCQM practice hotspots.

Disclosure statement

No potential conflict of interest was reported by the author(s).

References

Abdallah, A. B., Alfar, N. A., & Alhyari, S. (2021). The effect of supply chain quality management on supply chain performance: The indirect roles of supply chain agility and innovation. *International Journal of Physical Distribution & Logistics Management*, *51*, 785–812. https://doi.org/10.1108/IJPDLM-01-2020-0011

Aung, M. M., & Chang, Y. S. (2014). Traceability in a food supply chain: Safety and quality perspectives. *Food Control*, *39*, 172–184. https://doi.org/10.1016/j.foodcont.2013.11.007

Bardone, E., & Spalvēna, A. (2019). European Union food quality schemes and the transformation of traditional foods into European products in Latvia and Estonia. *Appetite*, *135*, 43–53. https://doi.org/10.1016/j.appet.2018.12.029

Basnet, C., Childerhouse, P., Foulds, L. R., & Martin, V. (2006). Sustaining supply chain management in New Zealand. *International Journal of Logistics Systems and Management*, *2*(3), 217–229. https://doi.org/10.1504/IJLSM.2006.009773

Bastas, A., & Liyanage, K. (2018). Sustainable supply chain quality management: A systematic review. *Journal of Cleaner Production*, *181*, 726–744. https://doi.org/10.1016/j.jclepro.2018.01.110

Ben-Daya, M., Hassini, E., Bahroun, Z., & Banimfreg, B. H. (2020). The role of internet of things in food supply chain quality management: A review. *Quality Management Journal*, *28*(1), 17–40. https://doi.org/10.1080/10686967.2020.1838978

Bertello, A., De Bernardi, P., Venuti, F., & Foscolo, E. (2020). How to avoid the tragedy of alternative food networks (AFNs)? The impact of social capital and transparency on AFN performance. *British Food Journal*, *122*(7), 2171–2186. https://doi.org/10.1108/BFJ-07-2019-0537

Böhle, C., Hellingrath, B., & Deuter, P. (2014). Towards process reference models for secure supply chains. *Journal of Transportation Security*, *7*(3), 255–276. https://doi.org/10.1007/s12198-014-0142-6

Bromiley, P., & Rau, D. (2014). Towards a practice-based view of strategy. *Strategic Management Journal*, *35*(8), 1249–1256. doi:10.1002/smj.2238

Brunori, G. (2007). Local food and alternative food networks: A communication perspective. *Anthropology of Food*, *2* (S2). doi:10.4000/aof.430

Burgess, P., Sunmola, F., & Wertheim-Heck, S. (2022). Blockchain enabled quality management in short food supply chains. *Procedia Computer Science*, *200*, 904–913. https://doi.org/10.1016/j.procs.2022.01.288

Burgess, P. R., Sunmola, F. T., & Wertheim-Heck, S. (2023). A review of supply chain quality management practices in sustainable food networks. *Heliyon*, *9*(11), e21179. https://doi.org/10.1016/j.heliyon.2023.e21179

Carzedda, M., Marangon, F., Nassivera, F., & Troiano, S. (2018). Consumer satisfaction in alternative food networks (AFNs): Evidence from Northern Italy. *Journal of Rural Studies*, *64*, 73–79. https://doi.org/10.1016/j.jrurstud.2018.10.003

Chardine-Baumann, E., & Botta-Genoulaz, V. (2014). A framework for sustainable performance assessment of supply chain management practices. *Computers & Industrial Engineering*, *76*, 138–147. https://doi.org/10.1016/j.cie.2014.07.029

Chiarini, A. (2017). Environmental policies for evaluating suppliers' performance based on GRI indicators. *Business Strategy and the Environment*, *26*(1), 98–111. https://doi.org/10.1002/bse.1907

Chong, S., Hoekstra, R., Lemmers, O., Van Beveren, I., Van Den Berg, M., Van Der Wal, R., & Verbiest, P. (2019). The role of small-and medium-sized enterprises in the Dutch economy: An analysis using an extended supply and use table. *Journal of Economic Structures*, *8*(1), 1–24. https://doi.org/10.1186/s40008-018-0132-0

Chukwu, O. A., & Adibe, M. (2022). Quality assessment of cold chain storage facilities for regulatory and quality management compliance in a developing country context. *International Journal of Health Planning and Management*, *37*(2), 930–943. https://doi.org/10.1002/hpm.3385

Dries, L., Peerlings, J., & Van De, L. P. (2019). EU food quality policy and rural employment. In *Rural policies and employment: Transatlantic experiences* (pp. 253–270). World Scientific Publishing Co.

Escorcia-Caballero, J. P., Moreno-Luzon, M. D., & Romano, P. (2020). Does supply chain quality integration guarantee ambidexterity? Contingency and configuration perspectives on their relationships. *Total Quality Management and Business Excellence*, *33*, 388–409. https://doi.org/10.1080/14783363.2020.1858710

Firmansyah, H. S., & Siagian, H. (2022). The impact of information sharing on supply chain performance through supplier quality management, supply chain agility, and supply chain innovation. *Petra International Journal of Business Studies*, *5*(2), 119–131. https://doi.org/10.9744/ijbs.5.2.119-131

Fonte, M. (2010). Introduction: Food relocalisation and knowledge dynamics for sustainability in rural areas. In M. Fonte (Ed.), *Naming food after places: Food relocalisation and knowledge dynamics in rural development* (pp. 1–35). Ashgate Publishing, Ltd.

Forssell, S., & Lankoski, L. (2015). The sustainability promise of alternative food networks: An examination through 'alternative' characteristics. *Agriculture and Human Values*, *32*(1), 63–75. https://doi.org/10.1007/s10460-014-9516-4

Foster, S. T. (2008). Towards an understanding of supply chain quality management. *Journal of Operations Management*, *26*(4), 461–467. https://doi.org/10.1016/j.jom.2007.06.003

Foster, S. T., Jr., Wallin, C., & Ogden, J. (2011). Towards a better understanding of supply chain quality management practices. *International Journal of Production Research*, *49*(8), 2285–2300. https://doi.org/10.1080/00207541003733791

Ghadimi, P., Wang, C., & Lim, M. K. (2019). Sustainable supply chain modeling and analysis: Past debate, present problems and future challenges. *Resources, Conservation and Recycling*, *140*, 72–84. https://doi.org/10.1016/j.resconrec.2018.09.005

Goodman, D. (2003). The quality 'turn' and alternative food practices: Reflections and agenda. *Journal of Rural Studies*, *19*(1), 1–7. https://doi.org/10.1016/S0743-0167(02)00043-8

Goodman, D., DuPuis, E. M., & Goodman, M. K. (2012). *Alternative Food Networks: Knowledge, Practice, and Politics*. Routledge. https://www.jstor.org/stable/41714208.

Goodman, D., & Goodman, M. K. (2009). Food networks, alternative. In A. Kobayashi (Ed.), *International Encyclopedia of Human Geography* (2nd ed.), pp. 175–185). Elsevier. https://doi.org/10.1016/B978-0-08-102295-5.10012-5.

Heron, G., & Oglethorpe, D. (2013). Testing the theory of constraints in UK local food supply chains. *International Journal of Operations & Production Management*, *33*(10), 1346–1367. https://doi.org/10.1108/IJOPM-05-2011-0192

Hong, J., Liao, Y., Zhang, Y., & Yu, Z. (2019). The effect of supply chain quality management practices and capabilities on operational and innovation performance: Evidence from Chinese manufacturers. *International Journal of Production Economics*, *212*, 227–235. https://doi.org/10.1016/j.ijpe.2019.01.036

Jabbour, A. B. L. d. S., Viana, A. B. N., & Jabbour, C. J. C. (2011). Measuring supply chain management practices. *Measuring Business Excellence*, *15*(2), 18–31. https://doi.org/10.1108/13683041111131592

Jarosz, L. (2008). The city in the country: Growing alternative food networks in Metropolitan areas. *Journal of Rural Studies*, *24*(3), 231–244. https://doi.org/10.1016/j.jrurstud.2007.10.002

Jarzębowski, S., & Bezat, N. (2018). Supply chain management according to the concept of short supply chain. *Proceedings in Food System Dynamics*, 313–320.

Jarzębowski, S., Bourlakis, M., & Bezat-Jarzębowska, A. (2020). Short food supply chains (SFSC) as local and sustainable systems. *Sustainability*, *12*, 4715. https://doi.org/10.3390/su12114715

Jesson, J., Matheson, L., & Lacey, F. M. (2011). *Doing your literature review: Traditional and systematic techniques*. Sage Publications Ltd.

Kajzer Mitchell, I., Low, W., Davenport, E., & Brigham, T. (2017). Running wild in the marketplace: The articulation and negotiation of an alternative food network. *Journal of Marketing Management*, *33*(7–8), 502–528. https://doi.org/10.1080/0267257X.2017.1329224

Kapała, A. M. (2022). Legal instruments to support short food supply chains and local food systems in France. *Laws*, *11*, 21. https://doi.org/10.3390/laws11020021

Kaynak, H., & Hartley, J. L. (2008). A replication and extension of quality management into the supply chain. *Journal of Operations Management*, *26*(4), 468–489. https://doi.org/10.1016/j.jom.2007.06.002

Kessari, M., Joly, C., Jaouen, A., & Jaeck, M. (2020). Alternative food networks: Good practices for sustainable performance. *Journal of Marketing Management*, *36*(15–16), 1417–1446. https://doi.org/10.1080/0267257X.2020.1783348

Kim-Soon, N., Mostafa, S. A., Nurunnabi, M., Chin, L. H., Kumar, N. M., Ali, R. R., & Subramaniam, U. (2020). Quality management practices of food manufacturers: A comparative study between small, medium and large companies in Malaysia. *Sustainability*, *12*(18), 7725. https://doi.org/10.3390/su12187725

Klir, G. J., & Yuan, B. (1996). Fuzzy sets and fuzzy logic: Theory and applications. *Possibility Theory versus Probab. Theory*, *32*(2), 207–208.

Kneafsey, M., Venn, L., Schmutz, U., Balázs, B., Trenchard, L., Eyden-Wood, T., Bos, E., Sutton, G., & Blackett, M. (2013). Short food supply chains and local food systems in the EU. A state

of play of their socio-economic characteristics. *Publications Office of the European Union. JRC Scientific and Policy Reports*, *123*, 129. https://op.europa.eu/en/publication-detail/-/publication/d16f6eb5-2baa-4ed7-9ea4-c6dee7080acc.

Kuei, C., Madu, C. N., & Lin, C. (2001). The relationship between supply chain quality management practices and organizational performance. *International Journal of Quality & Reliability Management*.

Li, S., Ragu-Nathan, B., Ragu-Nathan, T. S., & Rao, S. S. (2006). The impact of supply chain management practices on competitive advantage and organizational performance. *Omega*, *34*(2), 107–124. https://doi.org/10.1016/j.omega.2004.08.002

Li, S., Rao, S., Ragu-Nathan, T., & Nathan, R. (2005). Development and validation of a measurement instrument for studying supply chain practices. *Journal of Operations Management*, *23*(6), 618–641. https://doi.org/10.1016/j.jom.2005.01.002

Lim, A.-F., Lee, V.-H., Foo, P.-Y., Ooi, K.-B., & Wei-Han Tan, G. (2022). Unfolding the impact of supply chain quality management practices on sustainability performance: An artificial neural network approach. *Supply Chain Management: An International Journal*, *27*(5), 611–624. https://doi.org/10.1108/SCM-03-2021-0129

Lindh, H., & Olsson, A. (2010). Communicating imperceptible product attributes through traceability: A case study in an organic food supply chain. *Renewable Agriculture and Food Systems*, *25*(4), 263–271. https://doi.org/10.1017/S1742170510000281

Ling, E. K., & Wahab, S. N. (2020). Integrity of food supply chain: Going beyond food safety and food quality. *International Journal of Productivity and Quality Management*, *29*(2), 216–232. https://doi.org/10.1504/IJPQM.2020.105963

Lu, H., Mangla, S. K., Hernandez, J. E., Elgueta, S., Zhao, G., Liu, S., & Hunter, L. (2020). Key operational and institutional factors for improving food safety: A case study from Chile. *Production Planning and Control*, *32*, 1248–1264. https://doi.org/10.1080/09537287.2020.1796137

Ma, J., Tse, Y. K., Zhang, M., & MacBryde, J. (2022). Quality risk and responsive actions in sourcing/procurement: An empirical study of food fraud cases in the UK. *Production Planning & Control*, *35*, 323–334. https://doi.org/10.1080/09537287.2022.2080125

Maghsoudi, A., & Pazirandeh, A. (2016). Visibility, resource sharing and performance in supply chain relationships: Insights from humanitarian practitioners. *Supply Chain Management*, *21*(1), 125–139. https://doi.org/10.1108/SCM-03-2015-0102

Mahdikhani, M. (2023). Total quality management and lean six sigma impact on supply chain research field: Systematic analysis. *Total Quality Management & Business Excellence*, *34*(15–16), 1921–1939. https://doi.org/10.1080/14783363.2023.2214506

Mancini, M. C., & Arfini, F. (2018). Short supply chains and protected designations of origin: The case of parmigiano reggiano (Italy). *Ager*, *2018*(25), 43–64. https://doi.org/10.4422/ager.2018.11

Mancini, M. C., Menozzi, D., Donati, M., Biasini, B., Veneziani, M., & Arfini, F. (2019). Producers' and consumers' perception of the sustainability of short food supply chains: The case of parmigiano reggiano PDO. *Sustainability*, *11*(3), 721. https://doi.org/10.3390/su11030721

Mellat-Parast, M. (2013). Supply chain quality management: An inter-organizational learning perspective. *International Journal of Quality & Reliability Management*, *30*(5), 511–529. https://doi.org/10.1108/02656711311315495.

Michel-Villarreal, R., Hingley, M., Canavari, M., & Bregoli, I. (2019). Sustainability in alternative food networks: A systematic literature review. *Sustainability*, *11*, 859. https://doi.org/10.3390/su11030859

Mondal, S., & Samaddar, K. (2021). Reinforcing the significance of human factor in achieving quality performance in data-driven supply chain management. *TQM Journal*, *35*, 183–209. https://doi.org/10.1108/TQM-12-2020-0303

Oñederra-Aramendi, A., Begiristain-Zubillaga, M., & Malagón-Zaldua, E. (2018). Who is feeding embeddedness in farmers' markets? A cluster study of farmers' markets in Gipuzkoa. *Journal of Rural Studies*, *61*, 22–33. https://doi.org/10.1016/j.jrurstud.2018.05.008

Osei Tutu, B., & Anfu, P. O. (2019). Evaluation of the food safety and quality management systems of the cottage food manufacturing industry in Ghana. *Food Control*, *101*, 24–28. https://doi.org/10.1016/j.foodcont.2019.02.028

Phan, A. C., Nguyen, H. A., Trieu, P. D., Nguyen, H. T., & Matsui, Y. (2019). Impact of supply chain quality management practices on operational performance: Empirical evidence from

manufacturing companies in Vietnam. *Supply Chain Management: An International Journal*, *24*(6), 855–871. https://doi.org/10.1108/SCM-12-2018-0445

Poças Ribeiro, A., Rok, J., Harmsen, R., Rosales Carreón, J., & Worrell, E. (2019). Food waste in an alternative food network – A case-study. *Resources, Conservation and Recycling*, *149*, 210–219. https://doi.org/10.1016/j.resconrec.2019.05.029

Pospíchal, J. (1996). Fuzzy Sets and Fuzzy Logic: Theory and Applications. *Journal of Chemical Information and Computer Sciences*, *36*(3), 619. https://doi.org/10.1021/ci950144a

Prigent-Simonin, A.-H., & Hérault-Fournier, C. (2005). The role of trust in the perception of the quality of local food products: With particular reference to direct relationships between producer and consumer. *Anthropology of Food*, *4*), https://doi.org/10.4000/aof.204

Quang, H. T., Sampaio, P., Carvalho, M. S., Fernandes, A. C., Binh An, D. T., & Vilhenac, E. (2016). An extensive structural model of supply chain quality management and firm performance. *International Journal of Quality and Reliability Management*, *33*(4), 444–464. https://doi.org/10.1108/IJQRM-11-2014-0188

Rashid, Y., Rashid, A., Warraich, M. A., Sabir, S. S., & Waseem, A. (2019). Case study method: A step-by-step guide for business researchers. *International Journal of Qualitative Methods*, *18*, 1609406919862424. https://doi.org/10.1177/1609406919862424

Renting, H., Marsden, T. K., & Banks, J. (2003). Understanding alternative food networks: Exploring the role of short food supply chains in rural development. *Environment and Planning A*, *35*(3), 393–411. https://doi.org/10.1068/a3510

Ruteri, J. M., & Xu, Q. (2009). Supply chain management and challenges facing the food industry sector in Tanzania. *International Journal of Business and Management*, *4*(12), 70–80. https://doi.org/10.5539/ijbm.v4n12p70

Sadeghi Moghadam, M. R., Safari, H., & Yousefi, N. (2021). Clustering quality management models and methods: Systematic literature review and text-mining analysis approach. *Total Quality Management & Business Excellence*, *32*(3–4), 241–264. https://doi.org/10.1080/14783363.2018.1540927

Salimian, H., Rashidirad, M., & Soltani, E. (2020). Supplier quality management and performance: The effect of supply chain oriented culture. *Production Planning and Control*, *32*, 942–958. https://doi.org/10.1080/09537287.2020.1777478

Sang Chin, K., Yeung, I., & Fai Pun, K. (2006). Development of an assessment system for supplier quality management. *International Journal of Quality & Reliability Management*, *23*(7), 743–765. https://doi.org/10.1108/02656710610679806

Sarrico, C. S., & Rosa, M. J. (2016). Supply chain quality management in education. *International Journal of Quality & Reliability Management*, *33*(4), 499–517. https://doi.org/10.1108/IJQRM-11-2014-0181

Schreiner, M., Korn, M., Stenger, M., Holzgreve, L., & Altmann, M. (2013). Current understanding and use of quality characteristics of horticulture products. *Scientia Horticulturae*, *163*, 63–69. https://doi.org/10.1016/j.scienta.2013.09.027

Sellitto, M. A., Vial, L. A. M., & Viegas, C. V. (2018). Critical success factors in Short Food Supply Chains: Case studies with milk and dairy producers from Italy and Brazil. *Journal of Cleaner Production*, *170*, 1361–1368. https://doi.org/10.1016/j.jclepro.2017.09.235

Sharma, Y. K., Mangla, S. K., Patil, P. P., & Liu, S. (2019). When challenges impede the process: For circular economy-driven sustainability practices in food supply chain. *Management Decision*, *57*(4), 995–1017. https://doi.org/10.1108/MD-09-2018-1056

Siddh, M. M., Jain, R., Sharma, M. K., & Soni, G. (2018). Structural model of perishable food supply chain quality (PFSCQ) to improve sustainable organizational performance. *Benchmarking: An International Journal*, *25*(7), 2272–2317. https://doi.org/10.1108/BIJ-01-2017-0003

Siddh, M., Kumar, S., Soni, G., Jain, V., Chandra, C., Jain, R., Sharma, M. K., & Kazancoglu, Y. (2021). Impact of agri-fresh food supply chain quality practices on organizational sustainability. *Operations Management Research*, *15*, 146–165. https://doi.org/10.1007/s12063-021-00196-x

Siddh, M. M., Soni, G., Jain, R., Sharma, M. K., & Yadav, V. (2020). A framework for managing the agri-fresh food supply chain quality in Indian industry. *Management of Environmental Quality: An International Journal*, *32*(2), 436–451. https://doi.org/10.1108/MEQ-05-2020-0085

Siddh, M. M., Soni, G., Jain, R., Sharma, M. K., & Yadav, V. (2021). A framework for managing the agri-fresh food supply chain quality in Indian industry. *Management of Environmental*

Quality: An International Journal, *32*(2), 436–451. https://doi.org/10.1108/MEQ-05-2020-0085

Singh, R. K., & Kumar, R. (2020). Strategic issues in supply chain management of Indian SMEs due to globalization: An empirical study. *Benchmarking: An International Journal*, *27*(3), 913–932. https://doi.org/10.1108/BIJ-09-2019-0429

Soares, A., Soltani, E., & Liao, Y.-Y. (2017). The influence of supply chain quality management practices on quality performance: An empirical investigation. *Supply Chain Management: An International Journal*, *22*, 122–144. https://doi.org/10.1108/SCM-08-2016-0286

Song, H., Turson, R., Ganguly, A., & Yu, K. (2017). Evaluating the effects of supply chain quality management on food firms' performance: The mediating role of food certification and reputation. *International Journal of Operations and Production Management*, *37*(10), 1541–1562. https://doi.org/10.1108/IJOPM-11-2015-0666

Stephens, R., & Barbier, M. (2021). Digital fooding, cashless marketplaces and reconnection in intermediated third places: Conceptualizing metropolitan food provision in the age of prosumption. *Journal of Rural Studies*, *82*, 366–379. https://doi.org/10.1016/j.jrurstud.2020.11.009

Sunmola, F., Burgess, P., Albert, T., Chanchaichujit, J., Balasubramania, S., & Mahmud, M. (2023). Prioritising visibility influencing factors in supply chains for resilience. *Procedia Computer Science*, *217*, 1589–1598. https://doi.org/10.1016/j.procs.2022.12.359.

Supply Chain Council. (2017). *Supply chain operations reference model (SCOR): Overview (Version 12)*. APICS.

Szűcs, A., & Koncz, G. (2020). The role of trust in short food supply chains. *Acta Carolus Robertus*, 99–106. https://doi.org/10.33032/acr.2020.spec.99

van Tilburg, A., Trienekens, J., Ruben, R., & van Boekel, M. (2007). Governance for quality management in tropical food chains. *Journal on Chain and Network Science*, *7* (1), 1–9. https://doi.org/10.3920/JCNS2007.x073

Vergamini, D., Bartolini, F., Prosperi, P., & Brunori, G. (2019). Explaining regional dynamics of marketing strategies: The experience of the Tuscan wine producers. *Journal of Rural Studies*, *72*, 136–152. https://doi.org/10.1016/j.jrurstud.2019.10.006

Wagner, S. M., & Neshat, N. (2012). A comparison of supply chain vulnerability indices for different categories of firms. *International Journal of Production Research*, *50*(11), 2877–2891. https://doi.org/10.1080/00207543.2011.561540

Wallace, C. A., & Manning, L. (2020). Food provenance: Assuring product integrity and identity. *CABI Reviews*, *15*(32). https://doi.org/10.1079/PAVSNNR202015032

Watts, D. C. H., Ilbery, B., & Maye, D. (2017). Making reconnections in agro-food geography: Alternative systems of food provision. *The Rural: Critical Essays in Human Geography*, 165–184. doi:10.4324/9781315237213-9

Watts, D., Little, J., & Ilbery, B. (2018). 'I am pleased to shop somewhere that is fighting the supermarkets a little bit'. A cultural political economy of alternative food networks. *Geoforum; Journal of Physical, Human, and Regional Geosciences*, *91*, 21–29. https://doi.org/10.1016/j.geoforum.2018.02.013

Wenger, E. (1999). *Communities of practice: Learning, meaning, and identity*. Cambridge University Press.

Wertheim-Heck, S. C. O., & Spaargaren, G. (2016). Shifting configurations of shopping practices and food safety dynamics in Hanoi, Vietnam: A historical analysis. *Agriculture and Human Values*, *33*(3), 655–671. https://doi.org/10.1007/s10460-015-9645-4

Wiengarten, F., Humphreys, P., Cao, G., Fynes, B., & McKittrick, A. (2010). Collaborative supply chain practices and performance: Exploring the key role of information quality. *Supply Chain Management: An International Journal*, *15*(6), 463–473. https://doi.org/10.1108/13598541011080446

Witter, A., Murray, G., & Sumaila, U. R. (2021). Consumer seafood preferences related to alternative food networks and their value chains. *Marine Policy*, *131*, 104694. https://doi.org/10.1016/j.marpol.2021.104694

Yadav, V. S., Singh, A. R., Raut, R. D., & Govindarajan, U. H. (2020). Blockchain technology adoption barriers in the Indian agricultural supply chain: An integrated approach. *Resources, Conservation and Recycling*, *161*, 104877. https://doi.org/10.1016/j.resconrec.2020.104877

Yin, R. K. (2011). *Applications of case study research*. SAGE.

Zadeh, L. A. (1975). The concept of a linguistic variable and its application to approximate reasoning —I. *Information Sciences*, *8*(3), 199–249. https://doi.org/10.1016/0020-0255(75)90036-5

Zadeh, L. A. (2008). Is there a need for fuzzy logic? *Information Sciences*, *178*(13), 2751–2779. https://doi.org/10.1016/j.ins.2008.02.012

Zeng, J., Phan, C. A., & Matsui, Y. (2013). Supply chain quality management practices and performance: An empirical study. *Operations Management Research*, *6*(1), 19–31. https://doi.org/10.1007/s12063-012-0074-x

Zeng, W., Tse, M. Y. K., & Tang, M. (2018). Supply chain quality management: An investigation in the Chinese construction industry. *International Journal of Engineering Business Management*, *10*, 184797901881061. https://doi.org/10.1177/1847979018810619

Zhang, M., Hu, H., & Zhao, X. (2020). Developing product recall capability through supply chain quality management. *International Journal of Production Economics*, *229*, 107795. https://doi.org/10.1016/j.ijpe.2020.107795

Zhu, Q., Sarkis, J., Cordeiro, J. J., & Lai, K.-H. (2008). Firm-level correlates of emergent green supply chain management practices in the Chinese context. *Omega*, *36*(4), 577–591. https://doi.org/10.1016/j.omega.2006.11.009

Živković, L., Pešić, M. B., Schebesta, H., & Nedović, V. A. (2022). Exploring regulatory obstacles to the development of short food supply chains: Empirical evidence from selected European countries. *International Journal of Food Studies*, *11*, SI138–SI150. https://doi.org/10.7455/ijfs/11.SI.2022.a2.