Journal of Applied Engineering and Technological Science
Vol 5(2) 2024: 1199-1220

LEAN KNOWLEDGE MANAGEMENT IN THE ADOPTION OF TRACEABILITY TECHNOLOGY FOR HALAL PERISHABLE FOOD SUPPLY CHAIN: A SYSTEMATIC LITERATURE REVIEW

Wresni Anggraini[1*], Wakhid Slamet Ciptono[2], Luluk Lusiantoro[3], Heru Kurnianto Tjahjono[4]
Doctoral Program of Islamic Economy and Halal Industry, Graduate School, Universitas Gadjah Mada, Yogyakarta, Indonesia and Industrial Engineering Department, Universitas Islam Negeri Sultan Syarif Kasim Riau, Indonesia[1]
Doctoral Program of Islamic Economy and Halal Industry, Graduate School, Universitas Gadjah Mada, Yogyakarta, Indonesia and Faculty of Economics and Business, Universitas Gadjah Mada, Yogyakarta, Indonesia[23]
Doctoral Program of Islamic Economy and Halal Industry, Graduate School, Universitas Gadjah Mada, Yogyakarta, Indonesia and Faculty of Economics and Business, Universitas Muhammadiyah Yogyakarta, Indonesia[4]
wresni.a@uin-suska.ac.id

Received : 13 November 2023, Revised: 19 March 2024, Accepted : 23 March 2024
**Corresponding Author*

ABSTRACT
This research was perfomed to provide a comprehensive Systematic Literature Review (SLR) on the mutually beneficial link between Lean and Knowledge Management (LKM). The primary focus was to highlight the crucial role of LKM as an enabler in empowering perishable food supply chains (PFSC) to effectively embrace traceability technology, ensuring the integrity of halal supply chains. The research was carried out using the SLR method and adhered to the procedures of the Preferred Reporting for Systematic Reviews and Meta-Analyses (PRISMA). In total, 65 articles from the Scopus database, published in various journals over 22 years were chosen, mapped, and evaluated. Furthermore, there were several featured forms of mutual collaboration between Lean and Knowledge Management (KM). The implementation of LKM in halal supply chain traceability for perishable food was still absent from the literature. Efficient (lean) KM processes for business actors turned knowledge into added value for the PFSC. The vital role of LKM as an enabler for PFSC in adopting traceability technology, which is characterized as fast-changing technology and highly knowledge-centric, is by eliminating wasteful knowledge so could advance responsiveness, efficiency, and flexibility. Considering the important role of LKM as an enabler of PFSC to address complex challenges in traceability technology adoption, collaborative interdisciplinary research is needed. Academic publications exploring the incorporation of lean and KM in the context of PFSC were relatively scarce. This SLR represented one of the pioneering efforts to investigate the amalgamation and its potential to overcome obstacles and inhibitors in the adoption of traceability technology.
Keywords : *Lean, Knowledge Management, Traceability, Perishable Food*

1. Introduction

The management of perishable food supply chains is experiencing an increase in complexity due to heightened attention surrounding food safety, food quality, health considerations, and the constraints posed by limited product shelf life (Balaji & Arshinder, 2016). Perishable foods are interpreted as products whose quality deteriorates over time and are usually a basic need for society. Products included in perishable foods are fruit, vegetables, meat, poultry, dairy products, medicines, bread, cooked foods, and seafood (Kumar *et al*., 2021; Karaesmen *et al*., 2011).

Challenges in PFSC have been spotlighted in several studies. Perishable foods are sensitive to quality degradation due to their limited shelf life (Dash *et al*., 2022; Kumar *et al*, 2021). Patidar & Agrawal (2020) Highlighted the distribution cost that arises due to unfavorable environmental situations like temperature, vibration, pressure, and humidity during transportation. The next feature of perishable foods is that they need proper, safe, and good-

quality storage as highlighted by (Aung & Chang, 2014). The storage of perishable products for a long time requires attention to proper equipment to prevent damage to product quality and safety, which could lead to losses in all aspects (Dash *et al*., 2022). When the storage is not precise then the food would be dangerous for human consumption (Lusiantoro *et al*., 2018). Damaged products are usually thrown away with consequences to the environment and finances because they can no longer be used or reclaimed (Kaipia & Loikkanen, 2013). Furthermore, to ensure perishable food is of good grade and arrives at a good place and time (Kumar *et al*., 2020), PFSC management should be supported by high-quality processes and strict inspection. The process and product grade from farm to fork are included in the supply chain quality of perishable goods (Siddh *et al*., 2015).

There are also several risks related to halal in the PFSC that are actually related to perishable product characteristics. Halal is not only limited to the sourcing of food materials or ingredients but also includes the whole supply chain, namely: process, handling, packaging, storage, and transportation. Food halalness must be assured throughout the whole food supply chain from the upstream to the downstream. In meat and poultry, many critical points can affect the halalness of food, namely animal feed (Ramli *et al*., 2020), the slaughtering process at slaughterhouses (Shahdan *et al*., 2016), warehousing and transportation (Zailani *et al*., 2015). Muslim clients need to confirm that the food consumed truly reflects Islamic values (Hanafiah & Hamdan, 2021). Furthermore, it is necessary to provide the wholeness of perishable food from the source, consumption, and post-purchase stages, which include product returns (Fernando *et al*., 2022).

Halal certificates and logos are employed to formally assure consumers the food consumed fulfills halal requirements and is certified by appropriate and authorized religious authorities. Halal certification is a way to acquire halal recognition by an authorized body via several stages of assessment to confirm that the natural materials, production process, and halal product guarantee method in a company are by specified standards. However, some food scandals have increased the apprehensions of consumers concerning their food supply, namely: frozen meat contaminated by pork in Malaysia (Fernando *et al*., 2022), horse flesh in the United Kingdom, chicken sausages with pork DNA in Italy (Pinto *et al*., 2015), halal certified chocolate contaminated by pork in Malaysia *(*Tan *et al*., 2017), infant milk recipe contaminated by melamine in China (Marucheck *et al*., 2011).

According to Alqudsi (2014), transparency is the primary aspect of enhancing halal integrity, and it is related to traceability, which recreates a crucial position in the Halal Supply Chain (Khan *et al*., 2018). In addition, establishing a reliable traceability procedure is important to confirm the integrity of food in terms of rate, safety, and halal aspects (Lin *et al*., 2019). The progress of ICTs has enabled the product of new approaches to outcome traceability (Sayogo, 2018). Based on this approach, the advanced technologies are the IoT, machine learning, blockchain, as well as data mining (Dash *et al*., 2022). These enable the traceability system to add value to clients by enhancing product quality guarantee, providing constant information feedback, and supporting the supply chain in efficiently tracking all goods (Morales *et al*., 2022).

The adoption of advanced traceability technology is impeded by several barriers and challenges, such as expensive initial investment (Dash & Jena, 2022), additional costs arising from the preparation of necessary software as well as hardware to assure the precision of the data (Compagnucci *et al*., 2022), incentives to create support for full value chain digital traceability (Hardt *et al*., 2017; Bosona & Gebresenbet, 2013), unstandardized data and means of data exchange between various links in the supply chain (Storøy *et al*., 2013; Bosona & Gebresenbet, 2013), technical and security issues like software bugs, demanding maintenance of IoT networks (Kamarulzaman *et al*., 2022; Nizetic *et al*., 2020; Hardt *et al*., 2017).

All the barriers and challenges that hinder the adoption of traceability technology or can be referred to as halal constraints could be overcome by bridging the knowledge gap on the benefits, value, and technology operation (Hardt *et al*., 2017). The reserve chain network not only of the material and information discharge but also consists of the knowledge flow. The traceability approach is an effort to ensure the halalness of a product that is knowledge-oriented. It requires an enabler in extracting, digesting, and transforming information, ultimately leading

to the creation of knowledge about the technology (Yang & Cai, 2009). According to (Nonaka and Takeuchi, 1995 in Klein *et al.*, 2023), the most precious asset that subsists for organizations is knowledge. Furthermore, knowledge management (KM) makes it possible to drive innovation and quality (Iqbal, 2021). The procedure empowers the supply-chain accomplishment (Kalogeraki *et al*., 2018), which represents an important element in an information-intensive and multicultural corporate environment (Koochakzadeh & Behzadi, 2019). However, it should be conducted efficiently (lean) to avoid failure and prevent valuable insights from going to waste (Ferenhof *et al.*, 2015).

Lean and KM, severally, are powerful management tools. However, most of the discussions and methods of lean and KM, particularly in supply chain management (SCM), are still carried out separately. Lean, individually, has been applied in many reserve chains, especially those striving to enhance performance by decreasing waste (Arif-Uz-Zaman & Ahsan, 2014). According to Ugochukwu *et al.*, (2012) and Marodin *et al.*, (2017) some of the advantages of implementing lean in the supply chain are client satisfaction, high quality, optimized efficiency, high flexibility, and decreased costs. Inefficiencies could take place in PFSC due to the bullwhip effect, inimical relations among supply chain partners along with dysfunctional enterprise techniques such as an overreliance on price climbs. KM would empower cooperation and coordination among PFSC's actors (Corso *et al*., 2010). Combining Lean principles with KM (LKM) for traceability on halal PFSC is projected as a key enabler of PFSC and gives adding value. In the context of PFSC, an effective and efficient KM process can handle the flow of understanding in a systematic routine to reach the objective of PFSC implementation and competitive edge (Nazam *et al.*, 2020).

While numerous investigations have explored lean and KM, research that examines the alliance between Lean and KM remains extremely scarce (Zhao *et al.*, 2016). This analysis desired to donate to the extant literature, by examining the convergence of both tools and identifying the key theoretical traits of LKM and PFSC in overcoming the barriers and challenges of adopting traceability technology. Furthermore, it employs an organized literature review to respond to the subsequent two questions:

RQ1. How is the the literature currently developing on the intersection between lean and KM developing?

RQ2. What is the role of LKM in facilitating PFSC to adopt the traceability technology?

2. Underpinning Theory

Efforts to ensure halal integrity by building a traceability system on PFSC require intensive and dynamic knowledge. In this research, three underlying theories were used to address the research questions, namely, Dynamic Capabilities Theory (DCT), Knowledge-Based View (KBV), and Diffusion of Innovation Theory (DOI).

Dynamic capability theory enables enterprises to effectively develop and renew resources, facilitating innovation and rapid adaptation to market and business environment changes. This framework helps elucidate why intangible assets, encompassing firms' collective knowledge and capabilities, have emerged as the most valuable asset class across various industries. These intangible assets, including knowledge and capabilities, are not only scarce but also resistant to imitation (Teece, 2017). Furthermore, the challenges faced by food supply and dynamic supply chains encompass aspects like cost, delivery, product quality, and timeliness (Mangla *et al*., 2019). These intricacies are further compounded by the attributes of perishable food supply chains, such as diminishing product grade, diverse product supply, and intricate design and management (Rijpkema & Rossi, 2013).

The KBV proposes that organizations utilize their knowledge to provide services that are integrated and propagated through various elements, including corporate culture and identity, established practices, policies, procedures, documentation, and personal personnel. It regards this concept as a pivotal organizational resource (Gong & Blijleven, 2017). Furthermore, KM serves as a significant facilitator of supply chain management (SCM), particularly in information and knowledge-intensive global enterprise environments (Gloet, 2018) which facilitates the transfer of learning among employees, supports inter-organizational companies, and complements business knowledge (Kalogeraki *et al*., 2018).

The DOI theory asserts that in order to achieve successful innovation and eventual widespread adoption, the technical attributes of such creation encompassing compatibility, observability, complexity, relative advantage, and trialability play a climactic role (Lai *et al.*, 2017) in mitigating uncertainty. The process of diffusion can also be conceptualized as an endeavor to seek and comprehend information. Consequently, the decision-making process comprises a sequence of phases through which an adopter (a person or a group) progresses from awareness of a creation (phase 1), developing an attitude towards it (phase 2), deciding to embrace or deny the innovation (phase 3), putting the new view into practice (phase 4), and confirming the decision (phase 5) Bremer *et al*., 2022).

Implementing a traceability system demands substantial supply chain investment, thereby constraining the full-scale deployment of the system (Herrera & Orjuela-Castro, 2021). Such negative perspectives have considerably impeded the widespread integration of digital supply chain traceability (SCT) systems within supply networks. Consequently, there is a pressing need for a thorough examination of how SCT can potentially enhance quality and economic commission (Zhou *et al*., 2022) to promote the effective integration of traceability technologies into food supply chains.

3. Framework

Lean management can be defined from various sights, such as philosophy, manner of thinking, procedure, set of principles, set of tools and methods, approaches, concepts, practices, systems, programs, manufacturing, paradigms, or models (Vanichchinchai, 2020). Lean principle focuses on consistently eliminating waste (Ruben *et al.*, 2019) and maximizing actions that add value from the customer's perspective (Jadhav *et al.*, 2014). While, according to Becerra-Fernandez & Sabherwal (2010, p. 40) KM constititues of activities that cover dicovery, share, capture and apply he knowledge to achieve organizational goals. Both two command tools emphasize efficiency and effectiveness.

Characteristics of actors in PFSC: there are many business actors with different business ownership statuses, different business scales, different corporate cultures, and different knowledge, and human resource capabilities. In the supply chain network, halal traceability is not only the responsibility or interest of one party but is a value chain that seeks to provide added value to the business in every existing process starting from procurement, production processes, marketing, to distribution. This study focuses on highlighting the fusion of lean and KM (LKM) as an enabler in empowering PFSC to effectively embrace traceability technology to ensure halal integrity. The framework that is developed is how lean principles can make the KM process for all PFSC actors and stakeholders more effective and efficient. Through LKM the waste of knowledge could be eliminated and the purpose of the halal food traceability system is to ensure halal goodness can be achieved. Figure 1 exhibits the LKM framework.

In the framework, the LKM process is conceptualized as a cycle that is carried out continuously by PFSC actors and stakeholders. It includes lean knowledge discovery, lean knowledge capture, lean knowledge application, and lean knowledge sharing. The four LKM processes are backed by seven KM subprocesses. Four subprocesses were proposed by (Nonaka & Lewin, 1994): socialization, externalization, internalization, and combination, which concentrate on how tacit and explicit knowledge associate and change the knowledge. Meanwhile Grant (1996) and Nahapiet & Ghoshal (1998) establish exchange, direction, and routine as another subprocesses. LKM mechanisms and technology adapt to LKM sub-processes and the types of waste that arise in the KM process. The outcomes of the LKM process and system are: the sprout of halal understanding among PFSC actors; the emergence of halal wisdom among PFSC actors and stakeholders; appropriate halal policy from the government as a part of stakeholders and halal regulator; and the use of precise halal traceability technology on PFSC actors.

4. Methodology

SLRs aim to enhance related research, synthesize results, and consider the state of scholarly knowledge concerning a special investigation inquiry or theme. This SLR provided exhaustive knowledge and overview of what had been academically obtained and developed to

date and also identified areas to be explored, particularly with regard to the ability of LKM. This enables organizations to overcome obstacles and challenges in embracing traceability technologies in PFSC.

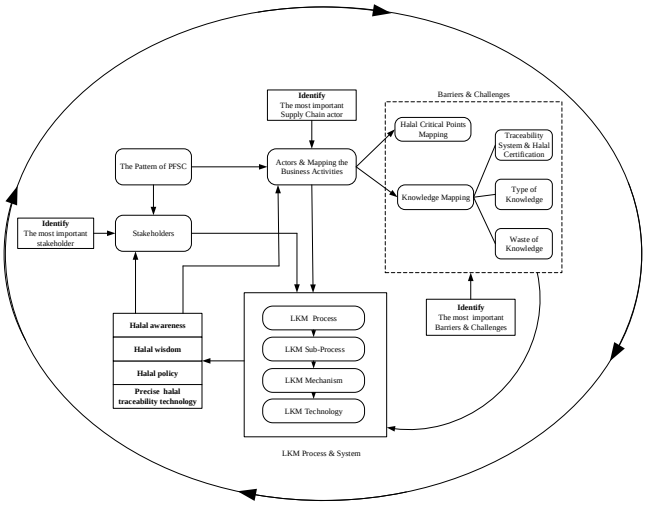

Fig. 1. LKM Framework

The SLR procedures outlined by Tranfield *et al.*, (2003) which include (1) review planning, (2) review execution, and (3) discussion of findings and knowledge transfer, were followed in this study. Furthermore, it used PRISMA and its flow chart, consisting of a four-phase flow diagram, namely, screening, identification, eligibility, and synthesizing the results (Moher *et al*., 2009), as shown in Figure 2. The PRISMA model is widely used as a reference for literature selection methods to recognize publications that can be used in reporting.

4.1 Planning the review

The inclusion criteria were developed in this SLR which consisted of two steps of filtering, namely abstract and full text. Articles included at a later stage had a "yes" answer for all the criteria in Table 1. Table 1 was adopted from (Lusiantoro *et al.*, 2018) and this research used Scopus online databases (consisting of several publishers namely: Wiley, Emerald, ScienceDirect, SpringerLink, Taylor& Francis, Sage as well as IEEE Explore) for the excavation of research papers. One of the primary goals was to point out how LKM enabled PFSC to adopt traceability technology. Therefore, all research papers that discuss lean, knowledge management, perishable food, food cache chain, halal food supply chain, and traceability were contained in the SLR.

Table 1 - Inclusion criteria for title-abstract and full-text filtering

Title - abstract filtering	Full-text inclusion filtering
Is it a peer-reviewed article?	Does the article discuss traceability technology systems focusing on halal and PFSC?
Is it an academic journal article?	
Is it written in English?	Does the article examine barriers to adopting traceability technology?
Does the objective, the finding, and/or the implication talk about traceability in the supply chain?	Does the article discuss the role of lean and /or knowledge management in the perishable food supply chain?
Does the objective, the finding, and/or the implication talk about LKM?	
Does the context of the article discuss perishable products?	

Adapted from Lusiantoro *et al*., 2018

4.2 Conducting the review

The review commenced with a scoping research, literature, and team discussion for keyword recognition and search strings (Tranfield *et al.*, 2003). The option of search keywords was founded on the research objective to provide the relevancy and thickness of the data across the selected publications and the two search groups, as shown in Table 2.

There were 375 articles identified on the Scopus database, from various multidisciplinary journals, produced in the last 22 years and then thoroughly chosen, charted, and evaluated to answer the study queries.

Table 2 - Keyword and Search Strings

Keyword	Search String
1st group	"lean" AND "knowledge management"
2nd group	"supply chain" OR "supply network" OR "supply management" OR "supply chain management" OR "logistic*" OR "logistic* management" OR "demand chain" OR "demand management" OR "demand chain management" OR "interorganisation*" OR "interorganisation* system" OR "value chain" OR "value chain management" OR "cold chain" OR "cold chain management" AND "traceability" OR "trace" OR "track" AND "perish*" OR "deteriorate*" OR "spoil*" OR "decay*" OR "short-lived" OR "short shelf life" OR "short life" OR "perish*food*" OR "perish* item*" OR "deteriorate* food*" OR "deteriorate* item*" OR "spoil* food*" OR "spoil* item*" OR "decay* food*" OR "decay* item*" OR "food*" OR "fresh food*" OR "agrifood*" OR "agricultural product*" OR "fresh produce*" OR "vegetable*" OR "fruit*" OR "poultry" OR "meat" OR "diary product*" OR "bakery product*"

Notes: *indicates a potential combination of each word
Adapted from Lusiantoro *et al*., 2018

4.3. Reporting the result

The articles included in the analysis were summarized in an Excel spreadsheet and descriptive research was carried out. The examination was executed to illustrate the "recent map" of the selected papers. It explained the number of publications per year, the research methods applied to each article, and the journal where the paper was published. Furthermore, this analysis was needed to conceive trends in the topic under study and the thematic analysis was carried out to raise answers to the research questions. The primary topics in every theme were also recognized, recorded, merged, and accumulated (Lizarelli *et al*., 2022).

A bibliometric analysis using VOSviewer software was offered to supply ideas in the field (Mubarrok *et al.*, 2022). This software can be used to examine bibliometric networks and investigate data results from inquiries in journals (Redeker *et al*., 2019). For bibliometric analysis, a node represented a keyword or academic article. The link (edge) indicates the amount of connections between one item (node) and another.

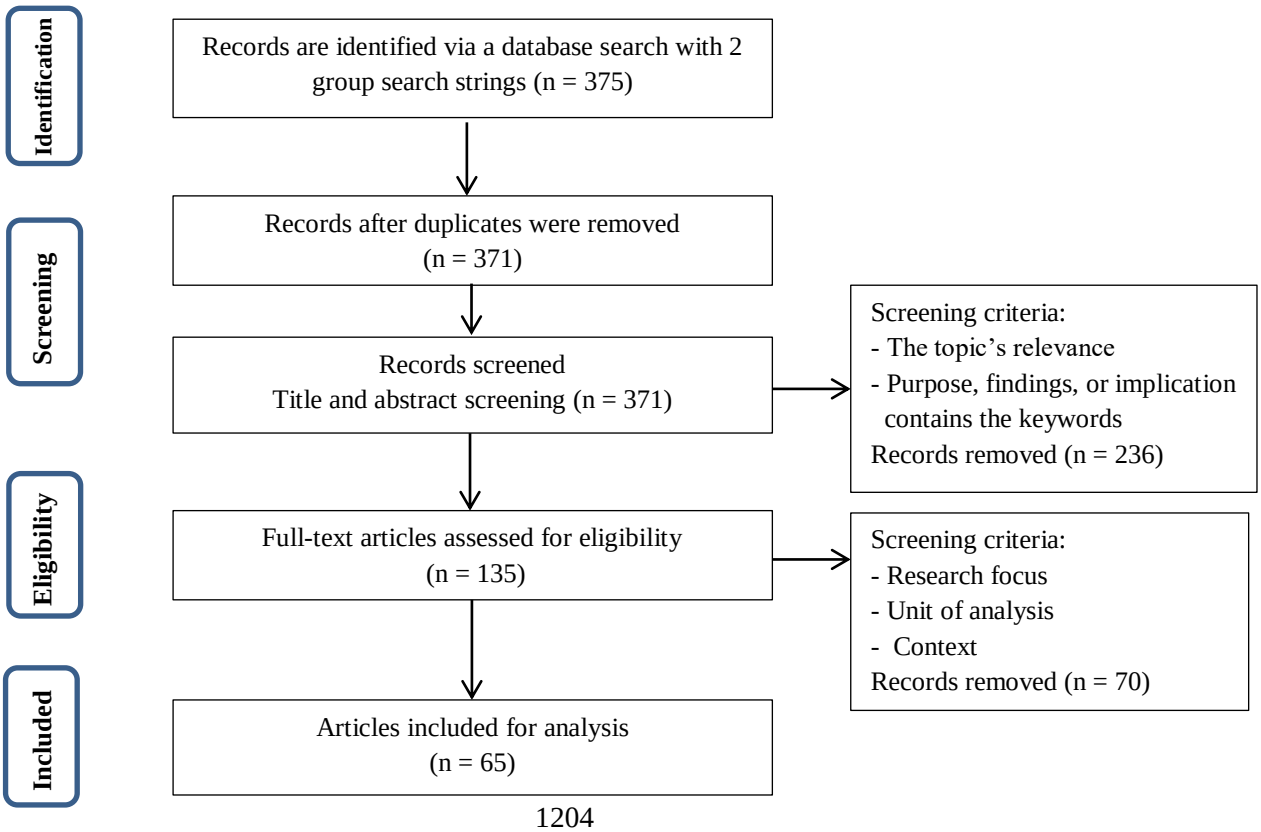

Fig. 2. The result of the PRISMA flow diagram (adapted from Moher *et al*., 2009)

5 Results and Discussion

5.1 Descriptive Analysis

5.1.1 Publication by year

This research was carried out in October 2022, and Figure 3 shows the number of publications by year, where analysis on Lean, KM, supply chain, and traceability for perishable food started in 2000 and experienced continuous growth. The number of articles with significant fluctuation from year to year showed an increasing trend. Meanwhile, there was a surge in interest in research works relating to Lean, KM, store chain, and traceability for perishable food supply chains with a remarkable peak in 2022, accounting for 15 of the 65 publications.

The halal food industry is thriving and is the second biggest sector since Islamic finance (Khan et al., 2022). This growing trend is followed by the advancement of ICTs, which was expected to establish trust mechanisms in addressing issues of transparency and food safety in the halal supply chain (Feng *et al*., 2020). Implementing traceability technology can provide a reliable tracking and tracing system to integrate process and product information at each level to ensure halal integrity in addressing the length and complexity of the PFSC.

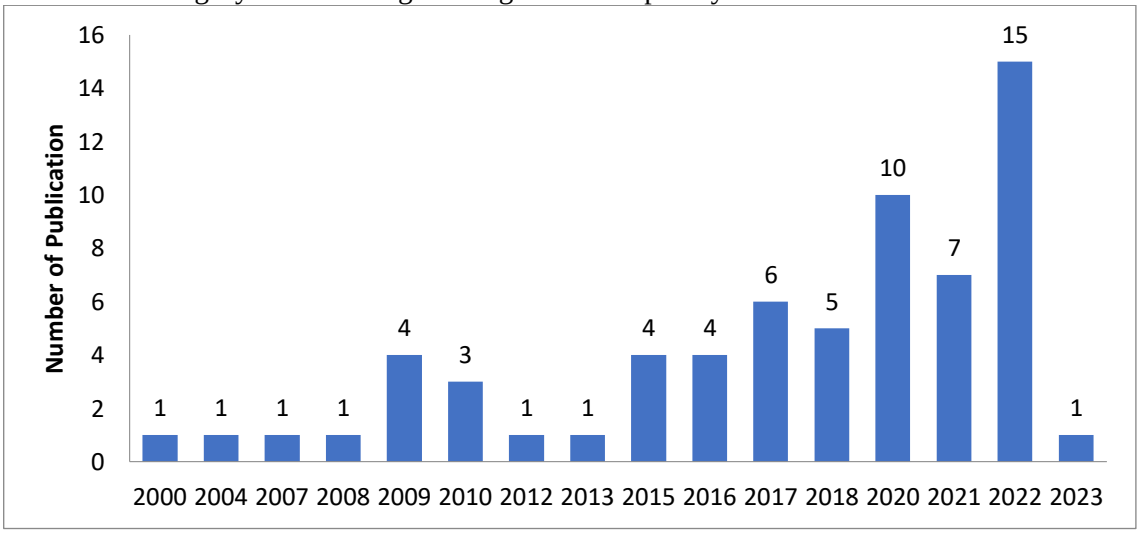

Fig. 3. Publications by Year (source: data processed)

5.1.2 Publication by country

The 65 articles reviewed encompassed 27 countries and 4 continents, as depicted in the geographic analysis. From the analysis, it was observed that Muslims (Indonesia, Malaysia, Saudi Arabia, and Iran) only contributed 15% of the research related to LKM in halal supply chain traceability for perishable food. In contrast, non-Muslim countries dominated the previous research with 85% (14% being United Kingdom-based, 28% from China, Italy, and India-based, 12% from USA and Brazil-based, 31% spread among Greece, Thailand, Sweden, South Korea, New Zealand, Colombia, Hungary, Germany, Netherland, Australia, Sarajevo, Norway, Spain, Mexico, Armenia, Vietnam, and Denmark). Figure 4 displays the total publications by country. The fact that non-Muslim nations manufacture and export food items to Muslim nations may be the reason why studies on the topic of halal food are beginning to surface from these nations. In these nations, Muslim consumers are becoming more conscious of the significance of halal food and the need for its existence to ensure their innocence. the products they ingest have labels and certificates.

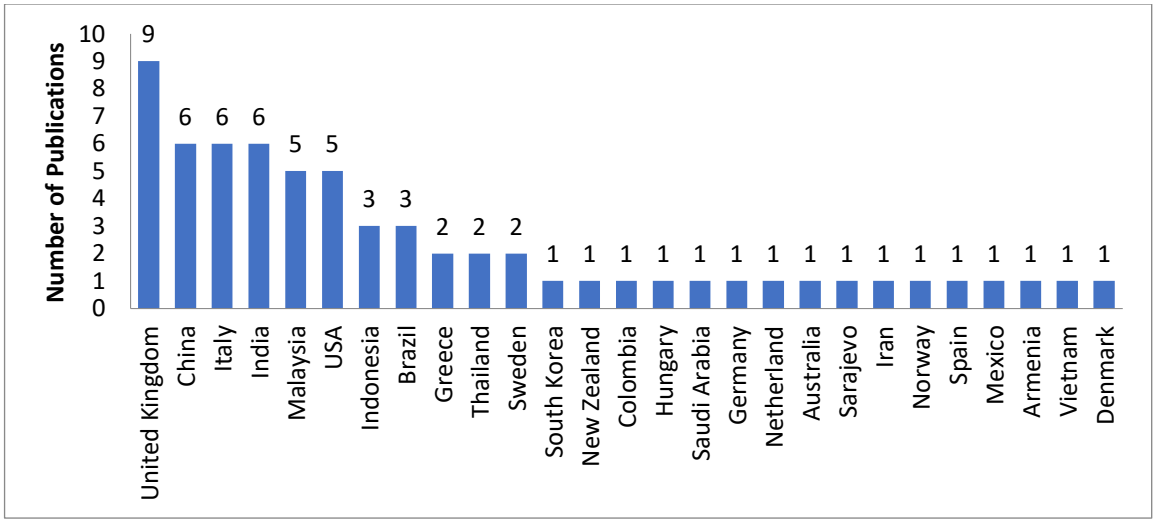

Fig. 4. Publications by Country (source: data processed)

5.1.3 Publication by journal

A total of 65 articles were published from 44 journals and British Food Journal is at the top of the list with 7 articles posted in the Scopus database. Secondly, the International Journal of Production Economics had 6 articles, followed by the International Journal on Food System Dynamics with 3 articles. Knowledge Management Research and Practices, VINE Journal of Information and Knowledge Management Systems, International Journal of Supply Chain Management, Benchmarking, Journal of Islamic Marketing, International Journal of Logistics Management, Journal of Cleaner Production and Transportation Research Part E: Logistics and Transportation Review, followed the list with 2 articles in each journal. Figure 5 presents the number of publications by journal. By displaying the top list of journals that publish about Lean, KM, supply chain, and traceability for perishable food supply chains, this can be a reference for academics and researchers who will conduct literature studies or want to publish the results of their research.

Fig. 5. Publications by Journal (source: data processed)

5.1.4 Publication by Research Method

Figure 6 presents the number of articles by the methodology employed. The majority of the articles were case research and surveys, each of which was 29%, 17% constituted modeling, 14% constituted literature review, 6% for explanatory, descriptive inferential, and action research 2% and 1% of total publications.

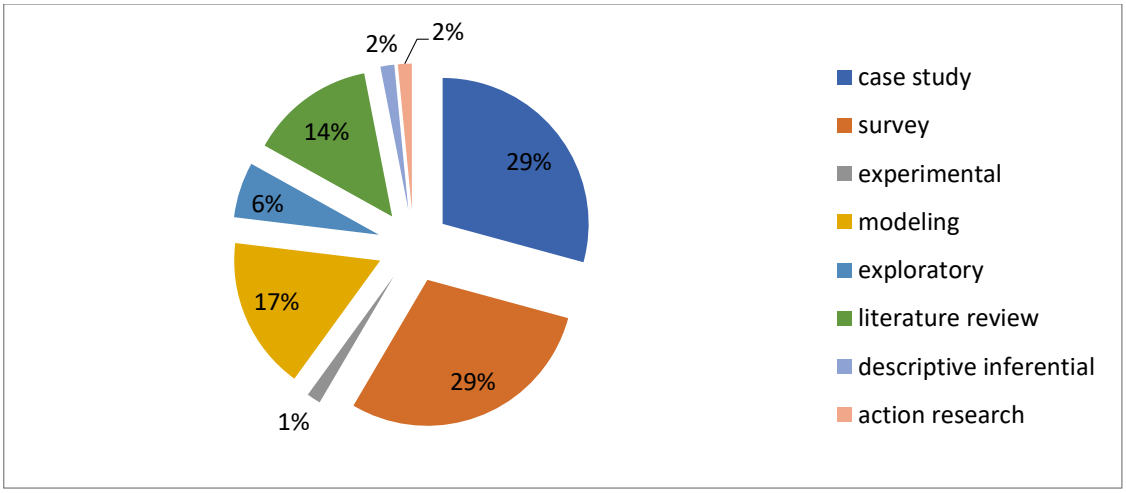

Fig. 6. Publications by Research Method (source: data processed)

5.2 Thematic Analysis

In this SLR we classify themes based on two categories. The first theme is a category of literature that addresses the development and intersection of lean and KM. Thus, we elaborate and map the literature as illustrated in Table 3. The second theme is a category of literatures that address traceability in PFSC and we were synthesizing and mapping on Table 4.

Table 3 - The Integration of Lean and KM

Integration/Intersection of Lean and KM	Field of Research	Variables	Authors
Increasing knowledge creation using LSS across multiple applications and channels at multiple planning levels	n.a	LSS core practices, LSS behavioral practices, Knowledge creation	(Asif, 2019)
Supporting knowledge creation and increasing efficiency using ten lean tools and methods	Product development environment	Efficient knowledge creation, Lean principle, Lean product development, Dynamic knowledge, Tacit knowledge, Explicit Knowledge, Lean tools	(Tyagi *et al*., 2015)
LSS implementation with a KM approach that focuses on the moderation role of human capital	Health Service Organizations	Human capital, Employee's Knowledge, Employee's skills, Employee's experiences, Employee's Morale, KM	(Aljazzazen & Schmuck, 2021)
Dissected the knowledge manipulation activities in its implementation of a Lean Sigma program	Multi-National Consumer Product Company	Knowledge leadership, Knowledge coordination, Knowledge control, Knowledge Measurement	(Chen & Holsapple, 2009)
Effect of lean tools via the mediating role of KM	n.a	Lean tools, Knowledge acquisition, Knowledge integration., Knowledge application	(Zhang *et al*., 2020)
Recognizing strategic action categories in the areas of KM, human resource management, and business growth using LM	Manufacturing & service businesses, education & health care institutions & nonprofit organizations	Lean transformation, KM, Human resources, Business growth, Performance heterogeneity	(Hallam *et al*., 2018)
The influence of lean tools on knowledge transfer in product development processes	R&D departments	Lean tools, Training-employee, Knowledge transfer	(Stanica & Peydro, 2016)
Toyota Kata on KM concept to Overcome Lean Service Obstacles	Banking company	Commitment, Involvement, Communication, Preparation. People's skills, Process	(Ferenhof *et al*., 2018)

		performance, Lean technical practices	
Supply chain decision support to achieve lean performance using knowledge sharing	Agri-Food Industry	Quality, Speed, Cost, Dependability, Flexibility	(Chen *et al*., 2017)
Examine how to embed KM into business processes to increase efficiency in workflows	Leading research institutes	Skillful knowing, Waste, Lean thinking principle, KM, Inefficiencies, Workflow, Knowledge flow	(Massingham & Holaibi, 2017)
Overcoming problems in KM with information search and use, diffusion of innovation, and resistance to change	n.a	Benchmarking, Conventional organization, Lean enterprise. KM, Continuous learning, Improvement	(Knuf, 2000)
Lean fundamentals to facilitate KM in IT outsourcing relations.	Service industries	KM, Respect for people, Continuous improvement, Systems thinking, Proactive behavior	(Gong & Blijleven, 2017)
Examined whether LSS and KM can generate synergies and to what extent.	n.a	Economic profitability, Sustainable, Customer focus, Competitive advantage, Corporate culture, Reward system,	(Strubelt & Mollenhauer, 2020)

(source: data processed)

Based on the mapping, lean has been collaborated with KM to some extent. It is figured out that there are two kinds of integration between lean and KM. The integration can be in the form of lean supports the KM process or vice versa, KM sustains and enhances the application of lean in different ways. Themes emerge from the research reviewed are: Lean Six Sigma (LSS) and knowledge management (KM) connections, the application of some lean tools and methods in the KM process within the organizations or companies, the implementation of KM in the lean supply chain, the usage of KM in the practice of lean technology and tools.

Lean principles such as regard for people, continuous progress, systems consideration, and proactive behavior have supported the KM process (Gong & Blijleven, 2017b). Meanwhile, the application of lean technology and instruments depends on the usage of knowledge, be it explicit knowledge that has been encoded in the formal form of literature or work manuals, or other tacit knowledge (Blay-palmer *et al*., 2018). Ferenhof *et al.,* (2018) used Toyota Kata to illustrate knowledge management (KM) concepts in order to address the obstacles associated with lean service. Asif (2021) gave an example of how LSS improves knowledge design at different planning levels using a variety of techniques and channels. Shaofeng Liu *et al.,* (2013) proposed a KM system for lean supply chain management by modeling the multi-layer KM framework.

Table 4 - Traceability within PFSC

Themes	**Perishable food sector**	**Authors**
Regulation for traceability	Dairy	(Casino *et al*., 2020)
	Exported mango	(Vanany *et al*., 2016)
	Agriculture product	(Latino *et al.*, 2022)
	General perishable food	(Maksimović *et al.*, 2015)
Benefits of traceability	Fish	(Mai *et al*., 2010)
	Food industries	(Khoifin & Nimsai, 2018)
	Mango	(Herrera & Orjuela-Castro, 2021)
	Fresh food	(Ringsberg, 2015)
	Food Cold Chain	(Masudin *et al.*, 2021)
	General food	(Wang & Li, 2007); (Poghosyan et al., 2004);
	Food SMEs	(Mattevi & Jones, 2016)
	Vegetable	(Alfaro & Rábade, 2009)

Halal food traceability	Chicken	(Akbar *et al*., 2022)
	General perishable food	(Soon *et al*., 2017)
	General halal food	(Tan *et al*., 2022); (Hew *et al*., 2020); (Zainuddin *et al*., 2020)
Traceability Technology	Imported fresh food	(Liu *et al*., 2022)
	Meat	(Sander *et al*., 2018)
	Fruits & Vegetables	(David *et al*., 2017)
	Beef	(Jo *et al*., 2022)
	Cattle	(Ribeiro *et al*., 2010)
	Exported mango	(Vanany *et al*., 2016)
	Chicken	(Akbar *et al*., 2022)
	General food	(Kelepouris *et al*., 2007)
	General perishable food	(Maksimović *et al*., 2015)
Barriers to adopting traceability technology	Agri-food	(Compagnucci *et al*., 2022)
	Food SMEs	(Kamarulzaman *et al*., 2022b); (Mattevi & Jones, 2016)
	General perishable food	(Kittipanya-ngam & Tan, 2020)
	Agri-food	(Moysiadis *et al*., 2022)
	General food	(Canavari *et al*., 2021);(Duan *et al*., 2017)

(source: data processed)

5.3 Bibliometric Analysis

The 65 reviewed papers were examined utilizing bibliometric instruments and tools to learn occurrences with keyword analysis in their publications. In addition, scientific data collection methods that are widely used in academic articles allow the emergence of keywords to determine the latest research topics in certain disciplines (Sternitzke & Bergmann, 2009). The appearance of two keywords in several publications reveals that there is a tight connection between the concepts and based on the results from VOSviewer there are around 236 keywords

5.3.1 Co-occurrence analysis of keywords

Figure 7 shows four major nodes, namely supply chain management, knowledge management, traceability, and blockchain with a high frequency. Based on the color, there are 10 clusters, each deputizing a particular topic. The color line indicates how usually one node (eg perishable food supply chain, yellow node) is linked to another (eg supply chain management, pink node). A different color marks each group that links to different nodes in the same title and keyword group. Per main topic is placed on the consistency of the lines and how often the nodes are related to each other (Handayani *et al.*, 2022).

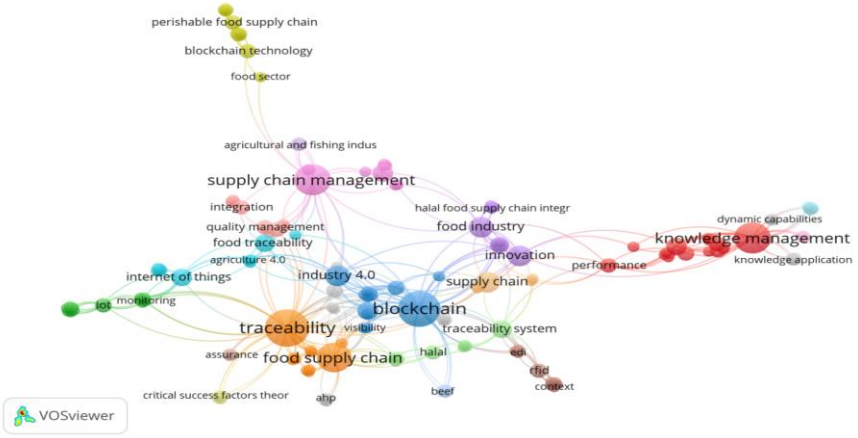

Fig. 7. Co-occurrence network and visualization of keywords (source: VOSviewer)

Figure 7, the occurrence of determined keywords. These include traceability (13) and food supply chain (7) incorporated to cluster one (orange color), Blockchain (12) and industry 4.0 (4) incorporated to cluster two (blue color), knowledge management (9) and lean (3)

incorporated to cluster three (red color), supply chain management (9) incorporated to cluster four (pink color). Food industry (4) and innovation (4) are incorporated into cluster five (purple color). Finally, the Internet of Things (3) incorporated cluster six (light blue color), and the 10 most common keywords are shown in Table 4.

Based on the co-occurrence of the keyword on the bibliometric analysis, it is recorded that there is still few research related to perishable food supply chain management. Although research on the food supply chain has an increasing trend, research on the halal food cache chain is an area of publication that is still rare. Research on traceability related to blockchain technology has begun to be published frequently. Likewise, KM is a research area that has been frequently published. However, research related to lean, knowledge management, perishable food, halal supply chain, and traceability has not been directly linked. There is a research gap in these areas.

Table 4 - Keywords by Authors

Rank	Keyword	Total link Strength
1	Traceability	59
2	Blockchain	58
3	Knowledge Management	36
4	Food Supply Chain	33
5	Supply Chain Management	29
6	Industry 4.0	23
7	Food industry	21
8	Innovation	18
9	Internet of Things	17
10	Lean	15

(source: data processed)

5.3.2 Co-authorship analysis of authors.

Co-authorship analysis conducted based on VOSviewer software was mapping the research topics by looking at the relationship or collaboration between authors. Based on Figure 8, the number of authors analyzed was 194, or the total number of existing authors, of this number there were only 7 authors who showed relationships with other authors. They were connected and categorized into four groups defined by color.

Fig. 8. Co-authorship analysis of authors (source: VOSviewer)

5.3.3 The Role of LKM for PFSC in Adopting Traceability Technology

Lean and KM are concepts that have been extensively discussed in the literature and applied in the practical world. However, most of the discussion and practice are being carried out separately (Strubelt & Mollenhauer, 2020). Lean aims to create and increase added value by eliminating activities that do not support value addition (Chongwatpol & Sharda, 2013). The capacity to leverage knowledge for optimal performance, innovation, and enhanced customer value is referred to as KM (Ashok *et al*., 2016). This concept elucidates the mechanisms of knowledge discovery, capture, sharing, and application within products/services and processes.

Lean management principles could support intelligent, effective, and efficient KM processes (LKM). LKM means efficient knowledge management which eliminates all forms of waste that interfere with the knowledge management process. Waste is described as any human movement or activity that absorbs some resources but does not produce any value (Ohno, 1988 in *Klein et al*., 2023).

LKM in the PFSC connects all partners and supply chain actors as a form of cooperation and coordination to realize adequate management of knowledge-based relationships across several commodities in the supply chain which leads to the invention of new learning and enhances supply chain operating performance (Kalogeraki *et al.*, 2018). According to Forsgren (2022), LKM involves collecting and sharing only related knowledge that helps organizations do work safely, effectively, and efficiently. LKM enables an organization to quickly collect and disseminate critical information to the people who need it most. LKM is a structured plan to harness the power of knowledge in an organization. LKM was implemented at the National Aeronautics and Space Administration (NASA), which is an autonomous agency of the United States Federal Government reliable for the civil space schedule, as well as aeronautics and space analysis. LKM practice at NASA overcomes the problem of wasteful bureaucratic exercise. LKM helped change the company culture and changed the way of doing business at NASA, which was done by establishing a Knowledge Management Office.

In the PFSC network, halal traceability is not only the responsibility or interest of one entity but is a value chain that seeks to provide added value to the business in every existing process, starting from procurement, production processes, and marketing, to distribution. LKM is expected to help reduce or eliminate wasteful knowledge of halal traceability in the PFSC. Traceability technology could be stated as quick-changing technology and highly knowledge-centric. The Traceability technology ensures product security and quality throughout the PFSC and relies on close coordination among the parties involved to give added value to customers. Supervision among these chain actors is supported by managing the flow of knowledge (Nazam *et al*., 2020), which is a valuable guide to intangible resources and organizational assets useful for tolerable competitive advantage (Tseng, 2010). Therefore, LKM has an incredible role in increasing the performance and coordination of the administrative process (Valacherry & Pakkeerappa, 2020).

Lean concentrated on enhancing competitive priorities such as rate, cost, adaptability, as well as delivery within organizations (Hallam et al., 2018). In such an enterprise, work should be conducted with a minimum of surveillance and control (Knuf, 2000). Furthermore, the role of traceability technology is a part of supervising and controlling food safety, quality, and halalness. For the SCM circumstances, the concept of lean has evolved rapidly to react to the needs of supply chain developments in addressing materials, information, funding, and customer issues (Chen et al., 2017). This is achieved through the elimination of waste, and non-value-added activities ensure the establishment of the highest cost efficiencies in the supply chain (Agarwal *et al*., 2006).

The processes of LKM, which efficiently manages knowledge, can convert knowledge into added value for the supply chain. Existing literature indicates that these principles enhance the Knowledge Management process by promoting knowledge sharing and fostering innovation in numerous organizations. In practical application, Lean has emerged as a widely accepted management philosophy for businesses (Stone, 2012) and is extensively employed to direct the performance of strategic thinking (Droste, 2007). Although the concept initially revolved around well-structured operations like manufacturing, its focus has now shifted to encompass less-structured functions such as services (Gupta & Sharma, 2016), knowledge products (Zhang & Chen, 2016) as well as innovation (Gong & Blijleven, 2017).

Numerous prominent food enterprises have embraced traceability technologies to oversee real-time product quality monitoring throughout the entire production process (Sander et al., 2018). Moreover, the capacity to track all products and components holds immense significance in the day-to-day operations of food processors and manufacturers, as well as in managing crises like product recalls (Zhou *et al.*, 2022). Given the intricate and dynamic character of food supply chains and the imperative for safety, food traceability operates within a chain-based system (Duan *et al.*, 2017). These systems necessitate integration with other logistics and

record-keeping frameworks employed by business partners or regulatory authorities (Ringsberg, 2015). In this context, LKM plays a pivotal role in enabling PFSC to adopt traceability by:

a. Increasing responsiveness by reducing customer complaints related to food scandals. Responsiveness can be seen from the response, filling, shipping error, and product delay rates (Stranieri *et al*., 2021). PFSC must give great attention to downtime/dwell time (Bumblauskas *et al*., 2020) as well as total customer waiting duration (Esmaili & Sahraeian, 2017). Therefore, with the transparency gained from traceability technology and the benefits of knowledge, supply chain leaders could design a more responsive PFSC (Nikookar & Yanadori, 2022).
b. Enhancing efficiency through traceability technology also reduces operating costs (Bortolini *et al*., 2016), logistics expenses (Govindan *et al*., 2014), total travel costs (Esmaili & Sahraeian, 2017), transportation costs (Musavi & Bozorgi-amiri, 2017), product quality, safety and halal-ness, product shelf life and reduction of food waste (Beshai *et al*., 2020).
c. Advancing Flexibility: According to Ramos *et al*. (2021), PFSCs have to upgrade their flexibility to prevent supply disruptions, such as COVID-19 outbreaks. The adoption of traceability technology significantly impacted traceability systems during the pandemic (Masudin *et al*., 2021). The pandemic caused lockdowns and travel restrictions which led to a supply-demand mismatch as well as the risk of product expiration. Through technology, the shelf life of products (Accorsi *et al*., 2018), rack space allocation (Yang *et al*., 2017), and product turnover could be maintained, rearranged, and managed (Chowdhury *et al*., 2022).

6 Conclusion and limitations

In conclusion, two research questions were identified, and a comprehensive answer was provided.

RQ1. According to this research, Lean and KM were two concepts extensively discussed in the literature and applied in the practical world. most of the discussion and practice of lean and KM were still being carried out separately, hence the benefits of integrated lean and KM applications were not clearly visible. Based on the thematic analysis of the articles reviewed, several intersections were identified and some featured a form of mutual collaboration between lean and KM, namely, the relationship between LSS as well as KM, applying lean tools in the KM process within the organizations or companies and the implementation of KM on lean supply chain. However, the implementation of LKM in halal supply chain traceability for perishable food was still absent from the literature.

RQ2. LKM means efficient knowledge management which eliminates all forms of waste that interfere with the KM process. LKM processes for business actors turned knowledge into added value for the supply chain. The role of LKM was as an enabler for PFSC in adopting traceability technology. As a fast-changing technology, the adoption of traceability technology could be approached by LKM (efficient KM process) with several advantages achieved due to increased responsiveness, enhanced efficiency, and advanced flexibility. Considering the important role of LKM in enabling PFSC to address complex challenges in traceability technology adoption, collaborative interdisciplinary research is needed.

The finding of SLR has provided a contribution to advance the literature and understanding of LKM. The fusion of lean and KM could be a robust management tool (enabler) to cope with wasteful knowledge of halal traceability and strengthen halal integrity. In the context of PFSC, via the framework that has been developed, the LKM process and system are bolstering all actors and stakeholders in the PFSC, therefore raising halal awareness of halal wisdom, appropriate halal policy, and the use of precise halal traceability technology on PFSC actors.

However, this research had some limitations. Firstly, it relied solely on a literature review to explore the synergy of lean and KM, and future work should incorporate empirical research in measuring the role of LKM as an enabler of PFSC. Secondly, this research relied on a single Scopus database, hence future studies should combine EBSCO, Scopus, ABI/Inform, and Web of Science to explore more inclusive results. Thirdly, the discussion was limited to the task of LKM in halal supply chain traceability for perishable food circumstances. The generalization

and confirmation of the result to other reserve chain contexts must be performed scrupulously. The SLR presented a robust method to avoid interpretation bias but pertinent articles were not obtained. Therefore, future analyses should introduce new research areas not embedded in this study.

References

Accorsi, R., Cholette, S., Manzini, R., & Tufano, A. (2018). A hierarchical data architecture for sustainable food supply chain management and planning. *Journal of Cleaner Production*, *203*, 1039–1054. https://doi.org/10.1016/j.jclepro.2018.08.275

Agarwal, A., Shankar, R., & Tiwari, M. K. (2006). Modeling the metrics of lean , agile and leagile supply chain : An ANP-based approach. *European Journal of Operational Research*, *173*, 211–225. https://doi.org/10.1016/j.ejor.2004.12.005

Akbar, A., Aini, N., & Vanany, I. (2022). Halal Blockchain Application for a Chicken Slaughtering Factory. *International Journal of Food System Dynamics*, *13*(3), 321–334.

Aldrighetti, A., Canavari, M., & Hingley, M. K. (2021). A Delphi Study on Blockchain Application to Food Traceability. *International Journal on Food System Dynamics*, *12*(1), 6–18. https://doi.org/10.18461/ijfsd.v12i1.72

Alfaro, J. A., & Rábade, L. A. (2009). Traceability as a strategic tool to improve inventory management: A case study in the food industry. *International Journal of Production Economics*, *118*(1), 104–110. https://doi.org/10.1016/j.ijpe.2008.08.030

Aljazzazen, S., & Schmuck, R. (2021). The Impact of Knowledge Management Practice on Lean Six Sigma Implementation: The Moderating Role of Human Capital in Health Service Organisations. *International Journal of Operations and Quantitative Management*, *27*(3), 267–285. https://doi.org/10.46970/2021.27.3.5

Alqudsi, S. G. (2014). Awareness and Demand for 100 % Halal Supply Chain Meat Products. *Procedia - Social and Behavioral Sciences*, *130*, 167–178. https://doi.org/10.1016/j.sbspro.2014.04.021

Arif-Uz-Zaman, K., & Ahsan, A. M. M. N. (2014). Lean supply chain performance measurement. *International Journal of Productivity and Performance Management*, *63*(5), 588–612. https://doi.org/10.1108/IJPPM-05-2013-0092

Ashok, M., Narula, R., & Martinez-noya, A. (2016). How do collaboration and investments in knowledge management affect process innovation in services ? *Journal of Knowledge Management*, *20*(5), 1004–1024. https://doi.org/10.1108/JKM-11-2015-0429

Asif, M. (2019). Lean Six Sigma institutionalization and knowledge creation: towards developing theory. *Total Quality Management and Business Excellence*, *32*(7), 811–828. https://doi.org/10.1080/14783363.2019.1640598

Aung, M. M., & Chang, Y. S. (2014). Traceability in a food supply chain: Safety and quality perspectives. *Food Control*, *39*(1), 172–184. https://doi.org/10.1016/j.foodcont.2013.11.007

Balaji, M., & Arshinder, K. (2016). Resources , Conservation and Recycling Modeling the causes of food wastage in Indian perishable food supply chain. *"Resources, Conservation & Recycling," 114*, 153–167. https://doi.org/10.1016/j.resconrec.2016.07.016

Becerra-Fernandez, I., & Sabherwal, R. (2010). *Knowledge Management System and Processes*. M.E. Sharpe, Inc. All.

Ben Ruben, R., Vinodh, S., & Asokan, P. (2019). State of art perspectives of lean and sustainable manufacturing. *International Journal of Lean Six Sigma*, *10*(1), 234–256. https://doi.org/10.1108/IJLSS-11-2016-0070

Beshai, H., Sarabha, G. K., Rathi, P., Alam, A. U., & Deen, M. J. (2020). Freshness Monitoring of Packaged Vegetables. *Appplied Sciences*, *10*, 1–41.

Blay-palmer, A., Santini, G., Dubbeling, M., Renting, H., Id, M. T., & Giordano, T. (2018). Validating the City Region Food System Approach : Enacting Inclusive , Transformational City Region Food Systems. *Sustainability (Switzerland)*, *10*, 1–23. https://doi.org/10.3390/su10051680

Bogataj, D., Bogataj, M., & Hudoklin, D. (2017). Mitigating risks of perishable products in the cyber-physical systems based on the extended MRP model. *International Journal of*

Production Economics, *193*(June), 51–62. https://doi.org/10.1016/j.ijpe.2017.06.028

Bortolini, M., Faccio, M., Ferrari, E., Gamberi, M., & Pilati, F. (2016). Fresh food sustainable distribution : cost , delivery time and carbon footprint three-objective optimization. *Journal of Food Engineering*, *174*, 56–67. https://doi.org/10.1016/j.jfoodeng.2015.11.014

Bosona, T., & Gebresenbet, G. (2013). Food traceability as an integral part of logistics management in food and agricultural supply chain. *Food Control*, *33*(1), 32–48. https://doi.org/10.1016/j.foodcont.2013.02.004

Bremer, P., Mather, D., & Mirosa, M. (2022). Factors affecting the diffusion of traceability practices in an imported fresh produce supply chain in China. *British Food Journal*, *124*(4), 1350–1364. https://doi.org/10.1108/BFJ-03-2021-0227

Bumblauskas, D., Mann, A., Dugan, B., Rittmer, J., Iowa, N., Address, P., Business, C., Ia, C. F., & States, U. (2020). A blockchain use case in food distribution : Do you know where your food has been ? *International Journal of Information Management*, *52*, 102008. https://doi.org/10.1016/j.ijinfomgt.2019.09.004

Casino, F., Kanakaris, V., Dasaklis, T. K., Moschuris, S., Stachtiaris, S., Pagoni, M., & Rachaniotis, N. P. (2020). Blockchain-based food supply chain traceability: a case study in the dairy sector. *International Journal of Production Research*, *0*(0), 1–13. https://doi.org/10.1080/00207543.2020.1789238

Chen, D. C., & Holsapple, C. W. (2009). Knowledge shared is power: Utilizing knowledge management activities to replicate lean sigma best practices. *Knowledge Management and E-Learning*, *1*(2), 90–102. https://doi.org/10.34105/j.kmel.2009.01.008

Chen, H., Kingdom, U., Liu, S., Kingdom, U., Oderanti, F., & Kingdom, U. (2017). A Knowledge Network and Mobilisation Framework for Lean Supply Chain Decisions in Agri-Food Industry. *International Journal of Decision Support System Technology*, *9*(4), 37–48. https://doi.org/10.4018/IJDSST.2017100103

Chongwatpol, J., & Sharda, R. (2013). Achieving Lean Objectives through RFID : A Simulation-Based Assessment *. *Decision Sciences*, *44*(2), 239–266.

Chowdhury, T., Sarkar, A., & Paul, S. K. (2022). A case study on strategies to deal with the impacts of COVID-19 pandemic in the food and beverage industry. *Operations Management Research*, *15*, 166–178.

Compagnucci, L., Lepore, D., Spigarelli, F., Frontoni, E., Baldi, M., & Di, L. (2022). Uncovering the potential of blockchain in the agri-food supply chain : An interdisciplinary case study. *Journal of Engineering and Technology Management*, *65*, 101700. https://doi.org/10.1016/j.jengtecman.2022.101700

Corso, M., Dogan, S. F., Mogre, R., & Perego, A. (2010). The role of knowledge management in supply chains : Evidence from the Italian food industry The role of knowledge management in supply chains : evidence from the Italian food industry Mariano Corso , Seyhan Firdevs Dogan , Riccardo Mogre * and Alessandro. *International Journal of Networking and Virtual Organisations*, *7*(2/3), 163–183. https://doi.org/10.1504/IJNVO.2010.031216

Dash, A., Sarmah, S. P., & Manoj Kumar TiwariJena, S. K. (2022). Modeling traceability in food supply chain. *Benchmarking: An International Journal*. https://doi.org/10.1108/BIJ-03-2022-0156

Droste, A. (2007). Lean thinking , banish waste and create wealth in your corporation. *Action Learning Research and Practice*, *4*(1), 105–114. https://doi.org/10.1080/14767330701233988

Duan, Y., Miao, M., Wang, R., Fu, Z., & Xu, M. (2017). A framework for the successful implementation of food traceability systems in China. *Information Society*, *33*(4), 226–242. https://doi.org/10.1080/01972243.2017.1318325

Esmaili, M., & Sahraeian, R. (2017). A new Bi-objective model for a Two-echelon Capacitated Vehicle Routing Problem for Perishable Products with the Environmental Factor. *International Journal of Engineering*, *30*(4), 523–531.

Feng, H., Wang, X., Duan, Y., Zhang, J., & Zhang, X. (2020). Applying blockchain technology to improve agri-food traceability: A review of development methods, benefits and challenges. *Journal of Cleaner Production*, *260*, 121031.

https://doi.org/10.1016/j.jclepro.2020.121031

Ferenhof, H. A., Durst, S., & Mauricio, P. (2015). Knowledge Waste in Organizations : A Review of Previous Studies. *Brazilian Journal of Operations & Production Management*, *12*, 160–178. https://doi.org/10.14488/BJOPM.2015.v12.n1.a15

Ferenhof, H. A., Henrique, A., Cunha, D., Bonamigo, A., & Forcellini, F. A. (2018). Toyota Kata as a KM solution to the inhibitors of implementing lean service in service companies. *VINE Journal of Information and Knowledge Management Systems*, *48*(3), 404–426. https://doi.org/10.1108/VJIKMS-11-2017-0083

Fernando, Y., Jasmi, M. F. A., Wahyuni-TD, I. S., & Mergeresa, F. (2022). Supply chain integration and halal frozen meat product returns integration. *Journal of Islamic Marketing*. https://doi.org/10.1108/JIMA-05-2021-0144

Forsgren, R. (2022). *Lean Knowledge Management How NASA Implemented a Practical KM Program*.

Gloet, M. (2018). The role of knowledge management in innovative supply chain design. *Proceedings of the Annual Hawaii International Conference on System Sciences*, *51*, 4171–4180. https://doi.org/10.24251/hicss.2018.524

Gong, Y., & Blijleven, V. (2017a). The role of Lean principles in supporting knowledge management in IT outsourcing relationships The role of Lean principles in supporting knowledge management in IT outsourcing relationships. *Knowledge Management Research & Practice*, *15*(4), 533–541. https://doi.org/10.1057/s41275-017-0072-8

Gong, Y., & Blijleven, V. (2017b). The role of Lean principles in supporting knowledge management in IT The role of Lean principles in supporting knowledge management in IT outsourcing relationships. *Knowledge Management Research & Practice*, *15*(4), 533–541. https://doi.org/10.1057/s41275-017-0072-8

Govindan, K., Jafarian, A., Khodaverdi, R., & Devika, K. (2014). Two-echelon multiple-vehicle location – routing problem with time windows for optimization of sustainable supply chain network of perishable food. *Intern. Journal of Production Economics*, *152*, 9–28. https://doi.org/10.1016/j.ijpe.2013.12.028

Grant, R. M. (1996). TOWARD A KNOWLEDGE-BASED THEORY OF THE FIRM. *Strategic Management Journal*, *17*, 109–122.

Gupta, S., & Sharma, M. (2016). Lean services : a systematic review. *International Journal of Productivity and Performance Management*, *65*(8), 1025–1056. https://doi.org/10.1108/IJPPM-02-2015-0032

Hallam, C. R. A., Valerdi, R., & Contreras, C. (2018). Strategic lean actions for sustainable competitive advantage. *International Journal of Quality & Reliability Managemen*, *35*(2), 481–509. https://doi.org/10.1108/IJQRM-10-2016-0177

Hanafiah, M. H., & Hamdan, N. A. A. (2021). Determinants of Muslim travellers Halal food consumption attitude and behavioural intentions. *Journal of Islamic Marketing*, *12*(6), 1197–1218. https://doi.org/10.1108/JIMA-09-2019-0195

Handayani, D. I., Masudin, I., Haris, A., & Restuputri, D. P. (2022). Ensuring the halal integrity of the food supply chain through halal suppliers: a bibliometric review. *Journal of Islamic Marketing*, *13*(7), 1457–1478. https://doi.org/10.1108/JIMA-10-2020-0329

Hardt, M. J., Flett, K., & Howell, C. J. (2017). Current Barriers to Large-scale Interoperability of Traceability Technology in the Seafood Sector. *Journal of Food Science*, *82*, A3–A12. https://doi.org/10.1111/1750-3841.13796

Herrera, M. M., & Orjuela-Castro, J. (2021). An Appraisal of Traceability Systems for Food Supply Chains in Colombia. *International Journal on Food System Dynamics*, *12*(1), 37–50. https://doi.org/10.18461/ijfsd.v12i1.74

Hew, J. J., Wong, L. W., Tan, G. W. H., Ooi, K. B., & Lin, B. (2020). The blockchain-based Halal traceability systems: a hype or reality? *Supply Chain Management*, *25*(6), 863–879. https://doi.org/10.1108/SCM-01-2020-0044

Iqbal, A. (2021). Innovation speed and quality in higher education institutions: the role of knowledge management enablers and knowledge sharing process. *Journal of Knowledge Management*, *25*(9), 2334–2360. https://doi.org/10.1108/JKM-07-2020-0546

Jadhav, J. R., Mantha, S. S., & Rane, S. B. (2014). Exploring barriers in lean implementation.

International Journal of Lean Six Sigma, *5*(2), 122–148. https://doi.org/10.1108/IJLSS-12-2012-0014

Jo, J., Yi, S., & Lee, E. (2022). Including the reefer chain into genuine beef cold chain architecture based on blockchain technology. *Journal of Cleaner Production*, *363*(May), 132646. https://doi.org/10.1016/j.jclepro.2022.132646

Kaipia, R., & Loikkanen, L. (2013). Creating sustainable fresh food supply chains through waste reduction. *International Journal of Physical Distribution & Logistics Management*, *43*(3), 262–276. https://doi.org/10.1108/IJPDLM-11-2011-0200

Kalogeraki, E., Apostolou, D., & Polemi, N. (2018). Knowledge management methodology for identifying threats in maritime / logistics supply chains. *Knowledge Management Research & Practice*, *16*(4), 508–524. https://doi.org/10.1080/14778238.2018.1486789

Kamarulzaman, N. H., Muhamad, N. A., & Nawi, N. M. (2022a). An investigation of adoption intention of halal traceability system among food SMEs. *Journal of Islamic Marketing*, *13*(9), 1872–1900. https://doi.org/10.1108/JIMA-11-2020-0349

Kamarulzaman, N. H., Muhamad, N. A., & Nawi, N. M. (2022b). An investigation of adoption intention of halal traceability system among food SMEs. *Journal of Islamic Marketing*, *13*(9), 1872–1900. https://doi.org/10.1108/JIMA-11-2020-0349

Karaesmen, I. Z., Scheller–Wolf, A., & Deniz, B. C.-K. (2011). Planning Production and Inventories in the Extended Enterprise. In *Planning Production and Inventories in the Extended Enterprise* (Vol. 151, pp. 393–436). https://doi.org/10.1007/978-1-4419-6485-4

Kelepouris, T., Pramatari, K., & Doukidis, G. (2007). RFID-enabled traceability in the food supply chain. *Industrial Management and Data Systems*, *107*(2), 183–200. https://doi.org/10.1108/02635570710723804

Khan, A., Arafat, M. Y., & Azam, M. K. (2022). Role of halal literacy and religiosity in buying intention of halal branded food products in India. *Journal of Islamic Marketing*, *13*(2), 287–308. https://doi.org/10.1108/JIMA-08-2019-0175

Khan, S., Haleem, A., Khan, M. I., Abidi, M. H., & Al-Ahmari, A. (2018). Implementing traceability systems in specific supply chain management (SCM) through critical success factors (CSFs). *Sustainability*, *10*. https://www.mdpi.com/256154

Khoifin, K., & Nimsai, S. (2018). Investigating traceability costs and benefits in food supply chain: Case study in Serang City, Indonesia. *International Journal of Supply Chain Management*, *7*(5), 153–161. https://www.researchgate.net/profile/Kiki-Khoifin-2/publication/328653480_Investigating_Traceability_Costs_and_Benefits_in_Food_Supply_Chain_Case_Study_in_Serang_City_Indonesia/links/5bda9a3f4585150b2b959276/Investigating-Traceability-Costs-and-Benefits-i

Kittipanya-ngam, P., & Tan, K. H. (2020). A framework for food supply chain digitalization: lessons from Thailand. *Production Planning and Control*, *31*(2–3), 158–172. https://doi.org/10.1080/09537287.2019.1631462

Klein, L. L., Vieira, K. M., Alves, A. C., & Pissutti, M. (2023). Demystifying the eighth lean waste : a knowledge waste scale. *International Journal of Quality & Reliability Management*. https://doi.org/10.1108/IJQRM-01-2022-0020

Knuf, B. J. (2000). Bbenchmarking the Lean Enterprise : Organizational Learning at Work. J*ournal of Management in Engineering*, *16*, 58–71.

Koochakzadeh, R. S., & Behzadi, S. (2019). The Role of KM Tactical Factors in Supply Chain Management for Gaining Competitive Advantage. *International Journal of Supply Chain Management*, *8*(2), 836–851.

Kumar, A., Kumar, S., Kumar, P., & Song, M. (2021). Mitigate risks in perishable food supply chains : Learning from COVID-19. *Technological Forecasting & Social Change*, *166*(February), 120643. https://doi.org/10.1016/j.techfore.2021.120643

Kumar, A., Mangla, S. K., Kumar, P., & Karamperidis, S. (2020). Challenges in perishable food supply chains for sustainability management : A developing economy perspective. *Business Strategy and the Environment*, *29*(5), 1809–1831. https://doi.org/10.1002/bse.2470

Lai, V. S., Lai, F., & Lowry, P. B. (2017). Technology Evaluation and Imitation : Do They Have Differential or Dichotomous Effects on ERP Adoption and Assimilation in China ?

Technology Evaluation and Imitation : Do They Have Differential or Dichotomous Effects on ERP Adoption and Assimilation in C. *Journal of Management Information Systems*, *33*(4), 1209–1251. https://doi.org/10.1080/07421222.2016.1267534

Latino, M. E., Menegoli, M., Lazoi, M., & Corallo, A. (2022). Voluntary traceability in food supply chain: a framework leading its implementation in Agriculture 4.0. *Technological Forecasting and Social Change*, *178*(August 2021), 121564. https://doi.org/10.1016/j.techfore.2022.121564

Lin, Q., Wang, H., Pei, X., & Wang, J. (2019). Food Safety Traceability System Based on Blockchain and EPCIS. *IEEE Access*, *7*, 20698–20707. https://doi.org/10.1109/ACCESS.2019.2897792

Liu, Shaofeng, Leat, M., Moizer, J., & Megicks, P. (2013). A decision-focused knowledge management framework to support collaborative decision making for lean supply chain management. *International Journal of Production Research*, *7543*. https://doi.org/10.1080/00207543.2012.709646

Liu, Shuai, Hua, G., Kang, Y., Cheng, T. C. E., & Xu, Y. (2022). What value does blockchain bring to the imported fresh food supply chain ? *Transportation Research Part E*, *165*(July), 102859. https://doi.org/10.1016/j.tre.2022.102859

Lizarelli, F. L., Torres, A. F., Antony, J., Ribeiro, R., & Salentijn, W. (2022). Critical success factors and challenges for Lean Startup : a systematic literature review. *The TQM Journal*, *34*(3), 534–551. https://doi.org/10.1108/TQM-06-2021-0177

Lusiantoro, L., Yates, N., Mena, C., & Varga, L. (2018). A refined framework of information sharing in perishable product supply chains. *International Journal of Physical Distribution & Logistics Management*, *48*(3), 254–283. https://doi.org/10.1108/IJPDLM-08-2017-0250

Mai, N., Bogason, S. G., Arason, S., Árnason, S. V., & Matthíasson, T. G. (2010). Benefits of traceability in fish supply chains - case studies. *British Food Journal*, *112*(9), 976–1002. https://doi.org/10.1108/00070701011074354

Maksimović, M., Vujović, V., & Omanović-Mikličanin, E. (2015). Application of internet of things in food packaging and transportation. *International Journal of Sustainable Agricultural Management and Informatics*, *1*(4), 333–350. https://doi.org/10.1504/IJSAMI.2015.075053

Mangla, S. K., Sharma, Y. K., Patil, P. P., & Yadav, G. (2019). Logistics and distribution challenges to managing operations for corporate sustainability : Study on leading Indian diary organizations. *Journal of Cleaner Production*, *238*, 117620. https://doi.org/10.1016/j.jclepro.2019.117620

Marodin, G. A., Tortorella, G. L., & Frank, A. G. (2017). The moderating effect of Lean supply chain management on the impact of Lean shop fl oor practices on quality and inventory. *Supply Chain Management: An International Journal*, *6*(August), 473–485. https://doi.org/10.1108/SCM-10-2016-0350

Marucheck, A., Greis, N., Mena, C., & Cai, L. (2011). Product safety and security in the global supply chain : Issues , challenges and research opportunities. *Journal of Operations Management*, *29*(7–8), 707–720. https://doi.org/10.1016/j.jom.2011.06.007

Massingham, P., & Holaibi, M. Al. (2017). Embedding Knowledge Management into Business Processes. *Knowledge and Process Management*, *24*(1), 53–71. https://doi.org/10.1002/kpm.1534

Masudin, I., Ramadhani, A., Restuputri, D. P., & Amallynda, I. (2021). The Effect of Traceability System and Managerial Initiative on Indonesian Food Cold Chain Performance: A Covid-19 Pandemic Perspective. *Global Journal of Flexible Systems Management*, *22*(4), 331–356. https://doi.org/10.1007/s40171-021-00281-x

Mattevi, M., & Jones, J. A. (2016). Food supply chain: Are UK SMEs aware of concept, drivers, benefits and barriers, and frameworks of traceability? *British Food Journal*, *118*(5), 1107–1128. https://doi.org/10.1108/BFJ-07-2015-0261

Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses : The PRISMA Statement. *Annals of Internal Medicine*, *151*(4), 264–269.

Morales, L. E., Ehmke, M. D., & Sheridan, A. (2022). Consumer Trust and Purchase of Perishable Fresh Food Online Versus In-Store : The Case of beef Consumer Trust and Purchase of Perishable Fresh Food. *Journal of International Food & Agribusiness Marketing*, *0*(0), 1–23. https://doi.org/10.1080/08974438.2022.2072992

Moysiadis, T., Spanaki, K., Kassahun, A., Kläser, S., Becker, N., Alexiou, G., Zotos, N., & Karali, I. (2022). AgriFood supply chain traceability: data sharing in a farm-to-fork case. In *Benchmarking*. https://doi.org/10.1108/BIJ-01-2022-0006

Mubarrok, U. S., Ulfi, I., Sukmana, R., & Sukoco, B. M. (2022). A bibliometric analysis of Islamic marketing studies in the "journal of Islamic marketing." *Journal of Islamic Marketing*, *13*(4), 933–955. https://doi.org/10.1108/JIMA-05-2020-0158

Musavi, M., & Bozorgi-amiri, A. (2017). A multi-objective sustainable hub location-scheduling problem for perishable food supply chain. *Computers & Industrial Engineering*, *113*, 766–778. https://doi.org/10.1016/j.cie.2017.07.039

Nahapiet, J., & Ghoshal, S. (1998). Capital , Social capital , Intellectual advantage and the Organizational. *Academy of Management Review*, *23*(2), 242–266.

Nazam, M., Hashim, M., & Baig, S. A. (2020). Modeling the key barriers of knowledge management adoption in sustainable supply chain. *Journal of Enterprise Information Management*, *33*(5), 1077–1109. https://doi.org/10.1108/JEIM-09-2019-0271

Nikookar, E., & Yanadori, Y. (2022). Preparing supply chain for the next disruption beyond COVID-19: managerial antecedents of supply chain resilience. *International Journal of Operations and Production Management*, *42*(1), 59–90. https://doi.org/10.1108/IJOPM-04-2021-0272

Nizetic, S., Solic, P., Gonzalez-de-Artaza, D. L.-I., & Patrono, L. (2020). Internet of Things (IoT): Opportunities , issues and challenges towards a smart and sustainable future. *Journal of Cleaner Production*, *274*, 122877. https://doi.org/10.1016/j.jclepro.2020.122877

Nonaka, I., & Lewin, A. Y. (1994). Dynamic Theory Knowledge of Organizational Creation. *Organization Science*, *5*(1), 14–37.

Patidar, R., & Agrawal, S. (2020). A mathematical model formulation to design a traditional Indian agri-fresh food supply chain: a case study problem. *Benchmarking*, *27*(8), 2341–2363. https://doi.org/10.1108/BIJ-01-2020-0013

Pinto, A. Di, Bottaro, M., Bonerba, E., Bozzo, G., Ceci, E., & Marchetti, P. (2015). Occurrence of mislabeling in meat products using DNA-based assay. *Journal of Food Science and Technology*, *52*(4), 2479–2484. https://doi.org/10.1007/s13197-014-1552-y

Poghosyan, A., Gonzalez-Diaz, F., & Bolotova, Y. (2004). Traceability and Assurance Protocols in the Global Food System. *International Food and Agribusiness Management Review*, *7*(3), 118–126.

Ramli, M. H., Rosman, A. S., Khan, A., Fadzillah, N. A., Ghazali, M. A., Darawi, A. B. B. S., Saari, Z., Jandra, M., & Jamli, N. A. O. (2020). Halal risk control at the upstream level of the broiler chicken supply chain. *Journal of Critical Reviews*, *7*(7), 1052–1057. https://doi.org/10.31838/jcr.07.07.191

Ramos, E., Patrucco, A. S., & Chavez, M. (2021). Dynamic capabilities in the "new normal": a study of organizational flexibility, integration and agility in the Peruvian coffee supply chain. *Supply Chain Management*, *July*. https://doi.org/10.1108/SCM-12-2020-0620

Redeker, G. A., Kessler, G. Z., & Kipper, L. M. (2019). Lean information for lean communication : Analysis of concepts , tools , references , and terms. *International Journal of Information Management*, *47*(December 2016), 31–43. https://doi.org/10.1016/j.ijinfomgt.2018.12.018

Ribeiro, P. C. C., Scavarda, A. J., & Batalha, M. O. (2010). RFID in the international cattle supply chain: Context, consumer privacy and legislation. *International Journal of Services and Operations Management*, *6*(2), 149–164. https://doi.org/10.1504/IJSOM.2010.030633

Rijpkema, W. A., & Rossi, R. (2013). Effective sourcing strategies for perishable product supply chains. *International Journal of Physical Distribution & Logistics Management*, *44*(6), 494–510. https://doi.org/10.1108/IJPDLM-01-2013-0013

Ringsberg, H. A. (2015). Implementation of global traceability standards: incentives and opportunities. *British Food Journal*, *117*(7), 1826–1842. https://doi.org/10.1108/BFJ-10-2014-0353

Sander, F., Semeijn, J., & Mahr, D. (2018). The acceptance of blockchain technology in meat traceability and transparency. *British Food Journal*, *120*(9), 2066–2079. https://doi.org/10.1108/BFJ-07-2017-0365

Sayogo, D. S. (2018). Online traceability for halal product information: perceptions of Muslim consumers in Indonesia. *Journal of Islamic Marketing*, *9*(1), 99–116. https://doi.org/10.1108/JIMA-07-2016-0057

Shahdan, I. A., Regenstein, J. M., Shahabuddin, A. S. M., & Rahman, M. T. (2016). Developing control points for halal slaughtering of poultry. *Poultry Science*, *95*(7), 1680–1692. https://doi.org/10.3382/ps/pew092

Siddh, M. M., Soni, G., & Jain, R. (2015). Perishable food supply chain quality (PFSCQ) implications for future research. *Journal of Advances in Management Research*, *12*(3), 292–313. https://doi.org/10.1108/JAMR-01-2015-0002

Soon, J. M., Chandia, M., & Regenstein, J. M. (2017). Halal integrity in the food supply chain. *British Food Journal*, *119*(1), 39–51. https://doi.org/10.1108/BFJ-04-2016-0150

Stanica, S., & Peydro, J. (2016). How does the employee cross-training lean tool affect the knowledge transfer in product development processes? *VINE Journal of Information and Knowledge Management Systems*, *46*(3), 371–385. https://doi.org/10.1108/VJIKMS-11-2015-0061

Sternitzke, C., & Bergmann, I. (2009). Similarity measures for document mapping : A comparative study on the level of an individual scientist. *Scientometrics*, *78*(1), 113–130. https://doi.org/10.1007/s11192-007-1961-z

Stone, K. B. (2012). Four decades of lean : a systematic literature review. *International Journal of Lean Six Sigma*, *3*(2), 112–132. https://doi.org/10.1108/20401461211243702

Storøy, J., Thakur, M., & Olsen, P. (2013). Principles and guidelines for implementing traceability in food value chains. *Journal of Food Engineering*, *115*, 41–48. https://doi.org/10.1016/j.jfoodeng.2012.09.018

Stranieri, S., Riccardi, F., Meuwissen, M. P. M., & Soregaroli, C. (2021). Exploring the impact of blockchain on the performance of agri-food supply chains. *Food Control*, *119*(May 2020), 107495. https://doi.org/10.1016/j.foodcont.2020.107495

Strubelt, H., & Mollenhauer, F. (2020). Identifying and evaluating synergies of Lean Six Sigma and knowledge management in deliberately interlocking application. *International Journal of Quality & Reliability Managemen*, *37*(5), 801–819. https://doi.org/10.1108/IJQRM-09-2018-0257

Tan, A., Gligor, D., & Ngah, A. (2022). Applying Blockchain for Halal food traceability. *International Journal of Logistics Research and Applications*, *25*(6), 947–964. https://doi.org/10.1080/13675567.2020.1825653

Tan, K. H., Ali, M. H., Makhbul, Z. M., & Ismail, A. (2017). The impact of external integration on halal food integrity. *Supply Chain Management*, *22*(2), 186–199. https://doi.org/10.1108/SCM-05-2016-0171

Teece, D. J. (2017). A capability theory of the firm : an economics and (Strategic) management perspective management perspective. *New Zealand Economic Papers*, *53*(1), 1–43. https://doi.org/10.1080/00779954.2017.1371208

Tranfield, D., Denyer, D., & Smart, P. (2003). Towards a Methodology for Developing Evidence-Informed Management Knowledge by Means of Systematic Review *. *British Journal of Management*, *14*, 207–222.

Tseng, S. M. (2010). The correlation between organizational culture and knowledge conversion on corporate performance. *Journal of Knowledge Management*, *14*(2), 269–284. https://doi.org/10.1108/13673271011032409

Tyagi, S., Cai, X., Yang, K., & Chambers, T. (2015). Lean tools and methods to support efficient knowledge creation. *International Journal of Information Management*, *35*(2), 204–214. https://doi.org/10.1016/j.ijinfomgt.2014.12.007

Ugochukwu, P., Engstr, J., & Langstrand, J. (2012). LEAN IN THE SUPPLY CHAIN : A

LITERATURE REVIEW. *Management and Production Engineering Review*, *3*(4), 87–96. https://doi.org/10.2478/v10270-012-0037-6

Valacherry, A. K., & Pakkeerappa, P. (2020). Knowledge Management in the Software Industry: Creating Value Through Knowledge Application. *Journal of Creating Value*, *6*(2), 249–270. https://doi.org/10.1177/2394964320968981

Vanany, I., Mardiyanto, R., Ijtihadie, R. M., Andri, K. B., & Engelseth, P. (2016). Developing electronic mango traceability in Indonesia. *Supply Chain Forum*, *17*(1), 26–38. https://doi.org/10.1080/16258312.2016.1143206

Vanichchinchai, A. (2020). Exploring organizational contexts on lean manufacturing and supply chain relationship. *Journal of Manufacturing Technology Management*, *31*(2), 236–259. https://doi.org/10.1108/JMTM-01-2019-0017

Wang, X., & Li, D. (2007). Value Added on Food Traceability: a Supply Chain Management Approach. *International Journal of Services Operations and Informatics*, *4*(3), 232–257. https://doi.org/10.1109/soli.2006.329074

Yang, K., & Cai, X. (2009). The integration of DFSS , lean product development and lean knowledge management. *Int. J. Six Sigma and Competitive Advantage*, *5*(1), 75–99.

Yang, S., Xiao, Y., & Kuo, Y. (2017). The Supply Chain Design for Perishable Food with Stochastic Demand. *Sustainablity*, *9*, 1–12. https://doi.org/10.3390/su9071195

Zailani, S., Kanapathy, K., Iranmanesh, M., & Tieman, M. (2015). Drivers of halal orientation strategy among halal food firms. *British Food Journal*, *117*(8), 2143–2160. https://doi.org/10.1108/BFJ-01-2015-0027

Zainuddin, N., Saifudin, A. M., Deraman, N., & Osman, A. A. (2020). The Effect of Halal Traceability System on Halal Supply Chain Performance. *International Journal of Supply Chain Management*, *9*(1), 490–498. https://core.ac.uk/download/pdf/288291208.pdf

Zhang, B., Niu, Z., & Liu, C. (2020). Lean Tools , Knowledge Management , and Lean Sustainability : The Moderating E ff ects of Study Conventions. *Sustaianability*, *12*, 1–20.

Zhang, L., & Chen, X. (2016). Role of lean tools in supporting knowledge creation and performance in lean construction. *Procedia Engineering*, *145*, 1267–1274. https://doi.org/10.1016/j.proeng.2016.04.163

Zhao, P., Rasovska, I., Rose, B., & Rose, B. (2016). Integrating Lean Perspective and Knowledge in Services : application to the service and of a Management CNC manufacturer. *IFAC-PapersOnLine*, *49*(12), 77–82. https://doi.org/10.1016/j.ifacol.2016.07.553

Zhou, X., Zhu, Q., & Xu, Z. (2022). The mediating role of supply chain quality management for traceability and performance improvement: Evidence among Chinese food firms. *International Journal of Production Economics*, *254*(August), 108630. https://doi.org/10.1016/j.ijpe.2022.108630