Innovations

Quality Management and Lean Technology in Food Processing Industries: A systematic literature review

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Abstract

Purpose*: The objective of this study was to identify the profile of academic research on quality management and lean technology in agro-manufacturing industries and look at the connection between quality management and resource efficiency.* ***Theoretical framework:*** *Food safety concerns have plagued the food industry the world over, resulting in outbreaks of foodborne diseases that affect both domestic and foreign consumers (Zhang et al. 2015). How can manufacturers assure quality within the manufacturing process while simultaneously minimizing waste and maximizing productivity?* ***Design/methodology/approach:*** *We analysed the profile of publications on blended learning in quality and lean manufacturing from 2000 to 2022. We identified when, who, where and what was published on the subject, singling out the authors and journals with the greatest impact based on the h-index and Cite Score (Scopus and web of science. Articles were first screened by reviewing their titles to exclude non-relevant articles. A PRISMA flow chart was used to extract the data from the included articles.* ***Findings:*** *The volume of research has been increasing over the past twenty years, although there are only a few authors, institutions and reference journals contributing to the topic's consolidation and the countries conducting the most research, authors and impact journals. The review also demonstrates the areas where we can all agree and why research has produced disparate results. Such disparities in research findings are vexing for both researchers designing new studies and practitioners seeking guidance on how to implement lean and quality management systems.* ***Research, Practical & Social implications:*** *Future studies could analyze the impact of joint applications and possible links between lean manufacturing and other approaches like TQM, Six Sigma, etc., with the aim of process improvement.* ***Originality/value:*** *The review demonstrates the areas where we can all agree and why research has produced disparate results. Such disparities in research findings are vexing for both researchers designing new studies and practitioners seeking guidance on how to implement lean and quality management systems.*

Keywords: *Quality management, Lean technology in agro-manufacturing industries, PRISMA, Resource efficiency*

I. INTRODUCTION

Food safety concerns have plagued the food industry the world over, resulting in outbreaks of foodborne diseases affecting both domestic and foreign consumers (Zhang et al., 2015). Although food microbial

contamination is a global issue, the adulteration of food by adding chemicals (Xiu and Klein, 2010), allowing heavy metal contamination (Wang et al., 2019), or avoiding certain processing steps is of particular importance. In contrast to common microbiological contamination, which causes acute symptoms quickly, such contamination may result in chronic foodborne illnesses that develop over time (Li et al., 2019). To compete in a market, it is necessary to develop a controlled system for the production process to define, ship, analyze, and prepare needs through supply chain control (al-Khafaji, 2019), and to minimize resource loss. As a result, food manufacturers are constantly looking for ways to improve their efficiency and market competitiveness. In this context, efficiency is a critical success factor because it allows food manufacturers to cut costs, improve product quality, and meet environmental standards.

II. EMPIRICAL LITERATURE

Previous research attempted to situate food quality assurance within the context of the corporate social responsibility (CSR) concept (Zhang et al., 2015) or by assessing consumer trust in managerial or inspection service expertise (Han et al., 2020). The proposed approaches assume that company management will either apply the CSR concept or respond to consumer expectations and establish a process to accommodate quality assurance expectations. Quality managers in food companies may be well-educated, but they lack the authority and resources available to top management. End-of-line verification is the most common approach to quality assurance, rather than the sustained effort to monitor quality and safety at each processing stage that is characteristic of the global shift in supplier responsibility for food safety (Trienekens and Zuurbier, 2008).

Quality management (QM) and efficient resource utilization are essential segments for the food sector in the search to develop and apply a methodology that helps entities gain an advantage over their competitors, as food quality violations and waste are more significant than for other products. In the food sector, quality certification is a basic need and requirement for regional and domestic markets for trade and customer satisfaction (Talib et al. 2014). Furthermore, given the growing number of small businesses, it is possible to estimate that an exaggerated amount of resources are wasted daily due to a lack of direction in the execution of processes and insufficient methodological experience.

Much of the current literature agrees that Good Agricultural Practices (GAPs), Hazard Analysis of Critical Control Points (HACCPs), and the International Organization for Standardization (ISO) are used as benchmarks for food quality assurance in the global food industry. These practices are part of the food quality system's core triangle revolution in food safety management (Lamuka, 2014). Talib et al. (2014) asserted that TQM could improve enterprises' overall effectiveness, flexibility, and competitiveness. ISO 9000-certified companies in Greece's food and beverage industry benefit from increased productivity and efficiency, a better image, and market penetration (Kakouris and Sfakianaki, 2018). However, as Dora et al. (2013) point out, the size of the company plays a significant role in implementing QM. Small and micro ones fare better than medium ones.

Addressing these challenges requires innovative solutions and a commitment to sustainability and continuous improvement. There is therefore a need for resource efficiency in order to reduce "muda" in the manufacturing process. Lean manufacturing (Vlachos 2015), for example, emphasizes the elimination of waste and the creation of standardized work procedures to improve efficiency and quality control. Though there is no universal definition of lean thinking (Shah and Ward, 2007), there is general agreement that adopting lean thinking has two effects on how businesses operate: (a) at the strategic level, lean thinking helps companies define value; and (b) at the operational level, lean thinking provides a set of tools and techniques to eliminate waste (Hasle et al., 2012). To put lean thinking into action, you must first understand what lean is and what constitutes a successful lean action plan.

Most articles on lean production (LP) focus on the implementation of systems such as just-in-time (JIT), total quality management (TQM), total preventive maintenance programs, human resource management, value stream mapping, and vendor development, as well as their impact on operational performance (Cudney

and Elrod 2011). This approach has been shown to reduce costs and improve quality, but it requires a significant investment in training and culture change (Vargas-Hernández 2018; Avinash et al. 2015). Furthermore, authors such as Marcos-Pagliosa et al. (2021) concurred that lean manufacturing is an option that demonstrates flexibility when implemented in the different situations of the analyzed sector.

The lean manufacturing tool is best implemented, when one starts with the 5S (Sort /Seiri, set in order/Seiton, shine/Seiso, and standardise/Seiketsu) methodology and then continue with the other tools in which a culture of cleanliness is established in organisations in order to ensure the reduction of food waste that is caused by pollution and decomposition, as well as inventory levels (Borges et al. 2015). Therefore, the motivation proposed by the authors is to demonstrate that, by performing the correct application of the lean manufacturing methodology, it is possible to obtain favorable results for the continuous collective development of the entire organization.

In general, improving the effectiveness of quality management systems (such as ISO 9001, TQM, Lean, Six Sigma, and so on) can assist food manufacturing SMEs in consistently improving quality, preventing nonconformity, and satisfying their customers (Sui et al. 2018). Implementing QM has numerous benefits for the food industry. According to Psomas et al. (2013), maximizing ISO 9001 effectiveness can assist food processing SMEs in continuously improving quality, preventing nonconformity, and satisfying their customers. An abstract of the similarities/differences between lean and total quality management (TQM) is here summarised (Table 1).

Table 1: An abstract of similarities and differences between TQM and Lean (Kedar et al. 2008)

ID	Subject	Lean	TQM
1	Country of origin	Japan	Japan
2	Approach	Understanding customer value, Elimination of waste	Quality, focus on customer
3	Process view and time phase	Improve flow processes	Continuousimprovement
4	Fundamental concept	Continuously improving the value created for the customers by letting them pull value through a streamlined value stream	Data-based, employee driven, orientation towards customers and suppliers
5	Participation	Everyone	Normally everyone 6and s7uppliers, Le8t eve8rybody be 9committed
6	Methodology	Customer value, value stream analysis, flow, pull, perfection	Pan, Do, Check, Act
7	Tools	Analytical	Analytical and statistical
8	Primaryeffects	Reduce lead time	Increasecustomers satisfaction
9	Secondaryeffects	Reduce inventory, increase productivity, and customer satisfaction	Achieve customer loyalty and improves performance
10	Change introduced	Could be dramatic as well as incremental	Slow, incremental
11	Implementation time	Long, many new things are to be learned	5 – 10 years
12	Criticism	Causes congestion in the supply chain	No tangible improvement Resource demanding Unclear notion

In Cameroon, the manufacturing sector has played an important role since its independence, with productivity enhancement being crucial to the drive for rapid industrialization and economic growth (Tingum and Ofeh 2017). Today she has some laboratories and quality testing companies such as the "Institut Pasteur du Cameroun," a technical establishment of the Cameroonian Ministry of Public Health, "Hydrocarbures Analyses Contrôles (HYDRAC), "SociétéGénérale de surveillance Cameroun (SGS, for pre-shipment product conformity assessment)," "ANOR (AgenceNationale de Normalisation)," "LaboratoirePaleologos (for analyses of agricultural products), and IRAD (Agricultural Research Institute for Development).

However, laboratories of food control do not cover the whole aspect, including limited scope in testing, understaffed constraints involving a small number of staff and inadequately trained staff, and the management system's inability to detect potential risks and gaps, share information, plan together, and identify appropriate strategies for collaborative management of food safety in the supply chain and protect consumers. These constraints reduce workflow efficiency. Lean manufacturing, for example, emphasizes the elimination of waste and the creation of standardized work procedures to improve efficiency and quality control. This approach has been shown to reduce costs and improve quality, but it requires a significant investment in training and culture change. From the foregoing, we can infer that a combination of TQM and lean management could optimize efficiency and therefore increase customer satisfaction.

Many studies rarely explain the methodological underpinnings that structure the research issues, and as a result, there is no structured review that analyzes previous research designs, which could guide future research. Furthermore, despite the fact that the lean management concept was developed in the automobile industry and has since been widely adopted in engineering-oriented and assembly industries, there is still a scarcity of literature on the concept's applicability in the food industry, particularly in developing countries and African countries south of the Sahara. As a result, it is critical to fill this gap and investigate the research design and outcomes in previous contributions, using the food industry as an example over the last thirty years. Key questions of the review are:

- Which authors and journals lead the literature on quality management and lean manufacturing technology in food manufacturing industries and which articles are cited the most?
- What are the main topics that are researched, which countries contribute most to the scientific production and which words are most used in the literature on quality management and lean technology in food manufacturing?

III METHODOLOGY

A. Protocol registration and search strategy

This review adheres to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement (Moher et al. 2009). This review was conducted to gain an understanding of the state of the art in scientific literature regarding quality management and resource efficiency in food manufacturing industries. The Web of Science database was chosen for this study because it is published by Thomson Reuters and is the most important source of information for bibliometric analyses in the sciences (Chen et al. 2014), and SCOPUS is the largest bibliometric database in terms of information coverage (Akmal et al. 2018), while also being more comprehensive (Filser et al. 2017), indexing 22,794 peer-reviewed articles.

B. Eligibility Identification

The search criteria included quality management, efficiency, and experience in the food manufacturing industry. This review included studies with a report on quality management, lean manufacturing, studies with a report on lean implementation framework, lean manufacturing tools, adoption of lean manufacturing principles in process industries, "lean-based manufacturing and productivity, quality and waste reduction, continuous improvement philosophy, and studies conducted globally." Author(s), year of publication, publication type, and study location were among the information gathered. Investigate population characteristics and locations.

C. *Measurement of the outcome variables*

The primary goal of this review was to discover the literature, the relationship between quality management and efficient resource use in food manufacturing industries, as well as the research design used and the results in previous contributions. Endnote TM version X9.2 (Thomson Reuters, Philadelphia, PA, USA) software was used to export and manage all studies. All duplicated studies were eliminated, and full-text articles were manually searched using Endnote software.

D. Inclusion and exclusion criteria

Only publications from the Web of Science and Scopus databases were taken into account. The papers were to be published in English no later than 1999, with an emphasis on the impact of quality management, lean manufacturing, and/or resource utilization. To exclude non-relevant articles, articles were first screened by reviewing their titles. The following are our pre-defined exclusion criteria: There is no information on LM or QM. Publications that are duplicate The retained articles' abstracts and full texts were then reviewed. Microsoft Word was used for organizing, reviewing titles and abstracts, and identifying duplicates.

E. Quality assessment of individual studies

The Critical Appraisal Checklists for both qualitative and economic studies were used to assess the quality of the included studies (Critical Appraisal Skills Programme, CA 2018). Critical appraisal was used to reduce information overload by eliminating irrelevant or weak studies, identify the most relevant papers, distinguish evidence from opinion and assumptions, assess the study's validity, usefulness, and clinical applicability, and identify any potential for bias. CA covers a wide range of topics, including determining the study's suitability to answer the hypothesised question and the possibility of bias in the study. Some of the key questions considered when critically evaluating the papers were as follows:

- Does the study add anything new to the evidence in my field?
- What type of research question is being asked?
- Was the study design appropriate for the research question?

Participants were eligible if they had a postgraduate qualification (e.g., PhD, MSc, in quality management and/or related studies) and/or were a university teacher. The quality of the included studies was assessed independently by two reviewers. The two reviewers' exaggerated disparity was managed through brainstorming and discussions. The quality assessment tool includes twenty questions. Among the included studies, the highest score indicated a low risk of bias, while the lowest indicated a high risk of bias.

F. Data analysis

The Spearman's Rank Correlation Coefficient (Equation 1) was used to discover the strength of a link between two sets of data/ scores for variable by each observer.

$$\rho_k = 1 - \frac{6\sum d^2}{n(n^2-1)} \qquad (1)$$

Where:

d = the differences between scores,

6 = a constant, and

n is the number of scores/samples.

A correlation coefficient of closer or equal to +1 means a perfect positive correlation; if 0, then there is no correlation, and if closer to, or equal to -1, it means a perfect negative correlation.To evaluate repeatability of our indicator system, the signal to noise ratios (S/N or SNR; Equation 2) - a qualitative measure was used.

$$SNR = \frac{P_{(signal)}}{P_{(noise)}} = \frac{\mu}{\sigma} \qquad (2)$$

Where:

- Psignal is the power of the signal.

- Pnoise is the power of the noise.
- μ is the signal mean
- σ is the standard deviation of the noise

The signal-to-noise ratio (SNR, or S/N) was used here because the variance due to performing the assessment (i.e., the noise) must be less than the variance across the documents (i.e., the signal) in order to correctly determine the differences between documents evaluated in the review. The higher the ratio, the higher the signal quality. In our analysis, the signal was defined as the variance in the total rapid assessment score across all documents reviewed. Noise was defined as the variance (among observer variances) in total rapid assessment document studies.

G. *Data extraction and management*

The main data extraction categories were the matized based on the main characteristics of the study, which included author, year, journal, country, sample size, quality management, lean manufacturing, lean manufacturing tools, adoption of lean manufacturing principles in process industries, "lean-based manufacturing and productivity, quality and waste reduction, continuous improvement philosophy, and so on. The extracted data was then imported into Excel spreadsheets for further analysis. The descriptive analyses of the included articles were summarized using tables and graphs.

IV RESULTS

A Retrieved Contents

A total of 147 studies were identified through electronic search engines. Duplicates of 20records were removed. Of the 127records retained, 105 were articles were screened from the title, abstracts and duplications. Finally, 20 relevant studies were retained for the study after excluding 2 more records as summarized in the following PRISMA flowchart (Figure 1).

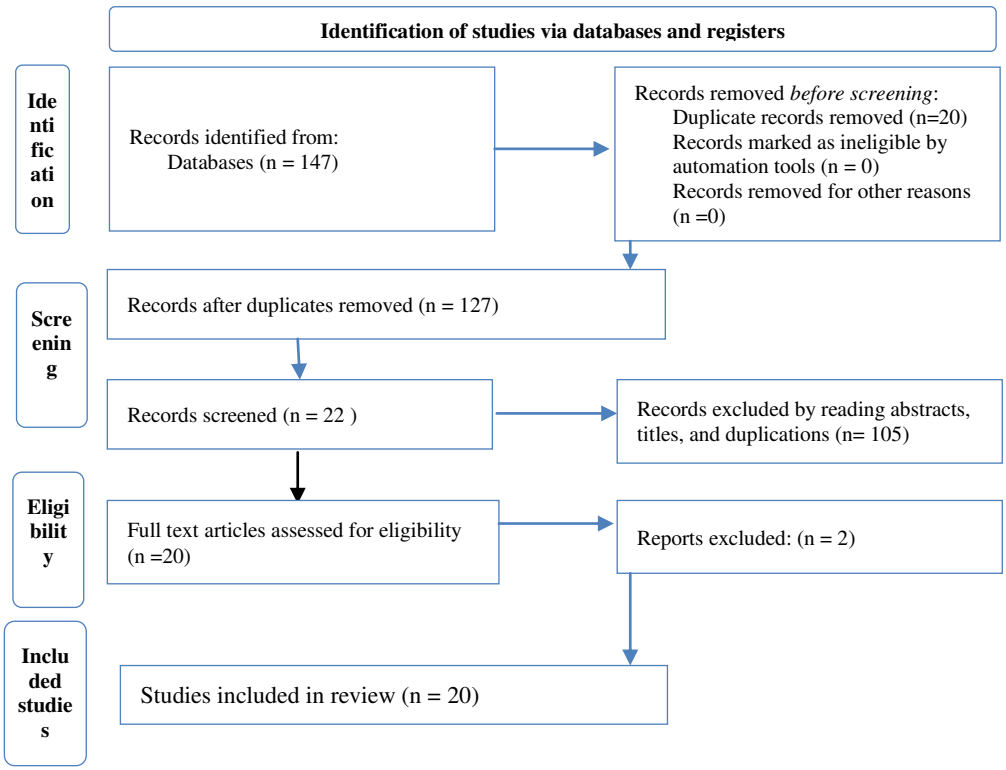

Figure 1 : PRISMA flow diagram for included studies in the review

The studies included in the study comprised the 20 included articles drawn from the different continents of the world. From the findings and limitations, it is clear that a combination of lean manufacturing and quality management practices are important for efficient use of resources in food processing, as this optimises performance. However, a myriad of limitations marr these approaches (Table 1)

Table 1 : Selected list of articles included in the study

No.	Author/ year	Country	Findings	Limitations
1	Tiendem, 2020	Cameroon	The QM principles have a significant positive effect on financial performance	The tool usage concerns financial performance only
2	Stanojeska et al. 2020	Macedonia	The top management has an influence on QMS'state and TQM practices by improving employee motivation	Focus on human resource only
3	Vlachos et al. 2015	UK	The potential contribution of lean food small and medium companies can be enormous given the percentage of food waste across supply chains.	The small size of SMEs, their traditional setup, and inflexible layout make it difficult to implement lean manufacturing in food-processing.
4	Han et al. 2020 Zhang et al. 2015	China	A Company'sattitude(defensive/passive/proactive) to corporate social responsibility (CSR) affects its attitude to food risks, & the CSR performance of a company affects the effectiveness of its food risk management measures.	Governments invest less in more efficient food safety projects and in the enhancement of publicity of normative documents in popular media.
5	Singh 2018	India	A positive relationship between quality management, product and process innovation (incremental and radical), and operational and financial performance, and direct and indirect relationships	Focuses on financial performance
6	Nurcahyo et al. 2021	Indonesia	ISO 9001 has a positive impact on business performance	Operational and business performance are the centers

				of interest
7	Charles &Małgorzata 2021	Poland	Through the combined efforts of HACCP and QA control points (QACP) such as improved food hygiene, both quality, and safety levels can be further enhanced and sustained	The cost of adopting and subsequently implementing ISO standards is understood to scare away the small-scale food industries.
8	Barbancho-Maya and Lopez-Toro, 2022	Kazhakstan	Most important benefits and motivations are access to new markets and compliance with legislation, while the most important barrier is the high cost of adopting quality and food safety systems within the company. Finally, the most relevant contingency factor when adopting these systems is the size of the company	The relationship between quality assurance and financial development; the role of contingency factors in the process of adopting these systems and the analysis of HACCP systems in the agri-food sector.
9	Zajac et al. 2015	Poland	According to the companies surveyed, introduction of ISO 9001 caused fulfillment of increasing company's prestige, customer satisfaction…	Does not regard resource's use but analizes the reasons and the difficulties linked to ISO 9001 implementation
10	Chaoniruthisai et al. 2018	Spain	The most important benefits and motivations are access to new markets and compliance with legislation	Focuses on determinant factors affecting the adoption of quality food services certifications in

				the agri-food sector.
11	Mambanda et al. 2017	Zimbabwe	Total quality management practices positively impacted on the performance of the food and beverage sector in Zimbabwe	Analyses the overall performance.
12	Vrellas and Tsiotras, 2015	Greece	Quality management in the brewing industry is improving the various operations performed within and outside the brewing factory.	Does not concern ressourc's use specifically.
13	Ngambi and Nkemkafui, 2015	Cameroon	some measures of organizational performance could be significantly impacted by TQM practices, all elements of TQM do not contribute to enhanced performance.	Focuses on link between TQM and performance.
14	Costa et al. 2020	Brazil	The compulsory cleaning practices restrict adoption of LSS practices such as set-up time reduction. Six Sigma role structure and Statistical Process Control dimensions are among the sector's least adopted practices. These practices require financial resources for training, which can be a challenge in a sector with low margins that primarily focuses on cost reduction, and they require statistical techniques and knowledge that is generally considered complex and too advanced in the food industry.	Six Sigma role structure and Statistical Process Control dimensions are among the sector's least adopted practices. These practices require financial resources for training, which can be a challenge in a sector with low margins that primarily focuses on cost reduction, and they require statistical techniques and knowledge that is generally considered complex and too advanced in the food industry.
15	Marcos Pagliosa et al.2021	Indonesia	Companies that use the LEAN philosophy are more flexible, achieve high performance and	Implementation cost and

			have an environment that is conducive to minimizing waste	management.
16	Riesenegger&Hübner 2022	UK	The potential contribution of lean food small and medium companies can be enormous given the percentage of food waste across supply chains.	Implementation cost and management.
17	Borges Lopez et al. 2015	Portugal.	Significant gains are obtained in both companies and, more importantly, it instils a continuous improvement culture and increases production flexibility while reducing lead times.	Accurately quantifying the impact of machine design changes and the impact in inventory reduction.
18	Psomas et al. 2018	Greece	Manufacturing industries in Indonesia; it is found out that there are five main problems in each company, i.e. process management, continuous improvement activities, focus on customers, top management leadership, and commitment on the quality of the products produced	By determining the strengths and weaknesses of the food SMEs' efforts to adopt Lean, suitable managerial initiatives can be undertaken by these companies as well as the whole sector to fully adopt Lean and derive the respective benefits.
19	Dimar et al. (2004)	Spain	Significant gains are obtained in both companies and, more importantly, it instills a continuous improvement culture and increases production flexibility while reducing lead times.	Comparing LM implementation results among companies of different sectors to allow for further understanding the potential and importance of process

				innovation in different industrial contexts.
20	Panwar et al. 2017	Pakistan	Adoption of lean practices results in a positive impact on inventory control, waste elimination, cost reduction, productivity, and quality improvement in process industries.	Implementation cost

The relationship between pairs of reviewer scores was relatively tight, with very little review bias (rho = 0.845, p 0.01 two-tailed). The quality of the 20 documents evaluated ranged from 1 to 19. The S/N ratio results (18.8) followed a similar pattern to the quality score (16–19), indicating that the signal level is higher than the noise level and that the reviewers' results did not agree significantly.

B. Publication by Year

There were no publications that met our selection criteria from 2000-2006. Although there are some fluctuations, the number of publications on the subject only began to increase substantially from 2016. Articles selected for review and screening were either systematic reviews, 31(23.13%), case studies, 51(34.70%), surveys, 31(21.09%), action oriented research, 20(13.61%), or modeling, 11(7.48%)(Fig. 2)

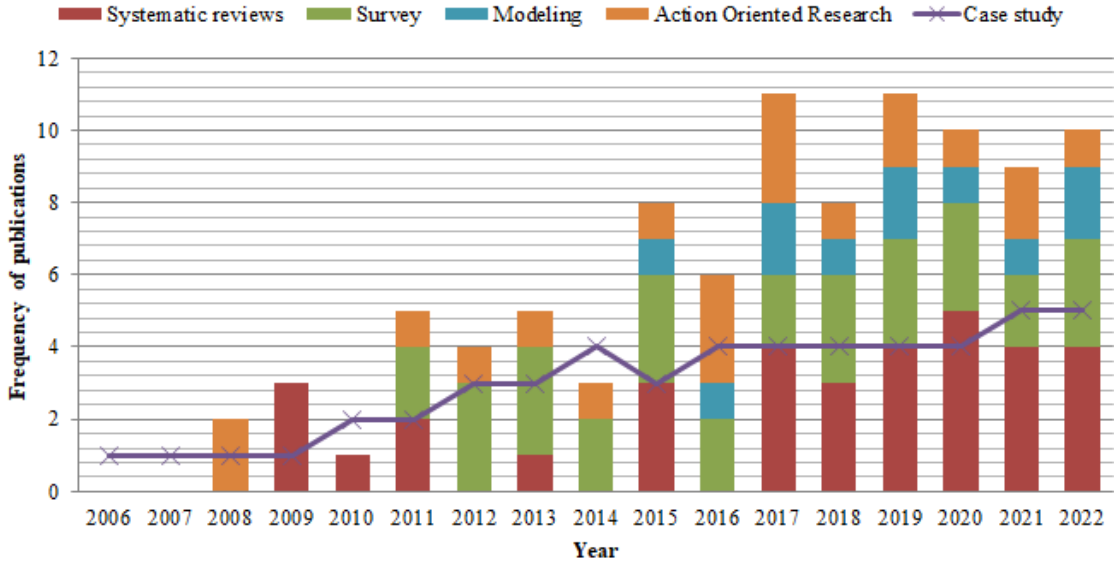

Figure 2: Distribution of documents studied per year according to type of article

The somewhat increasing trend in the different domains between 2016 and 2022 compared to the previous years could be attributed to the increasing awareness on the potential application of LM and QM technics as valuable tools in our competitive world. Both subjects (lean management and quality management) were widely distributed over a myriad of subject areas such as computer science, environmental science, chemistry, business management and accounting, etc., with the latter dominating (Fig. 3)

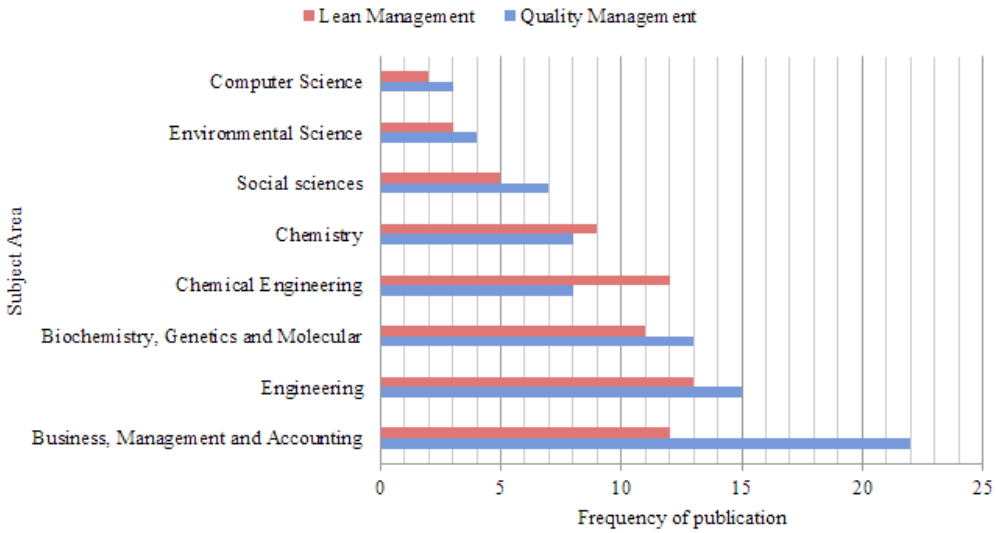

Figure 3 - Distribution among subject areas about LM and QM studies

The results in the above figure (Fig. 3) are not surprising since all knowledge need business, management, and accounting to sustain life and itself. While the concept and practice of quality management had been long applied in other parts of the world the African continent has only recently begun research in this area. Australia (mainly Oceania and New Zealand), has also increased its research in recent years 3) (Fig. 4a&b)

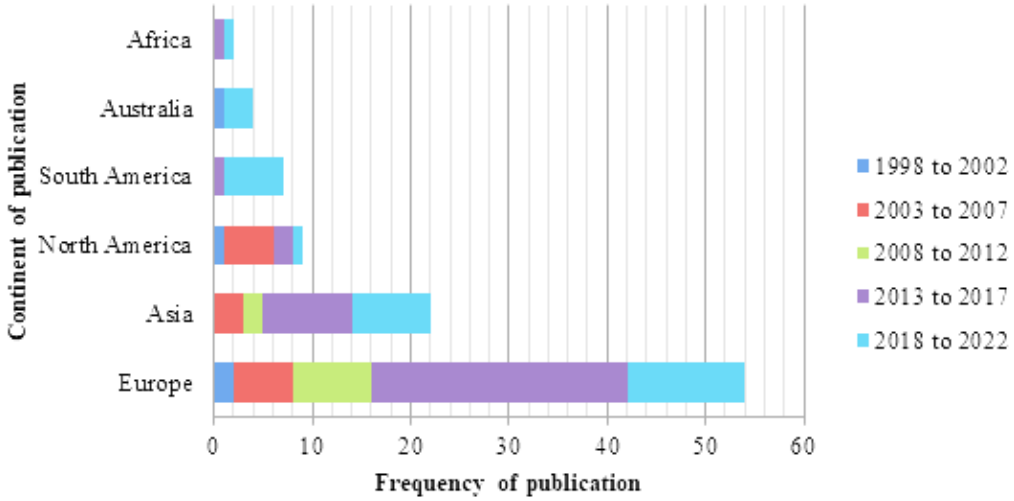

Figure 4a: Frequency of published articles with respect to continents of the world

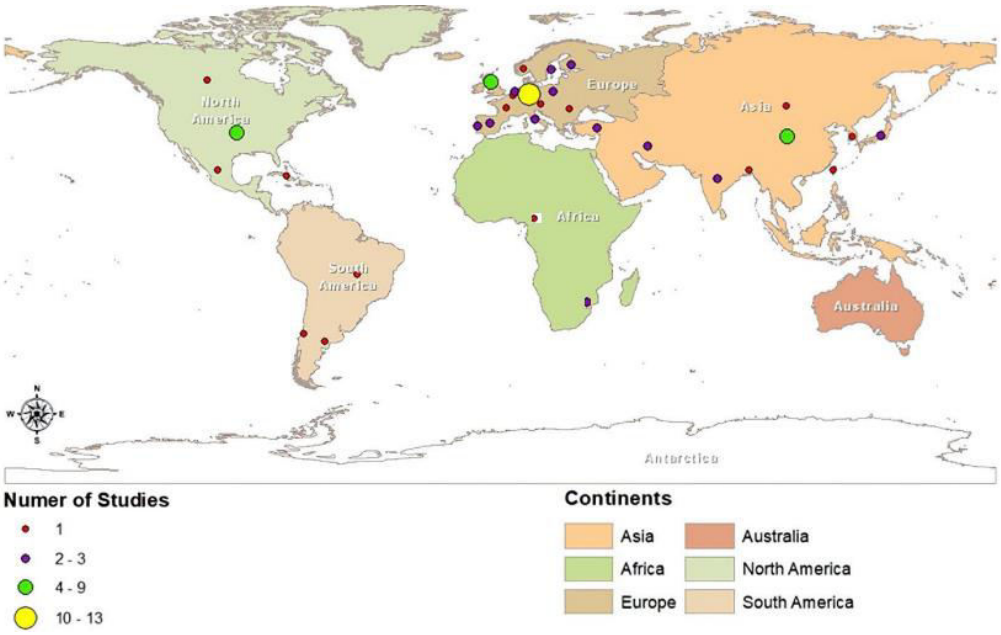

Figure 4b The spatial distribution of reviewed studies

The results from Figures 4a&b reflect the prevalent schism between the global "North and South" in this domain as well. Such differences could be linked to economic, scientific, and technological advancements.

V. DISCUSSIONS

A. Results in Context

This literature review on quality management and lean technology in agro-manufacturing industries looks at the connection between quality management, lean management, and resource efficiency or business performance. It demonstrates the areas where we can all agree and why research has produced disparate results. Our investigation uncovered some inconsistencies in this fundamental relationship. Such disparities in research findings are vexing for both researchers designing new studies and practitioners seeking guidance on how to implement lean and quality management systems. There are inconsistencies in the results due to differences in research design, which may explain some of the variation. The implications of our study for researchers and managers in the manufacturing industries are summarized in the following section.

ISO 9001 certification has occupied useful space in the agro-food industry or sector in recent decades (Okpala and Korzeniowska, 2021). It is, indeed, the most widely used QMS in the world. There are two types of studies on the relationship between quality management systems (ISO 9001) and performance: those that believe there is a strong positive relationship between the two and those that do not. For example, a recent study on ISO 9001-certified companies (Rawan and Rateb, 2017) explained that ISO-certified companies gained better performance, higher employee feelings of ownership, and a more flexible move to a more mature quality level, and that there are several benefits to implementing the QMS.

On the other hand, some studies criticized quality programs; they deduced that certified companies had a worse rate of net benefit growth, average cost savings, market share growth, and sales growth than non-certified companies. This result was supported by Martinez-Costa (2008), who clarified that ISO 9000 negatively affects companies' performance and can reduce profitability. Also, the Dimar et al. (2004) study, which was conducted on 1,000 firms in Catalonia and Spain, investigated the costs and benefits of ISO 9001. They found that the benefits of ISO 9001 gradually decreased over time. From the above discussion, it can be

concluded that the impact of ISO 9001 certification still has questions and needs to be rigorously grounded in theory, especially on the companies' internal environment, to reach credible inferences.

Concerning TQM, most empirical studies seem to agree with those of Talibet al. (2014) that TQM practices have a positive impact on organizational performance. Although the empirical literature suggests a positive link between TQM and organizational performance, the level of contribution attributed to TQM was not large, suggesting that there could be other variables at play. Those variables could be the differences in the processes of implementing TQM with respect to economic trends, the type of industry, the business environment, including technology, competitiveness and market, corporate strategy, the resources of the firm, etc.

In general, maximizing the effectiveness of quality management (such as ISO 9001, TQM, Lean, Six Sigma, and so on) can help food manufacturing industries consistently succeed in improving quality, reducing nonconformities, satisfying their customers, and becoming more performant and/or competitive (Sui et al. 2018). The food industry greatly benefits from QM implementation. Psomas et al. (2013) demonstrated that maximizing ISO 9001 effectiveness can assist food processing SMEs in continuously improving quality, preventing nonconformity, and satisfying their customers. In European food SMEs, implementing QM can reduce costs and customer complaints while increasing productivity and profitability (Dora et al. 2013).

Although we only review 20 research studies on the role of lean management and quality principles in manufacturing organizations, these studies together cover hundreds of manufacturing organizations from Africa, Asia, Europe, and the USA. As a consequence, we provide some guidelines concerning lean management and quality principles that these 20 research studies reach agreement on.

B. Implications for Researchers

According to research, manufacturing firms have adopted various lean and quality management principles to a greater extent. However, manufacturing industries, particularly food industries, on which humans rely heavily, have made less progress in lean and quality management. Priority for food safety, on the other hand, addresses issues such as improving food safety systems in exporting countries, contributing to consumer health and protection, and progress on food regulations and standards. Not all food manufacturing companies are able to meet international standards. One of the major challenges for developing countries is to comply with quality standards and improve standards in the food industry. This review of the literature reveals a strong relationship between the implementation of lean and quality management and resource efficiency.

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