Ingeniería y Competitividad
Vol 26 (3) 2024; doi: 10.25100/iyc.v26i3.13881

Vol 26 (3)

ISSN
0123-3033
e- 2027-8284

Reveiw Article

A systematic review of improvement methodologies for the optimization of production management in the restaurant sector

Una revisión sistemática de las metodologías de mejora para la optimización en la gestión de producción en el sector de restaurantes

Brian E. Braúl[1] Edgar C. Ruiz[2]

[1] Industrial Engineer from Universidad Privada del Norte (Private University of the North). He is currently a consultant for the Braucer group
[2] Doctor in Industrial Engineering from Universidad Nacional Mayor de San Marcos

Abstract

This research aimed to identify methodologies for the optimization of production management in restaurants. The PRISMA 2020 systematic review method was employed, using relevant meta-search engines such as ScienceDirect, Scopus, and Web of Science. The search query was determined, followed by reading and analysis of the results to identify improvement methodologies. Subsequently, a synthesis of the most relevant and innovative articles was conducted. The research yielded 40 articles encompassing various methodologies that optimize all aspects of production management in restaurants.

Resumen

La presente investigación tuvo como objetivo identificar las metodologías para la optimización en la gestión de producción en restaurantes. Se aplicó el método de revisión sistemática de la literatura utilizando metabuscadores relevantes como: ScienceDirect, Scopus y Web of Science; se prosiguió con la determinación de la fórmula de búsqueda, dando lectura y análisis de los resultados para identificar los métodos de mejora; finalmente, se realizó la síntesis de los artículos más relevantes y de mayor innovación. La investigación tuvo como resultado 46 artículos de diversos tipos de metodologías que optimizan la gestión de producción en todos sus aspectos en los restaurantes.

Keywords: improvement methodologies, Production management, Restaurant, Systematic review.

Palabras clave: metodologías de mejora, gestión de producción, restaurante, revisión sistemática.

How to cite?

Braul, B.E., Ruiz, E.C. A systematic review of improvement methodologies for the optimization of production management in the restaurant sector. Ingeniería y Competitividad, 2024, 26(3)e-30113881

https://doi.org/10.25100/iyc.v26i3.13881

Recibido: 18-04-24
Aceptado: 05-08-24

Correspondence:
brian.braul@unmsm.edu.pe

Conflict of interest: none declared

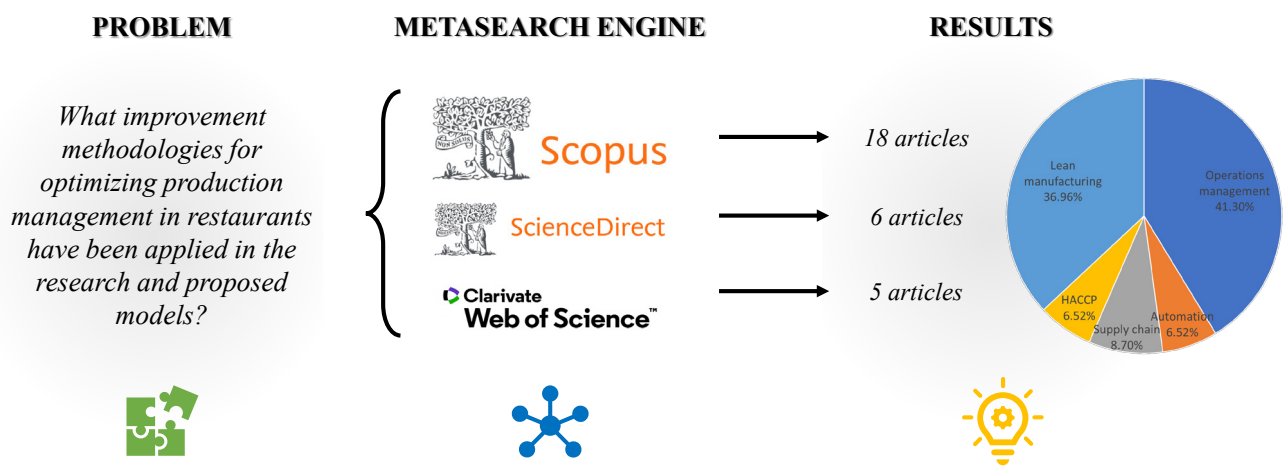
OPEN ACCESS

Why was it conducted?:
This research was carried out in order to identify the improvement methodologies used for optimization in production management in the restaurant sector by analyzing the applied research and proposed models; for this, the Prisma 2020 methodology was applied coupled with the systematic review of the literature.

What were the most relevant results?
The most relevant results of the systematic review of the literature is that it was possible to identify the improvement methodologies that have been proposed and applied to optimize production management in the restaurant sector in various dimensions such as improvement in productivity, control of quality and processes, reduction of waste, automation of processes and sustainability. After the analysis of the frequencies of implementation of the methods in the evaluated research, it is relevantly observed that there are 41% who applied operations management methods and 37% who applied the Lean manufacturing method.

What do these results contribute?
Knowing the latest results of the improvement methods for optimizing production management when applied in different types of research in the restaurant sector, will provide knowledge regarding the methods, procedures, limitations and various benefits that the methods provided. of improvement by optimizing production management in a sustainable manner.

Graphical Abstract



doi: 10.25100/iyc.v26i1.13881

Introduction

In the food industry, all production management in restaurants must consider the economic fluctuation of various sectors. According to Wiener (1), the need for restaurants to adapt to customer requirements, following the severe impact of the COVID-19 pandemic, has exacerbated the competition in delivery services. Therefore, it is necessary to optimize processes, reduce production lead times and ensure quality and safety. On the other hand, climate change is impacting the proper execution of production in the restaurant sector, as exhaustion due to high temperatures reduces worker productivity. Additionally, the agricultural sector, due to water consumption for livestock and crops, is causing resource scarcity, as mentioned by Wallace (2). Finally, the rise in oil and food prices caused by the armed conflict between Russia and Ukraine, along with increased interest rates set by banks and the growing inflation in various national economies, raise restaurant costs, according to Cooban (3).

Peruvian restaurants are not immune to these issues. According to Alcala (4), there was a 40% decline in restaurant sales in Peru in 2023, driven by the economic recession in the country, price inflation due to economic instability following supply shortages, and increased costs of technology and food, resulting in a 15% reduction in employment and a subsequent decline in restaurant revenues. At the end of 2023, the El Niño phenomenon began, impacting all sectors of the country, with agriculture and transportation being the most affected. According to Redacción Gestión (5), this was caused by heavy rains that led to crop destruction, road damage, and the migration of marine biodiversity to more suitable waters for their development. In this context, this research aimed to identify improvement methodologies used for the optimization of production management in the restaurant sector by analyzing applied research and proposed models. The PRISMA 2020 methodology was applied to this systematic literature review.

Background

Espinosa et al. (6) conducted a systematic review of technology in process management, aiming to determine whether the development of such technology successfully resolves various process management issues. They analyzed 2000 studies carried out between 2007 and 2014 concerning applied improvement methodologies. They concluded that the application of BPM technologies only has a positive impact on the organization if there is a focus on process improvement aimed at optimizing production management. Similarly, Ogunwolu et al. (7) conducted a literature review of Lean Manufacturing and Lean Six Sigma methodologies, aiming to understand their applications in operational fields. They identified 15 review articles discussing the methodologies applied in these fields. They concluded that Lean methodologies provide a structured approach that optimizes processes, leading to cost reduction and maximized profits. Additionally, Nickerson (8) conducted a literature review on process improvement methodologies, aiming to analyze these methodologies and their impact on processes. He identified 40 studies and concluded that the application of these methodologies significantly enhances processes, albeit with varying levels of effectiveness.

Literature review

Independent Variable: Process improvement methodologies

Process improvement methodologies are a series of systematic steps followed to identify areas for improvement in a process, implement changes, and measure results. These methodologies are used in a wide range of industries, including the restaurant sector, manufacturing, healthcare, and government, according to Días (9). Process improvement in the restaurant sector is a methodology aimed at optimizing the operations of an establishment to increase efficiency, profitability, and customer satisfaction. It is a systematic approach that involves identifying areas for improvement, implementing changes, and measuring results. Fariñas (10) noted that process improvement in the restaurant sector consists of a set of strategies and methodologies focused on optimizing the internal operations of establishments to primarily enhance primarily efficiency, maximize safety, quality, and business profitability. This is achieved through identifying and eliminating bottlenecks, reducing loss and waste, standardizing procedures, and implementing technological tools.

doi: 10.25100/iyc.v26i1.13881

The basic tools commonly used include data collection and check sheets, Pareto charts, cause and effect diagrams, histograms, various scatter plots, stratification, and statistical process control charts, according to Carrera et al. (11). As stated by Gutiérrez (12), the PDCA cycle enables proper project execution in the following four phases: Plan, Do, Check, Act. On the other hand, Escalante (13) mentioned that the Six Sigma methodology consists of five phases: Define, Measure, Analyze, Implement, and Control. It should be understood that the Deming cycle involves a general methodology applied to any process; however, the DMAIC cycle involves a more complex and thorough methodology with deep statistical analysis. Every process improvement methodology always involves an improvement in workers' mindset; therefore, for any improvement, it is necessary to convince all personnel of the benefits of the implemented tools for sustainable organizational development. Process improvement methodologies use tools for problem analysis that enable the prevention of errors and failures.

Dependent Variable: Optimization of Production Management

Production management is one of the important areas of a company, responsible for the proper administration of work and raw materials with adequate quality. Its optimization results in cost reduction and the subsequent maximization of profitability for the company. Chase et al. (14) stated that the optimization process contributes to proper production management to satisfy customers with competitive pricing, appropriate timing, and maximizing production capacity. Additionally, appropriate production management will allow for demand analysis and accurate forecasting for production planning. Moreover, Gaither and Frazier (15) pointed out that production is of great importance at the organizational level; therefore, they mentioned that efficient production management is required to be globally competitive, as it is the area that will enable the organization to deliver quality products, and have low costs, and timely stock levels. One of the pioneers of optimization in production management was Ohno (16), who stated that production is the nervous system of the company and therefore must be in balance. Due to the various existing economic problems, including those related to the supply of raw materials, labor, and different restrictions, it is necessary to establish a production flow that aims to maintain the continuity of the supply of inputs and raw materials.

According to Pico and Zambrano (17), optimizing production management in restaurants involves implementing strategies and tools to improve the efficiency, quality, and profitability of food and beverage production processes. In the dynamic environment of the restaurant industry, optimizing production management becomes a crucial aspect for achieving operational excellence and meeting customer requirements. According to Calixto and Collahua (18), optimizing production management in restaurants involves reducing costs, improving quality, increasing productivity, and enhancing customer satisfaction. This requires implementing improvement methodologies that enable identifying areas for improvement, analyzing processes, designing new processes, implementing them, and measuring the results obtained. Optimizing production management in the restaurant sector is a continuous process that requires commitment, dedication, and teamwork.

Methodology

This is a basic research study, as it involves an analysis of bibliographic and scientific documents, according to Álvarez (19). It also encompasses the analysis of improvement methodologies for the optimization of production management in the restaurant sector, a highly regarded topic that aligns with the proposed methodology. It is exploratory in nature, employing a qualitative approach; it was conducted using a systematic review design following the PRISMA 2020 model (Preferred Reporting Items for Systematic Reviews and Meta-Analyses), an updated statement providing a guideline for reporting systematic reviews and meta-analyses, according to Page et al. (20). The phases followed include the introduction or protocol phase, where the systematic review registration is described, the consulted data sources and the strategy used are detailed, and the inclusion and exclusion criteria for the studies under review are defined; next is the screening phase, where the quantities of identified, selected, and excluded studies are presented, and the studies are evaluated and described; finally, the findings synthesis phase is followed, where the meta-analysis findings and the qualitative or narrative synthesis are presented. According to Rave and Iván (21), it is descriptive, as process improvement methodologies for the optimization of production management in the restaurant sector are examined and analyzed.

doi: 10.25100/iyc.v26i1.13881

Population

After conducting the search according to the inclusion criteria, 496 articles were found up to the year 2024 among the meta-search engines, and it was decided to assess 100% of the articles.

Eligibility criteria

Inclusion and exclusion criteria were determined. Regarding the independent variable, metodologías de mejora and their variants, such as metodología de optimización, metodología, mejora, and optimización (in Spanish), were established; therefore, when searching for research studies in international meta-search engines, they should be translated as improvement methodology, optimization methodology, methodology, improvement, and optimization, respectively. Regarding the dependent variable, production management and its variant, production, were established. To limit the search, the restaurant sector (variant restaurant and restaurant chain) was selected, see table 1 Search criteria. The systematic literature review, for a comprehensive analysis, was determined by collecting information from the year 2020 to the year 2023 and early 2024. It is important to understand that Lean Manufacturing is a movement whose research and applications worldwide are currently evolving.

Table 1. Search criteria

Independent variable	Dependent variable	Location variable
Improvement methodology Optimization methodology Methodology Improvement Optimization	Production management Production	Restaurant Restaurant chain Restaurant sector

Information sources

The meta-search engines selected were Scopus, ScienceDirect, and Web of Science. Scopus and ScienceDirect belong to the most prestigious academic publisher in the world, with a long history of publishing scientific journals and specialized books in various fields of knowledge; Elsevier's publications undergo a rigorous peer-review process, ensuring the quality and reliability of the information they contain. Articles and books published by Elsevier are considered authoritative references in their respective fields. Document review was carried out considering the source of articles for the collection and analysis of improvement methodologies for production management in restaurants.

Search strategy

For this research, the PRISMA 2020 methodology, described by Page et al. (20), was applied. For this purpose, a search strategy tailored to this research was developed to address the research problem. The strategy can be seen in figure 1.

doi: 10.25100/iyc.v26i1.13881

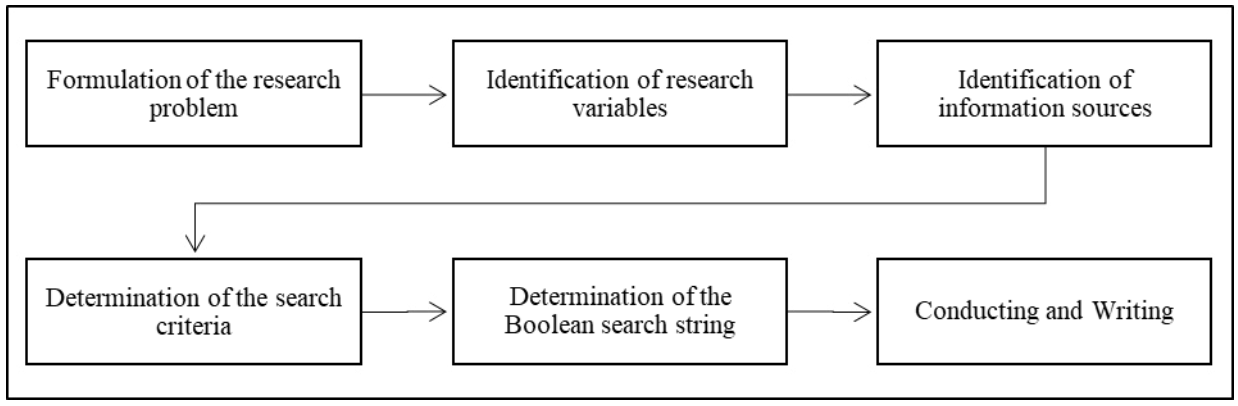


Figure 1. Search strategy flow diagram

The research question was first formulated: What improvement methodologies are used for the optimization of production management in the restaurant sector? Considering the previously determined sources and criteria, the Boolean search string were determined for each search engine. For the meta-search engine Scopus, the Boolean search string was formulated as title-abs-key("improvement methodology*" or "optimization methodology*" or "methodology*" or "improvement*" or "optimization*") and title-abs-key("production management*" or "production*") and title-abs-key("restaurant*" or "restaurant chain*" or "restaurant sector*"). For the meta-search engine ScienceDirect, the Boolean search string was formulated as ("improvement methodology" or "optimization methodology" or "methodology" or "improvement" or "optimization") and ("production management" or "production") and ("restaurant" or "restaurant sector"). Finally, for the meta-search engine Web of Science, the Boolean search string was formulated as ("improvement methodology*" or "optimization methodology*" or "methodology*" or "improvement*" or "optimization*") and ("production management*" or "production*") and ("restaurant*" or "restaurant chain*" or "restaurant sector*"). An initial search was conducted to determine which meta-search engines yielded the highest number of results according to the determined Boolean search string, considering search criteria and limitations.

The selection of studies proceeded by conducting an analysis to determine which meta-search engines would yield substantial results. Therefore, searches were performed using the Boolean search strings determined for each meta-search engine. A total of 305 articles were found in the meta-search engine Scopus; 74 articles were found in the meta-search engine ScienceDirect; and finally, 117 articles were found in the meta-search engine Web of Science.

Data selection and extraction process

All 496 articles were analyzed. Forty studies were identified from the established meta-search engines to address the research problem. Information such as meta-search engine, authors, year, city, country, title, method, general objective, findings, and DOI identifier was then collected. As for the meta-search engine Scopus, 18 relevant articles were identified; 29 relevant articles were identified in the meta-search engine ScienceDirect; and finally, 5 relevant articles were identified in the meta-search engine Web of Science to address the research question of this study.

Finally, in the writing phase, it was ensured that this research followed the procedure and objectives of a systematic literature review, including an introduction (presenting the problem statement and research objectives), a brief literature review, the systematic review methodology, the findings obtained, the research conclusions, and finally, recommendations for improvement methodologies and production management in the restaurant sector were written. Regarding the PRISMA 2020 methodology, in figure 2, the diagram used for the article analysis is shown. All located articles were read and analyzed, and those that appropriately applied process improvement methodologies for production optimization were selected. Moreover, studies not related to the restaurant sector were excluded, while studies from disciplines such as environmental engineering, health, and sciences were found.

doi: 10.25100/iyc.v26i1.13881

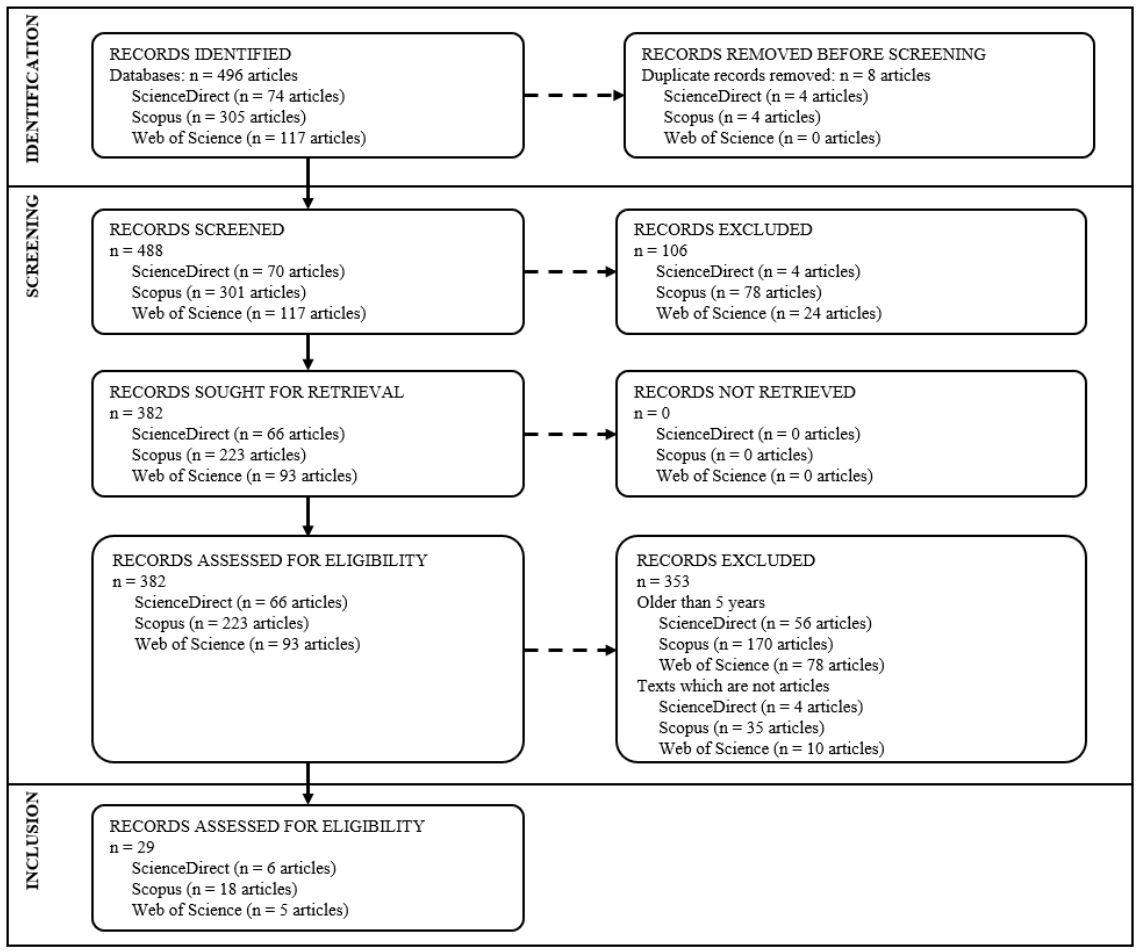


Figure 2. Analysis diagram according to PRISMA 2020

Results and discussion

Analysis of keywords

The keywords from the two meta-search engines with the most results were analyzed to understand the central themes of the identified articles and the annual evolution of the research using the VOSviewer software. As for the meta-search engine ScienceDirect, as shown in figure 3, there is a significant focus placed on research regarding optimization of production processes and waste reduction in restaurant to enhance consumer perceived value in the last 5 years. Furthermore, it can be observed that there is a need in research studies to optimize innovation in restaurant production processes.

doi: 10.25100/iyc.v26i1.13881

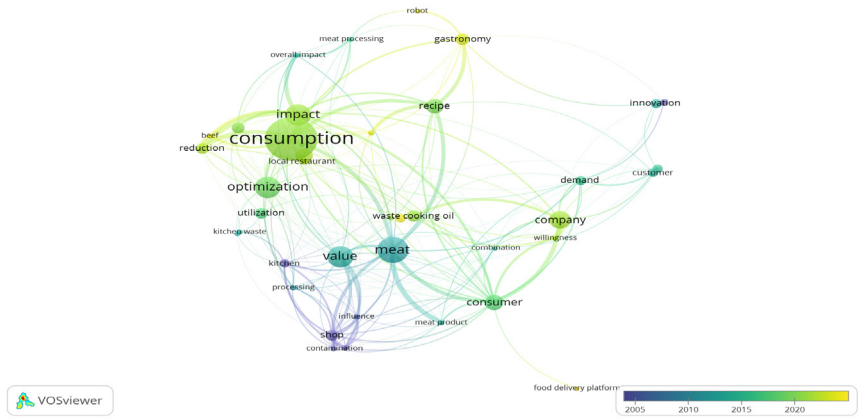


Figure 3. Network of keywords from the meta-search engine ScienceDirect

Regarding the meta-search engine Scopus, as shown in figure 4, it is observed that research is centered on optimizing production and improving work processes involving labor in restaurants. To this end, automation is implemented using robots for repetitive tasks in production lines, aimed at reducing costs.

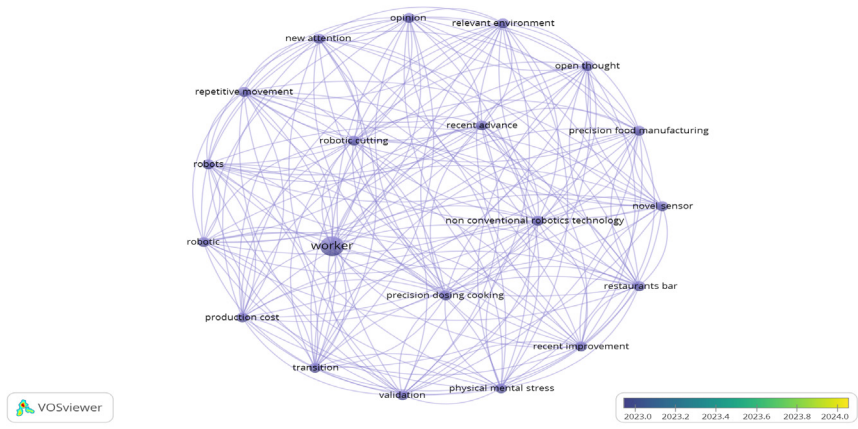


Figure 4. Network of keywords from the meta-search engine Scopus

Most relevant improvement methodologies identified for the optimization of production management in the restaurant sector

Studies found and analyzed from the meta-search engine ScienceDirect between 2019 and 2024 are listed in table 2. This section highlights the research by Wang, Lee, and Trappey from 2017, where they applied the Theory of Inventive Problem Solving (TRIZ) and Quality Function Deployment (QFD). These theories remain relevant today for optimizing production management.

doi: 10.25100/iyc.v26i1.13881

Table 2. ScienceDirect results

Authors	Methodology	Results
Jayasekara et al. (22)	Statistical Process Control	It was determined that 20% of food waste was generated due to inadequate weighing of food supplies during the food production process in restaurants.
Derossi et al. (23)	Process automation with robotics	It identified that process automation in the food sector results in over 80% efficiency across all food production processes, reduces labor costs by between 30% and 70%, and increases the number of restaurant customers by 6% to 10%.
Beheshti et al. (24)	Closed-loop supply chain	It was determined that there was a 30% increase in the profitability of the supply chain with production waste.
Aytaç and Korçak (25)	Internet of Things (IoT)	10% reduction in food waste throughout the restaurant production process.
Cosmi et al. (26)	Process scheduling modeling	The efficiency of the restaurant's production processes achieved between 80% and 99% depending on the operating capacity utilization.
Wang et al. (27)	Theory of Inventive Problem Solving (TRIZ) and Quality Function Deployment (QFD)	A 19% increase in the number of clients and a 16% increase in revenues were achieved. Furthermore, customer satisfaction increased by 50%.

Studies found and analyzed from the meta-search engine Scopus are listed in table 3. The relevant studies by Shimmura and his team from 2011, 2017, and 2018 were included. In these studies, conducted in Japan, an evolution in production management for optimization is observed, beginning with work process improvement, followed by the implementation of cellular production, standardization, and production control in the restaurant sector.

Table 3. Scopus results

Authors	Methodology	Results
Chiu (28)	The human capital theory	An efficiency of 73.60% was achieved among employees whose income consisted solely of salary, whereas an efficiency of 75.10% was achieved among employees whose benefits expenses were reduced.
Kosacheva and Nurgalieva (29)	Restructuring of the production and service system	Higher customer satisfaction was achieved by enhancing service capacity and improving the restaurant production line.
Linnes et al. (30)	Switching to a sustainable input	Through a 454-response interview, it was identified that the use of local input was feasible, allowing for a reduction of input costs and an increase in sales.
Ashton et al. (31)	Servuction model	It increased restaurant profitability, maximized customer satisfaction, and increased sales.

doi: 10.25100/iyc.v26i1.13881

Jia et al. (32)	Operations research	After using simulation and optimal production scheduling, they succeeded in determining that the studied methodology is feasible for maximizing resource utilization, improving production, and reducing waiting times.
Malquín et al. (33)	Production cost control	They identified the need for production cost control within an improvement methodology in order to maximize profitability and enable improvements in the restaurant.
Onaga et al. (34)	Lean Service (5S, SMED, standardization)	A 9.84% reduction in customer service time and a 16% increase in satisfaction were achieved.
Takeuchi et al. (35)	Queueing theory	They determined that there is potential for using production improvement methodologies through the application of queueing theory and proper work management to maximize efficiency in the restaurant.
Mohd et al. (36)	Product quality	They determined that quality has a high degree of association with increased sales across dimensions such as ambiance, food taste, price, and service, highlighting the importance of quality control in production processes.
Wu et al. (37)	Robotic automation in restaurant production processes	They determined and validated that the implementation of robotics positively impacts customers as well as reduces production costs.
Alva et al. (38)	5S methodology	They optimized the work environment for employees by increasing the number of processes they may perform without having to move more than 1 meter from their workspace.
Marx et al. (39)	Material flow analysis	They determined that the implementation of food waste control enables the reduction of loss, maximizes productivity and reduces production costs.
Morales et al. (40)	Lean manufacturing	After the analysis for identifying and eliminating waste, they determined that the customer's perspective will contribute to this objective as an audit tool to improve processes by optimizing productivity, efficiency, and quality.
Orynycz et al. (41)	Lean manufacturing	They increased work efficiency and reduced times, energy consumption, and CO2 emissions.
Singhal et al. (42)	Just in Time	They proposed a predictive model that allows for control at different points to forecast demand and avoid overproduction and stockouts.
Shimmura et al. (43)	Improvement in process methodology	They optimized production and reduced working hours by changing cooking systems. Furthermore, they noted that batch production increases the heterogeneity of the dishes produced after analyzing demand and customer perception.

doi: 10.25100/iyc.v26i1.13881

Shimmura et al. (44)	Task assignment and cellular production	They demonstrated that the model could reduce working hours through task assignment and the implementation of cellular production with a mini kitchen. Additionally, they showed that productivity increases as it improves process flexibility. Finally, they demonstrated that it is not necessary to use complex machines for production optimization.
Shimmura et al. (45)	Process improvement study	They propose the application of workload distribution to improve cooking processes, thereby reducing production lead time.

Studies found and analyzed from the meta-search engine Web of Science are listed in table 4.

Table 4. Web of Science results

Authors	Methodology	Results
Povorozniuk et al. (46)	Process management improvement and globalization	It revealed the opportunities that restaurateurs in Ukraine are taking through globalization by optimizing their production management with improvements.
Lévesque et al. (47)	Waste characterization	They managed to categorize the waste generated in the restaurant due to inadequate control in the production area, which required training and improvements to reduce waste.
Kalaitan et al. (48)	ABC analysis method	It has shown that the ABC analysis method is viable for analyzing a food matrix. In addition, the analysis of managerial variations was furthered for an optimal production management.
Malyarets et al. (49)	Linear programming	It was determined that the application of the algorithm is a form of multi-criteria production optimization. However, the author recommends using various algorithms that take into consideration diverse criteria formulas.
Takacs and Borrion (50)	Input lifecycle management	It was qualitatively demonstrated that product lifecycle management can reduce waste due to obsolescence.

Improvement methodologies for the optimization of production management in the restaurant sector

The frequency of methodologies applied in the reviewed studies was analyzed, and the dimensions of the studies were identified to calculate the percentage of frequency of these methodologies. It was observed that 41.30% of the studies applied operations management methodologies, Lean Manufacturing was applied in 36.96% of the studies, 8.70% applied supply chain analysis, 6.52% applied process automation in production lines, and the remaining 6.52% implemented the HACCP methodology for improving production management in restaurants, as shown in figure 5.

doi: 10.25100/iyc.v26i1.13881

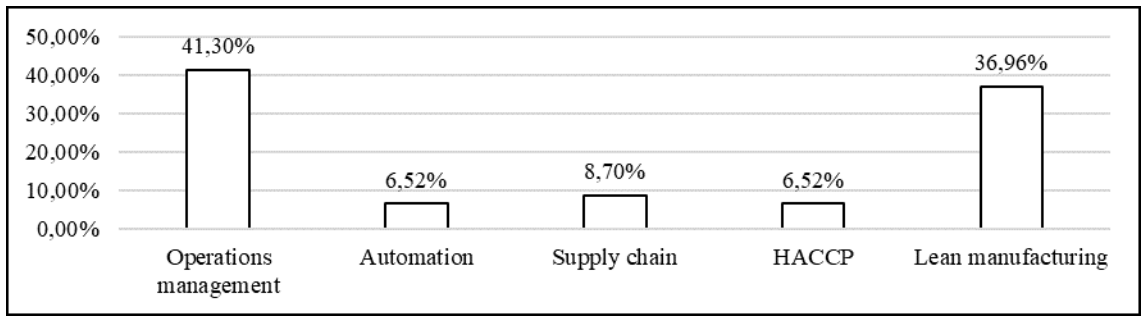


Figure 5. Frequency of applied methodologies

In addition, figure 6 shows the distribution of countries that have conducted research on process improvement for optimizing production management in restaurants. It can be observed that the majority of research studies come from countries such as Japan, USA, the United Kingdom, and Ukraine. It is worth noting that these countries are among the most visited by tourists; however, we will address it in a future study.

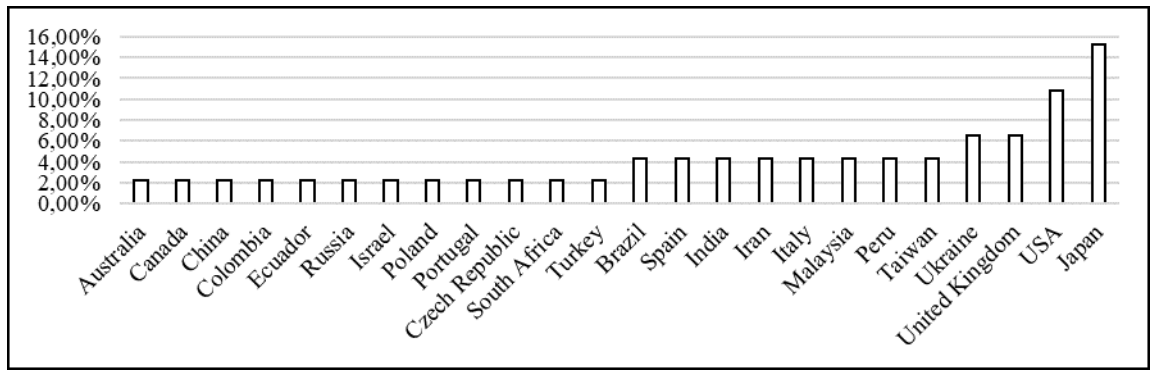


Figure 6. Research contributions from each country

Discussion

Regarding the study by Espinosa et al. (6), in which they conducted a systematic review of technology in process management, the conclusion was that methodologies applied in the operational fields have a positive impact on companies with an improvement approach, which corroborates the findings of this study. Furthermore, other process improvement methodologies were identified in this study, not only technological, since the implementation of improvements in work processes, productivity reduction, and training involves less money investment, resulting in a fast optimization of production management and a shift in the cultural mindset of the company.

Similarly, Ogunwolu et al. (7), by conducting a literature review of the Lean Manufacturing and Lean Six Sigma methodologies, likewise concluded that the analyzed methodologies achieved a structured approach and enabled process optimization, reducing costs and maximizing profits, which corroborates the findings of this study. In contrast, the applied Lean Manufacturing and Lean Six Sigma methodologies focus on intelligent work, in other words, applying improvements in production methods to avoid errors and thus reduce or eliminate the waste that such errors entail. This maximizes productivity, utilizes production capacity, and enhances the quality and safety of processes.

Finally, Nickerson (8) conducted a literature review on process improvement methodologies, which concluded that these methodologies significantly improve processes at different levels of effectiveness, corroborating the findings of this study. This correspondence of information paves the way for further research to understand the extent of the effect produced by implementing different improvement methodologies in similar situations, aiming to identify and develop an in-depth guide on the correct way to implement these process improvement methodologies.

doi: 10.25100/iyc.v26i1.13881

Fifty-two articles were identified, surpassing the number identified by Ogunwolu et al. (7), who conducted a literature review on Lean Manufacturing and Lean Six Sigma methodologies, identifying 15 authors reviewing the methodologies applied in this field. Likewise, the number identified by Nickerson (8), who identified 40 studies, was exceeded.

The optimization of production management has been pursued across various economic, political, military, and other sectors, as evidenced by the different countries identified and analyzed in this study. Regarding operations management, optimal results are observed in Italy, according to Cosmi et al. (26) in their study titled "Scheduling for last-mile meal-delivery processes". They increased production process efficiency in the restaurant by between 80% and 99% through the application of process scheduling. Furthermore, significant results were achieved in Australia by applying statistical process control or SPC, according to Jayasekara et al. (22) in their study "Mapping pre-consumer food waste in quick service restaurants on a university campus: Two Australian case studies". They aimed to analyze weight variations in waste processes of Australian university restaurants, where they identified that an excess of 20% of food waste was generated due to the inadequate weighing of food supplies in the food production process in the restaurants.

Methods related to Lean Manufacturing may demonstrate progressive development of the process improvement in production management in the restaurant sector, as evidenced in Taiwan by Wang et al. (27). In their study titled "Service design blueprint approach incorporating TRIZ and service QFD for a meal ordering system: A case study", they applied the theory of inventive problem solving (TRIZ) and quality function deployment (QFD) methodologies. They aimed to improve food production flexibility to meet requirements timely, achieve performance improvement, and increase competitiveness in service innovation. They succeeded in increasing the number of diners by 19%, revenues by 16%, and even customer satisfaction by 50%. In addition, in Peru, Onaga et al. (34) implemented Lean Service in their study titled "Service Management Model Based on Lean Service and Systematic Layout Planning for the Improvement of Customer Satisfaction in an SME in the Restaurant Sector in Peru", where they applied the Lean Manufacturing tools: 5S, SMED and standardization. They achieved a 9.84% reduction in customer service time and subsequently increased satisfaction by 16%.

Finally, the implementation of process automation is highlighted, integrating robotics and the use of the Internet of Things for optimizing production management. Regarding the Internet of Things, Aytaç and Korçak (25) conducted a study in Turkey titled "IoT based intelligence for proactive waste management in Quick Service Restaurants". After implementing sensors in restaurant production processes, they identified and reduced waste by 10%. As for process automation using robotics, in India, Derossi et al. (23), through their study titled "Avenues for non-conventional robotics technology applications in the food industry", maximized efficiency by 80% in all production processes and reduced labor costs by between 30% and 70%. They also increased the number of customers between 6% and 10% in the restaurants. Moreover, in the United States, Wu et al. (37) applied robotic automation in the production processes of restaurants for their study titled "Robotic involvement in the service encounter: a value-centric experience framework and empirical validation". They determined and validated that the implementation of robotics positively impacts customers as well as reduces production costs.

Conclusions

After the systematic literature review, improvement methodologies proposed and applied to optimize production management across various dimensions such as productivity enhancement, quality and process control, waste reduction, process automation, and sustainability were identified. The various improvements include a reduction in production costs by at least 30%, a reduction in waste by 10%, an increase in profitability by at least 30%, a 50% rise in customer satisfaction, and a minimum process efficiency of 80%. After analyzing the frequency of implementation for the methodologies in the reviewed studies, it is observed that 41% applied operations management methodologies and 37% applied the Lean Manufacturing methodology. Various challenges must be considered for the proper application of methodologies, as they require diverse knowledge, and the implementation of paradigm shifts among workers to maximize performance during methodology application. Additionally, the criterion of reducing production

doi: 10.25100/iyc.v26i1.13881

costs and increasing profitability always goes hand in hand in every process improvement project, which is why articles analyzing the impact generated by the application of these methodologies were identified. Subsequently, methodologies supported by robotics and software programming have been identified. It is worth emphasizing the multidisciplinary need in improvement projects for innovation and result optimization, as well as for generating research background aligned with industry 4.0. Finally, the application of improvement methodologies in accordance with sustainability goals is highlighted. It should be emphasized that improvement does not only involve optimizing productivity and reducing costs, but also adequately meeting sustainable development goals for comprehensive development across industry, society, and the environment.

References

(1) Wiener D. Three ways Covid changed the restaurant industry. CNN. 2023 Aug 14. Available in: https://www.cnn.com/2023/08/13/business/covid-restaurant-industry/index.html

(2) Wallace, A. 'It comes up on you fast:' Scorching heat is crushing American businesses. CNN. 2023 Jul 23. Available in: https://www.cnn.com/2023/07/23/economy/extreme-heat-economic-impact/index.html

(3) Cooban, A. Oil and food prices are rising, and so are wages. Inflation isn't beaten yet. CNN. 2023 Aug 8. Available in: https://www.cnn.com/2023/08/08/economy/global-oil-food-prices-inflation/index.html

(4) Alcala, C. Ventas en los restaurantes caen hasta en un 40%. La República.pe. 2023 Oct 25. Available in: https://larepublica.pe/economia/2023/10/24/ventas-en-los-restaurantes-caen-hasta-en-un-40-mef-alex-contreras-cevicherias-recesion-economica-890088

(5) Redacción Gestión. Economía peruana sigue débil: creció solo 0.31% en abril por caída de seis sectores. Gestión. 2023 jun 15. Available in: https://gestion.pe/economia/economia-peruana-crece-a-ritmo-debil-con-031-en-abril-por-caida-de-seis-sectores-pbi-producto-bruto-interno-produccion-nacional-inei-construccion-pesca-manufactura-agropecuario-noticia/

(6) Espinosa Cruz Y, Castro Zamora CI, López Paz CR, Arencibia Jorge R. Adopción de tecnologías de gestión de procesos de negocio: una revisión sistemática. Ingeniare. Revista chilena de ingeniería. 2020 Mar;28(1):41-55. Available in: http://dx.doi.org/10.4067/S0718-33052020000100041

(7) Ogunwolu FO, & Odeyinka OF. A Review of Lean Manufacturing, Six Sigma and Lean Six Sigma. 2021; 22(1):77-90. Available in:https://ir.unilag.edu.ng/handle/123456789/10305

(8) Nickerson W. Business process improvement methodologies: common factors and their respective efficacies [Doctoral thesis in Business Administration] England: University of Gloucestershire; 2014. Available in: https://eprints.glos.ac.uk/id/eprint/2068

(9) Días CD. Análisis comparativo de metodologías y sus herramientas para el mejoramiento de procesos [Bachelor's thesis in business engineering] Quito: Escuela Politécnica Nacional; 2024. Available in: http://bibdigital.epn.edu.ec/handle/15000/25290

(10) Fariñas FA. Gestión en restaurantes, basada en los prerrequisitos del sistema APPCC (Restaurant Management, Based on The Prerequisites of The HACCP System). Turismo y Sociedad. 2022 Jan; 30: 71-92. Available in: https://ssrn.com/abstract=4011163.

(11) Carrera C, Manobanda W, Castro D, Vallejo H. Mejoramiento continuo de procesos de calidad. Ediciones Grupo Compás. 2019; 18: p.8080.

(12) Gutiérrez, H. Calidad y productividad. 4th ed. Mexico: McGraw-Hill / Interamericana Editores, s.a. de c.v.; 2014.

(13) Escalante VE. Seis-Sigma: Metodología y técnicas. 2nd ed. Mexico: Limusa; 2013.

(14) Chase R, Jacobs R, Aquilano N. ADMINISTRACIÓN DE OPERACIONES. Producción y cadena de suministros. 13th ed. Mexico: McGraw-Hill / Interamericana Editores, s.a. de c.v.; 2009.

doi: 10.25100/iyc.v26i1.13881

(15) Gaither N, Frazier G. Administración De Producción Y Operaciones. 4.a ed. Cengage Learning Editores S.A. de C.V.; 2000.

(16) Ohno T. El Sistema de Producción Toyota: Mas allá de la producción a gran escala. Routledge; 1991.

(17) Pico MY, Zambrano LM. Optimización de procesos en compras para mejorar estrategias en restaurantes. Anuario Facultad de Ciencias Económicas y Empresariales. 2023 Dec 12; 14: 310-7. Available in: https://anuarioeco.uo.edu.cu

(18) Calixto LM, Collahua CJ, Figueroa ME (2019). Plan de mejora para la optimización de la gestión en el proceso operacional en el restaurante la botica [Bachelor thesis in Business Administration] Lima: Instituto Peruano de Administración de Empresas Ipae; 2019. Available in: https://hdl.handle.net/20.500.13065/246

(19) Álvarez A. Clasificación de las investigaciones. ULima. 2020.

(20) Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, Alonso-Fernández S. (2021). Declaración PRISMA 2020: una guía actualizada para la publicación de revisiones sistemáticas. Revista española de cardiología. 2020 Sep 1; 74(9): 790-799. Available in: https://doi.org/10.1016/j.recesp.2021.06.016

(21) Rave P, Iván J. Revisión sistemática de literatura en Ingeniería como apoyo a la Consultoría basada en Investigación. Universidad, ciencia y tecnología. 2013; 17(66): 38-48. Available in: https://ve.scielo.org/scielo.php?pid=S1316-48212013000100005&script=sci_abstract

(22) Jayasekara AP, McGrath D, Kravchuk O, Zhou SJ, Morris H. Mapping pre-consumer food waste in quick service restaurants on a university campus: Two Australian case studies. Journal of Cleaner Production. 2024 Jan 1; 434:139978. Available in: https://doi.org/10.1016/j.jclepro.2023.139978

(23) Derossi A, Di Palma E, Moses JA, Santhoshkumar P, Caporizzi R, Severini C. Avenues for non-conventional robotics technology applications in the food industry. Food Research International (Ottawa, Ont.). 2023 Jul 13; 173(113265): 113265. Available in: https://doi.org/10.1016/j.foodres.2023.113265

(24) Beheshti S, Heydari J, Sazvar Z. Food waste recycling closed loop supply chain optimization through renting waste recycling facilities. Sustainable Cities and Society. 2022 Mar 1; 78: 103644. Available in: https://doi.org/10.1016/j.scs.2021.103644

(25) Aytaç K, Korçak Ö. IoT based intelligence for proactive waste management in Quick Service Restaurants. Journal of Cleaner Production. 2021 Feb 15; 284:125401. Available in: https://doi.org/10.1016/j.jclepro.2020.125401

(26) Cosmi M, Nicosia G, Pacifici A. Scheduling for last-mile meal-delivery processes. IFAC-PapersOnLine. 2019 Jan 1; 52(13): 511-6. Available in: https://doi.org/10.1016/j.ifacol.2019.11.117

(27) Wang YH, Lee CH, Trappey AJ. Service design blueprint approach incorporating TRIZ and service QFD for a meal ordering system: A case study. Computers & Industrial Engineering. 2017 May 1; 107: 388-400. Available in: https://doi.org/10.1016/j.cie.2017.01.013

(28) Chiu CN. Can human capital be transferred efficiently? Evidence from the F&B companies. Journal of Organizational Change Management. 2023 Nov 24; 36(6): 825-47. Available in: https://doi.org/10.1108/JOCM-06-2022-0187

(29) Kosacheva EM, Nurgalieva AR. Prospects for the Development of the Cooperatisve Movement in Public Catering Enterprises of Almetyevsky District of the Republic of Tatarstan. InChallenges of the Modern Economy: Digital Technologies, Problems, and Focus Areas of the Sustainable Development of Country and Regions 2023 Jul 4 (pp. 577-581). Cham: Springer International Publishing. Available in: https://doi.org/10.1007/978-3-031-29364-1_112

doi: 10.25100/iyc.v26i1.13881

(30) Linnes C, Weinland JT, Ronzoni G, Lema J, Agrusa J. The local food supply, willingness to pay and the sustainability of an island destination. Journal of Hospitality and Tourism Insights. 2022 Aug 8;6(3): 1328-56. Available in: https://doi.org/10.1108/jhti-01-2022-0031

(31) Ashton M, Tuomi A, Backman P. Ghost production: applying the servuction model to establish a typology and propose a research agenda for on-demand restaurant food delivery. Journal of Hospitality and Tourism Insights. 2022 Sep 22; 6(5):1730-54. Available in: https://doi.org/10.1108/JHTI-04-2022-0134

(32) Jia K, He Z, Zhang Y. An Application Study of Stochastic Service Systems Based on Operations Search. In2022 3rd International Conference on Computer Science and Management Technology (ICCSMT) 2022 Nov 18 (pp. 44-47). IEEE. Available in: https://doi.org/10.1109/iccsmt58129.2022.00016

(33) Malquín DM, Espinosa GE, García AO. Costos de producción en el restaurante de la ciudad de Puyo-Ecuador. Universidad y Sociedad. 2022 Dec 1;14(S6):37-46. Available in: https://rus.ucf.edu.cu/index.php/rus/article/view/3431

(34) Onaga A, De La Rosa-Reyna N, Collao-Diaz M, Ruiz-Ruiz M. Service Management Model Based on Lean Service and Systematic Layout Planning for the Improvement of Customer Satisfaction in an SME in the Restaurant Sector in Peru. InProceedings of the 8th International Conference on Industrial and Business Engineering 2022 Sep 27 (pp. 242-249). Available in: https://doi.org/10.1145/3568834.3568853

(35) Takeuchi K, Kado H, Inada S. Improving the efficiency of operations including support workers using discrete event simulation: A case study of a restaurant. Journal of the Japan Society of Industrial Management. 2022; 72(4): 212-221. Available in: https://doi.org/10.11221/jima.72.212

(36) Mohd YL, Wan WJ, Maulan S. Perceived quality association as determinant to re-patronise Shariah-compliant brand restaurants. Journal of Islamic Marketing. 2021 Feb 23;12(2):302-15. Available in: https://doi.org/10.1108/jima-10-2018-0190

(37) Wu L, Fan A, Yang Y, He Z. Robotic involvement in the service encounter: a value-centric experience framework and empirical validation. Journal of Service Management. 2021 Oct 11;32(5):783-812. Available in: https://doi.org/10.1108/josm-12-2020-0448

(38) Alva, I., Rojas, J. and Raymundo, C., 2020. Improving processes through the use of the 5s methodology and menu engineering to reduce production costs of a mse in the hospitality sector in the department of ancash. In Human Interaction and Emerging Technologies: Proceedings of the 1st International Conference on Human Interaction and Emerging Technologies (IHIET 2019), August 22-24, 2019, Nice, France (pp. 818-824). Springer International Publishing. Available in: https://doi.org/10.1007/978-3-030-25629-6_128

(39) Marx NJ, Du GE, Fisher HJ, Viljoen AT. The South African quick service restaurant industry and the wasteful company it keeps. 2020; 15(1): 57-68. Available in: https://doi.org/10.2495/sdp-v15-n1-57-68

(40) Morales-Contreras MF, Suárez-Barraza MF, Leporati M. Identifying Muda in a fast food service process in Spain. International Journal of Quality and Service Sciences. 2020 Jun 12;12(2):201-26. Available in: https://doi.org/10.1108/ijqss-10-2019-0116

(41) Orynycz O, Tucki K, Prystasz M. Implementation of lean management as a tool for decrease of energy consumption and CO2 emissions in the fast food restaurant. Energies. 2020 Mar 5;13(5):1184. Available in: https://doi.org/10.3390/en13051184

(42) Singhal M, Hegde SV, Mohan R. Smart industrial supply chain management and prediction system. In2019 Women Institute of Technology Conference on Electrical and Computer Engineering (WITCON ECE) 2019 Nov 22 (pp. 91-94). IEEE. Available in: https://doi.org/10.1109/witconece48374.2019.9092920

doi: 10.25100/iyc.v26i1.13881

(43) Shimmura T, Oura S, Arai K, Fujii N, Nonaka T, Takenaka T, Tanizaki T. Multiproduct traditional Japanese cuisine restaurant improves labor productivity by changing cooking processes according to service product characteristics. International Journal of Automation Technology. 2018 Jul 5;12(4):449-58. Available in: https://doi.org/10.20965/ijat.2018.p0449

(44) Shimmura T, Fujii N, Takenaka T, Oura S, Nonaka, T. A study on reducing kitchen work hours in Japanese restaurants by rearranging cooking tasks. Journal of the Japan Society of Industrial Management. 2017; 67(4): 303-313. Available in: https://www.jstage.jst.go.jp/article/jima/67/4/67_303/_article/-char/ja/

(45) Shimmura, T., Akamatsu, M., Takenaka, T., & Oura, S. A study on process improvement in restaurants using cooking behavior analysis and customer order information (case study). Journal of the Japan Society of Industrial Management. 2011; 62(1): 12-20.

(46) Povorozniuk I, Dzhoha O, Neshchadym L, Kyryliuk I, Tymchuk S, Blahopoluchna A. The Influence of Globalization Processes on the Development of the Restaurant Business of Ukraine. Management Theory and Studies for Rural Business and Infrastructure Development. 2023 Apr 1;45(2):183-92. Available in: https://doi.org/10.15544/mts.2023.18

(47) Lévesque J, Perreault V, Bazinet L, Mikhaylin S. Food waste in a hotel foodservice: A case study identifying hot spots and strategies to prioritize towards a reduction. International Journal of Gastronomy and Food Science. 2022 Dec 1;30:100600. Available in: https://doi.org/10.1016/j.ijgfs.2022.100600

(48) Kalaitan T, Cherkasova N, Druhov O, Yaroshevych N. Features and scope of application of ABC analysis in the system of controlling enterprises of the restaurant industry. Financial and credit activity problems of theory and practice. 2021; 4(31): 196-207. Available in: https://doi.org/10.18371/fcaptp.v4i31.190856

(49) Malyarets LM, Iastremska OM, Herashchenko IM, Iastremska OO, Babenko VO. Optimization of indicators for management of enterprise: Finance, production, marketing, personnel. Estudios de economía aplicada. 2021; 38(4). Available in: https://doi.org/10.25115/eea.v38i4.4028

(50) Takacs B, Borrion A. The use of life cycle-based approaches in the food service sector to improve sustainability: a systematic review. Sustainability. 2020 Apr 25;12(9):3504. Available in: https://doi.org/10.3390/su12093504

doi: 10.25100/iyc.v26i1.13881