



Impact of legal standards on logistics management in the context of sustainable manufacturing

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Abstract

A documentary review was carried out on the production and publication of research papers related to the study of the variables Legal Standards and Sustainable Manufacturing. The purpose of the bibliometric analysis proposed in this document was to know the main characteristics of the volume of publications registered in the Scopus database during the period 2018-2022, achieving the identification of 107 publications. The information *provided* by this platform was organized through graphs and figures categorizing the information by Year of Publication, Country of Origin, Area of Knowledge and Type of Publication. Once these

characteristics have been described, the position of different authors towards the proposed theme is referenced through a qualitative analysis. Among the main findings made through this research, it is found that the United Kingdom, with 19 publications, was the country with the highest scientific production registered in the name of authors affiliated with institutions in that country. The Area of Knowledge that made the greatest contribution to the construction of bibliographic material referring to Legal Standards and Sustainable Manufacturing was Environmental Science with 63 published documents, and the Type of Publication most used during the period indicated above was the Journal Article with 74 documents of the total scientific production.

Keywords

legal standards, sustainable manufacturing, logistics management.

1. Introduction

The business sector is made up of multiple companies of a private and corporate nature that contribute to the national economy of a country from the execution of different types of activities among which we find those belonging to the Manufacturing sector. According to CEUPE Magazine a manufacturing company can be defined as:

An organization that is dedicated to the transformation of raw materials into finished or semi-finished products. To produce these goods, labor, machinery and automatic systems are used. Manufacturing companies are a type of industrial enterprise, since their tasks consist of receiving raw materials from extractive companies and converting them into finished products.(CEUPE Magazine , 2023)

Although in the past the fundamental thing in this type of companies was to produce quality products,at present, due to the demands of the market and the regulations established by each government following the provisions of important documents resulting from International Agreements or Treaties, it has been achieved that companies are in the constant search to implement strategies that allow them to continue with the manufacture of quality products guaranteeing the sustainability. In the words of Luis Fernando Silva:

Companies are no strangers to the environmental, social and economic awareness promoted for the dissemination, understanding and scope of the concept of sustainable development and the 2030 Agenda. All companies, regardless of their industry, are increasingly under increasing pressure so that their productive and logistics processes and operations generate fewer negative impacts and more favorable environments in society and, at the same time, remain profitable: that is, to seek the path of sustainable development.(Matthew, s.f.)

Hence, the emergence of the term Sustainable Manufacturing which refers to the development of products from materials from renewable resources that contribute to the conservation of the environment, that is, thanks to the

modification in the production logistics of a manufacturing company. Although we consider that the Legal Norms have considerably influenced these changes, it is precisely with this research article that we seek to verify this assumption through the description of the main characteristics of the set of publications attached to the Scopus database and that are directly related to our variables, as well as the description of the position of certain authors affiliated with various institutions during the period between 2018 and 2022.

2. General objective

Analyze from a bibliometric and bibliographic perspective, the elaboration of works on the variables Legal Standards and Sustainable Manufacturing in the Context of Sustainable Manufacturing during the period 2018-2022.

3. Methodology

This article is carried out through a mixed orientation research that combines the quantitative and qualitative method.

On the one hand, a quantitative analysis of the information selected in Scopus is carried out under a bibliometric approach of the scientific production corresponding to the study of the s Legal Standards and Sustainable Manufacturing.

On the other hand, examples of some research works published in the area of study indicated above are analyzed from a qualitative perspective, starting from a bibliographic approach that allows describing the position of different authors against the proposed topic.

It is important to note that the entire search was performed through Scopus, managing to establish the parameters referenced in *Figure 1*.

3.1 Methodological design

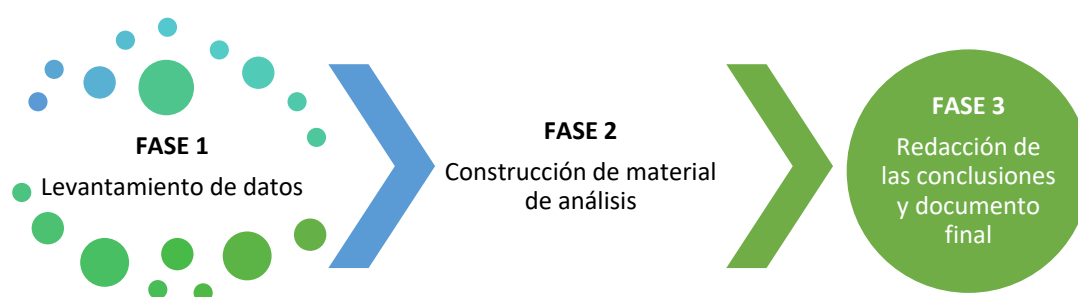


Figure 1. Methodological design
Source: Authors.

3.1.1 Phase 1: Data collection

Data collection was carried out from the Search tool on the Scopus website, where 107 publications were obtained from the choice of the following filters:

impact AND of AND legal AND regulations AND on AND logistics AND management AND in AND the AND context AND of AND sustainable AND manufacturing AND (LIMIT-TO (PUBYEAR , 2022) OR LIMIT-TO (PUBYEAR , 2021) OR LIMIT-TO (PUBYEAR , 2020) OR LIMIT-TO (PUBYEAR , 2019) OR LIMIT-TO (PUBYEAR , 2018)) AND (LIMIT-TO (EXACTKEYWORD , "Sustainability") OR LIMIT-TO (EXACTKEYWORD , "Laws And Legislation") OR LIMIT-TO (EXACTKEYWORD , "Manufacturing") OR LIMIT-TO (EXACTKEYWORD , "Logistics"))

1. Published documents whose study variables are related to the study of Legal Standards and Sustainable Manufacturing.
2. Limited to the years 2018-2022.
3. No limit of countries.
4. Limited to the keywords "Manufacturing, Law and Legislation, Sustainability and Logistics".
5. Regardless of type of publication.

3.1.2 Phase 2: Construction of analysis material

1. The information collected in Scopus during the previous phase is organized and subsequently classified by graphs, figures and tables as follows:
2. Co-occurrence of words.
3. Year of publication.
4. Country of origin of the publication.
5. Area of knowledge.
6. Type of publication.

3.1.3 Phase 3: Drafting of conclusions and outcome document

In this phase, we proceed with the analysis of the results previously yielded resulting in the determination of conclusions and, consequently, the obtaining of the final document.

4. Results

4.1 Co-occurrence of words

Figure 2 shows the co-occurrence of keywords found in the publications identified in the Scopus database.

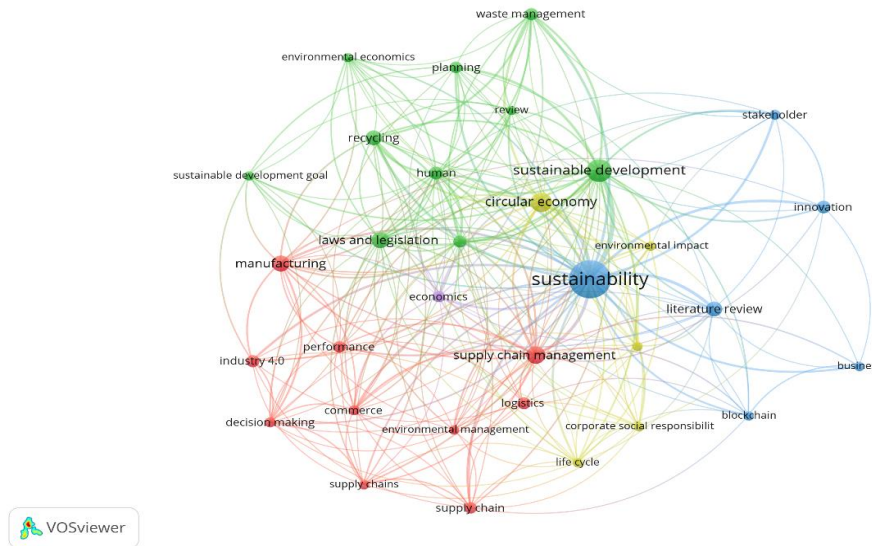


Figure 2. Co-occurrence of words

Source: Own elaboration (2023); based on data exported from Scopus.

The data in Figure 2, exported from Scopus, shows us our variables and their relationship with other terms which we will explain below.

Sustainability has become over time one of the global objectives, since it aims to influence companies by achieving a lower production of polluting emissions and waste as a result of their activities. In the case of Sustainable Manufacturing, it means that companies dedicated to the production of products do so from a better choice of raw materials, especially considering prioritizing the use of renewable resources that guarantee permanent access to them and consequently to the final products.

4.2 Distribution of scientific production by year of publication

Figure 3 shows how scientific production is distributed according to the year of publication.

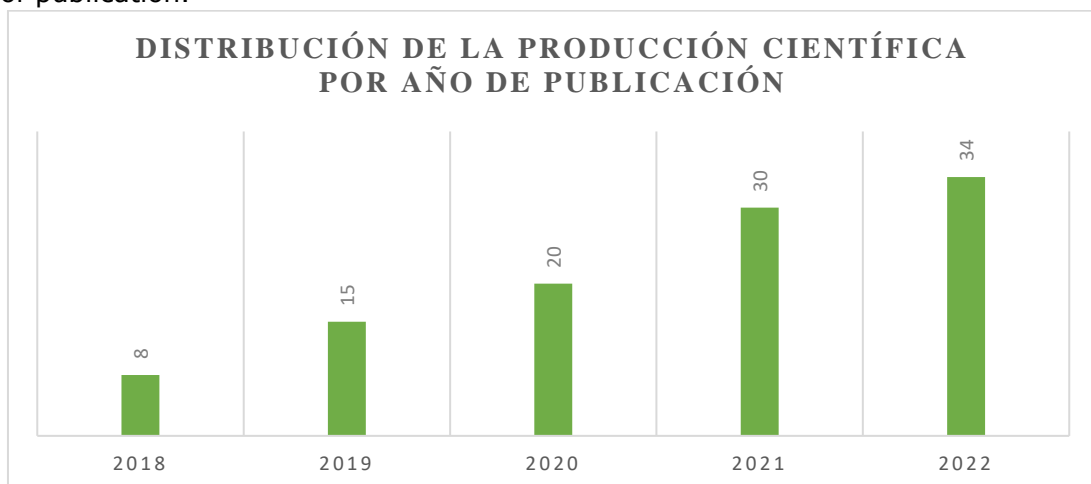


Figure 3. Distribution of scientific production by year of publication.

Source: Own elaboration (2023); based on data exported from Scopus

In figure 3 we find the scientific production concerning the variables Legal Standards and Sustainable Manufacturing during the period between 2018 and 2022 which resulted in the publication of 107 documents, in the Scopus database, containing the words key. Likewise, it is evident that some changes were experienced throughout the period. We started with the year 2018 with 8 documents, a figure that increases considerably during all the following years reaching the highest figure in 2022 with the publication of 34 documents.

From the year 2019, the article "Green supply chain management practices in manufacturing SMEs: key drivers and organizational performance" was highlighted, (Pornchaiwiseskul & Ueasangkomsate, 2019) which investigated what were the external factors that drove companies to implement "Green Supply Chain Management Practices (GSCM Practices)" as well as the relationship between these practices and the "organizational performance" of these small and medium-sized enterprises belonging to the food industry. Through questionnaires they managed to prove that "regulations, customer pressure, socio-cultural responsibility and competitive pressure have a significant positive effect on the implementation of GSCM practices for Thai SME food manufacturers" (Pornchaiwiseskul & Ueasangkomsate, 2019) so it could be concluded that " Thai SMEs in food manufacturing could derive significantly higher organizational performance from GSCM's practices in four different dimensions, including environmental, economic, intangible and operational performance." (Pornchaiwiseskul & Ueasangkomsate, 2019)

4.3 Distribution of scientific production by country of origin

Figure 4 shows how scientific production is distributed according to the nationality of the authors.

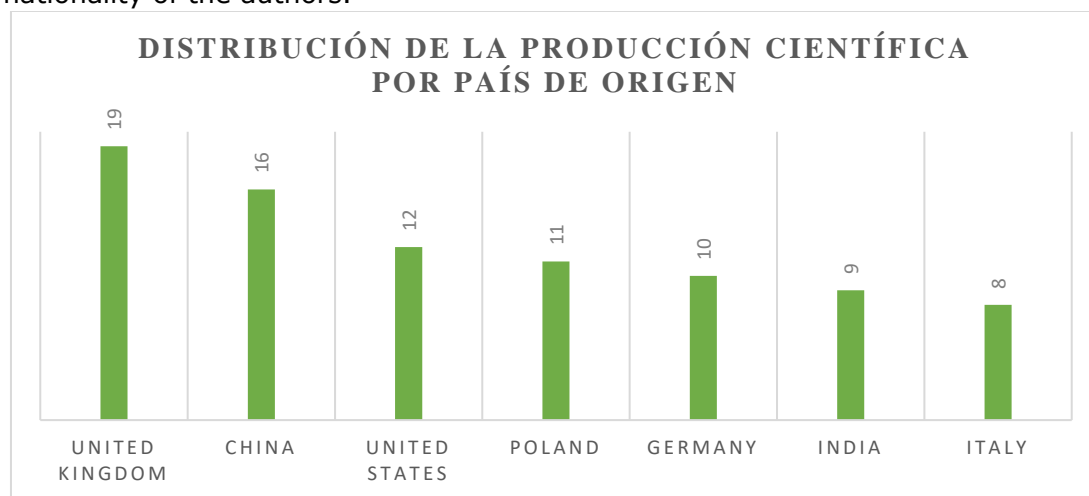


Figure 4. Distribution of scientific production by country of origin.

Source: Own elaboration (2023); based on data provided by Scopus.

In the study of the Legal Standards and Sustainable Manufacturing United Kingdom the list of documents published with a total of 19 records in the Scopus

database during the period of the years 2018-2022, followed by China and the United States with 16 and 12 documents respectively.

The article titled "Sustainable Performance in Manufacturing Operations: The Cumulative vs. Trade-off Approach" (Henao & Sarache, 2022) argues that "improving sustainability has become a priority for manufacturing companies due to increasing stakeholder pressures" (Henao & Sarache, 2022) although in most cases it has resulted in failed attempts to interfere in their decision-making process. This is why companies "have adopted the triple bottom line approach to measure and manage sustainable performance, but many have doubts about how to address each pillar of sustainability and achieve a balance between them" so this research seeks to solve this problem from the presentation of two models that include several relevant dimensions for any manufacturing company yielding results " (Henao & Sarache, 2022) useful for managers and professionals to implement and pursue sustainable manufacturing models in their organizations."(Henao & Sarache, 2022)

At this point, it is important to note that the preparation of scientific publications in many cases is carried out from collaborations that may involve private and/or public institutions from one or more countries. Therefore, the same publication can be linked to one or more authors with different nationalities and thus to more than one country simultaneously, being part of the total number of articles or publications of each of them in the final sum. Next, in *Figure 5*, you will see in greater detail the flow of collaborative work carried out by several countries.

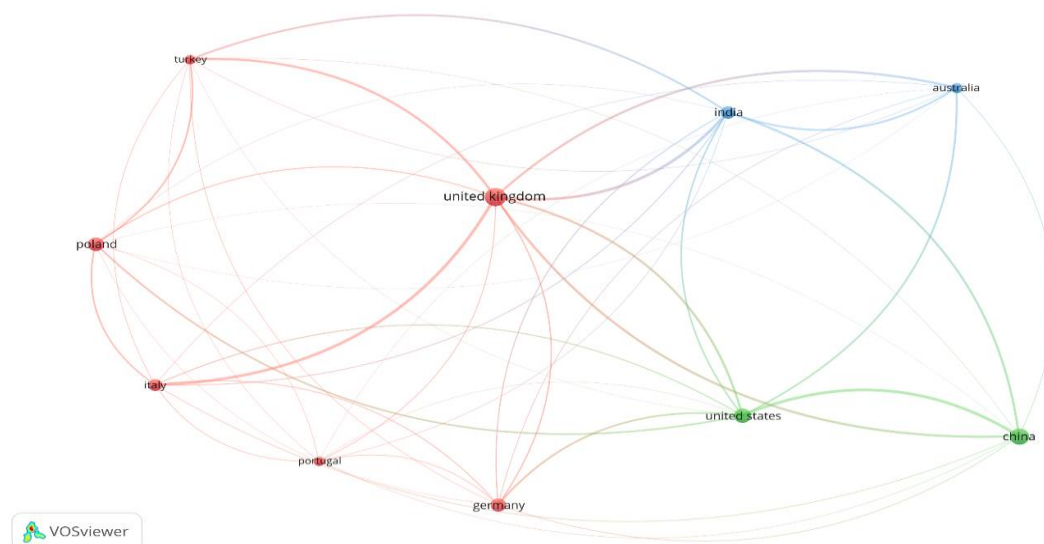


Figure 5. Co-citations between countries.

Source: Own elaboration (2023); based on data provided by Scopus.

Figure 5 shows the grouping of research according to the collaboration between authors belonging to various international institutions. There is evidence of outstanding participation among authors affiliated with institutions from countries such as the United Kingdom, the United States, China, Italy, Portugal, Germany, to name a few.

4.4 Distribution of scientific production by area of knowledge

Figure 6 shows the distribution of the elaboration of scientific publications from the area of knowledge through which the different research methodologies are implemented.

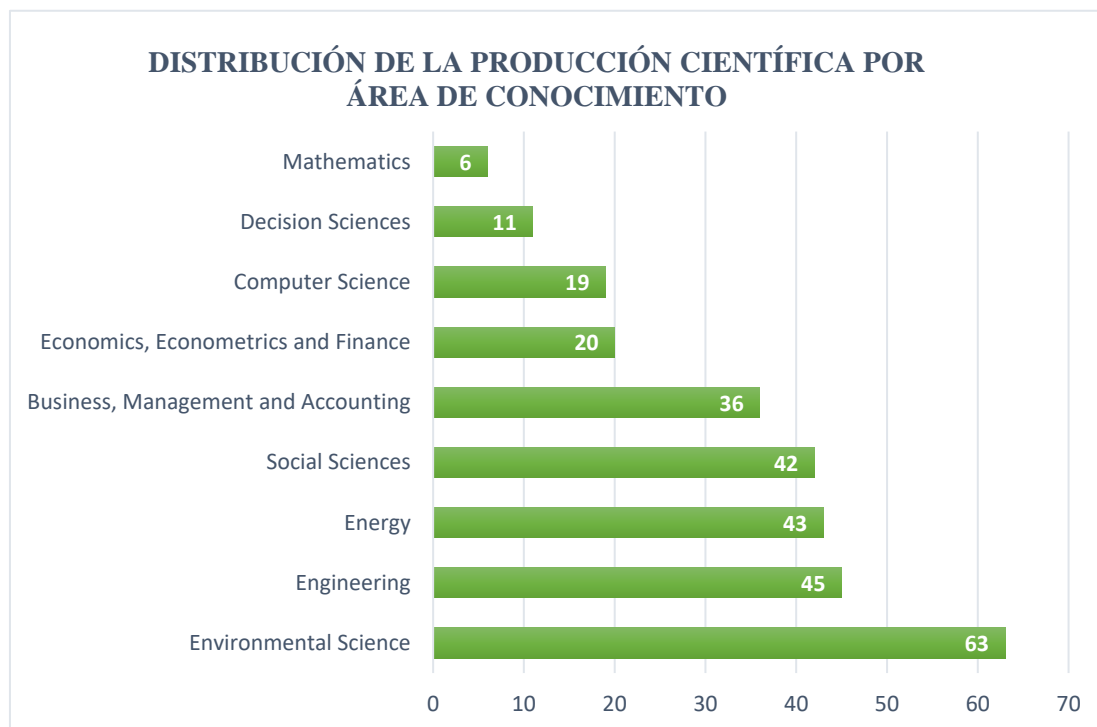


Figure 6. Distribution of scientific production by area of knowledge.
 Source: Own elaboration (2023); based on data provided by Scopus.

Due to the nature of our variables and their importance in reducing emissions resulting from manufacturing processes, it is not surprising that most of the publications found in the Scopus database are made from environmental science, occupying the main position in the publication of documents. Other areas such as engineering as well as energy have contributed to the study of these variables, publishing 45 and 43 documents respectively.

As we can see in *figure 6*, the variables object of this study are relevant in various areas of knowledge, since they positively impact the conservation of our environment through the good use of renewable sources for the elaboration of products that mainly satisfy human needs.

4.5 Type of publication

In the following graph, you will observe the distribution of the bibliographic finding according to the type of publication made by each of the authors found in Scopus.



Figure 7. Type of publication.

Source: Own elaboration (2023); based on data provided by Scopus.

Figure 7 clearly shows that the predominant type of publication in the study of Legal Standards and Sustainable Manufacturing was the journal article with a total of 74 documents, followed in second and third place by reviews with 25 publications and conference proceedings with 4 titles.

One of the most prominent reviews was the one entitled "Current situation and key considerations of green furniture manufacturing in China: a review" in which green furniture manufacturing in China is referred to by considering the "environmental impact and resource efficiency". (Ma, Wu, Xiong, YingyingYuan, & Zhang, 2020) (Ma, Wu, Xiong, YingyingYuan, & Zhang, 2020) Despite its benefits, they emphasize that for the full implementation of this alternative it is necessary to thoroughly analyze "the current situation, technologies and development strategies of China's green furniture manufacturing have not been thoroughly analyzed and a complete system of green manufacturing technology of the furniture industry is missing" managing to establish that "(Ma, Wu, Xiong, YingyingYuan, & Zhang, 2020) although China has determined that implementing green manufacturing is the only sensible way for the development of its furniture industry, many aspects are missing, such as public awareness, manufacturing technology and legal regulations." (Ma, Wu, Xiong, YingyingYuan, & Zhang, 2020)

5. Conclusions

After the bibliometric analysis carried out in the present research work, it was established that the United Kingdom was the country with the highest number of records published for the variables Legal Standards and Sustainable Manufacturing with a total of 19 publications, in the Scopus database during the period 2018-2022 and that the area of knowledge with the greatest contribution was environmental science with 63 texts.

Taking into account all the above, we are sure that there is a great interest by researchers worldwide to know the causes that have facilitated the changes at

the business level that have positively influenced the conservation of the environment and the resources that compose it. However, there were few documents found that were specifically related to the manufacturing sector, so we consider that general research is still being carried out that, although they can be adapted to any activity of the business sector, they leave aside characteristics of the manufacturing company, which directly influence the success of the implementation of sustainable strategies.

To itself, we find that most documents that refer to logistics refer mostly to the use of new types of transport of goods that meet the requirements established for the achievement of a global Sustainable Development and not to the best selection of raw materials for the subsequent elaboration of products that satisfy various types of needs. That is, there is actually very little literature related to our variables.

Despite this, with the little found it is possible to determine that Legal Standards greatly impact Logistics Management in the Context of Sustainable Manufacturing, especially in Manufacturing countries such as China in which it has been achieved that companies concentrate their efforts on choosing ecological raw materials that are also transformed through friendly processes achieving in the same way products with good quality without affecting the profitability of the production. For all of the above and with the sole objective of continuing to raise awareness of the importance of guaranteeing access to this type of information in a transparent manner by anyone, we hope to promote with this article the participation of scientific communities in the study of these variables from any scientific profile and area of knowledge always seeking to provide more alternatives that contribute to the investigation of General interest.

References

- Abdelatty, Y., Eliwa, A., Kostrzewski, M., & Nader, M. (2022). Analysis of Modern vs. Conventional Development Technologies in Transportation—The Case Study of a Last-Mile Delivery Process. *Sensors*.
- Adeniyi, O., Alaba, O. O., Ogundimu, O. E., & Ojo, L. D. (2022). Rethinking Green Supply Chain Management Practices Impact on Company Performance: A Close-Up Insight. *Sustainability (Switzerland)*.
- Akbari, M., & Do, T. N. (2021). A systematic review of machine learning in logistics and supply chain management: current trends and future directions. *Benchmarking*, 2977-3005.
- Andronie, M., Dijmărescu, I., Lăzăroiu, G., Ștefănescu, R., & Uță, C. (2021). Sustainable, smart, and sensing technologies for cyber-physical manufacturing systems: A systematic literature review. *Sustainability (Switzerland)*.
- Buła, P., Brzozowska, M., Kolasińska-Morawska, K., Morawski, P., & Sułkowski, Ł. (2022). Smart Logistics—Sustainable Technological Innovations in Customer Service at the Last-Mile Stage: The Polish Perspective. *Energies*.
- CEUPE Magazine . (2023). CEUPE Magazine. Retrieved from CEUPE Magazine : <https://www.ceupe.com/blog/empresa->

- manufacturer.html#:~:text=Una%20empresa%20manufacturer%20es%20una,obra%2C%20maquinarias%20y%20sistemas%20autom%C3%A1ticos.
- Eimontaite, I., Hyde, R., Leesakul, N., Oostveen, A.-M., & Wilson, M. L. (2022). Workplace 4.0: Exploring the Implications of Technology Adoption in Digital Manufacturing on a Sustainable Workforce. *Sustainability (Switzerland)*.
- Ferraris, A., Popkova, E. G., Rezaei, M., & Sergi, B. S. (2021). Digitalisation in transport and logistics: A roadmap for entrepreneurship in Russia. *International Journal of Technology Management*, 7-28.
- Gold, N. O., Ma, Y., & Taib, F. M. (2022). Firm-Level Attributes, Industry-Specific Factors, Stakeholder Pressure, and Country-Level Attributes: Global Evidence of What Inspires Corporate Sustainability Practices and Performance. *Sustainability (Switzerland)*.
- Govindan, K., Hossain, N. U., & Sakib, N. (2022). Assessing the performance of unmanned aerial vehicle for logistics and transportation leveraging the Bayesian network approach. *Expert Systems with Applications*.
- Guo, L., Hou, Y., & Sun, W. (2019). Analyzing and forecasting energy consumption in China's manufacturing industry and its subindustries. *Sustainability (Switzerland)*.
- Hartmann, J., Inkpen, A., & Ramaswamy, K. (2022). An FsQCA exploration of multiple paths to ecological innovation adoption in European transportation. *Journal of World Business*.
- Henao, R., & Sarache, W. (2022). Sustainable performance in manufacturing operations: The cumulative approach vs. trade-offs approach. *International Journal of Production Economics*.
- Kač, S. M., Klimecka-Tatar, D., Lazar, S., Obrecht, M., Potočan, V., & Yanginlar, G. (2022). Logistics Aspect of Organizational Culture and Normative Commitment in Electric Energy Supply Chain. *Management Systems in Production Engineering*, 319-330.
- Labucay, I. (2022). Is There a Smart Sustainability Transition in Manufacturing? Tracking Externalities in Machine Tools over Three Decades. *Sustainability (Switzerland)*.
- Ma, Q., Wu, Z., Xiong, X., YingyingYuan, & Zhang, M. (2020). Current situation and key manufacturing considerations of green furniture in China: A review. *Journal of Cleaner Production*.
- Nyangchak, N. (2022). Emerging green industry toward net-zero economy: A systematic review. *Journal of Cleaner Production*.
- Orji, I. J. (2019). Examining barriers to organizational change for sustainability and drivers of sustainable performance in the metal manufacturing industry. *Resources, Conservation and Recycling*, 102-114.
- Pornchaiwiseskul, P., & Ueasangkomsate, P. (2019). Green supply chain management practices in SME manufacturers: Key drivers and organizational performance. *Industrial Engineering and Management Systems*, 116-131.
- Silva Mateus, L. F. (n.d.). Sustainable logistics and manufacturing operations, a new and necessary strategy.