**Research Article**

# Revolutionizing Agro-Food Entrepreneurship Through Technology: A Bibliometric Exploration and Emerging Research Frontiers

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| ARTICLE INFO | ABSTRACT |
|---|---|
| | This paper presents a critical literature review of technological advancements with reference to agro-food entrepreneurial businesses using bibliometric analysis to compile articles from 2010-2024. Using the Scopus database and selecting it by theme, the number of publications annually, their countries, and authors' participation. The analysis revealed the areas of interest, divided by the country's contribution and the most referenced authors in the specified field. By employing VOSviewer study, the co-occurrence of the keywords and the citation connection were demonstrated to decipher the current popular issues and clusters evident from the obtained research works. Moreover, the analysis reveals a rising trend for the technological field of agro-food entrepreneurship activated by latest innovations in agricultural technologies, supply chain management, and sustainability. The bibliometric analysis finds important research topics that are focused on, such as the application of information technologies, the use of innovations to increase efficiency, technology effects on food safety and quality. Furthermore, this study outlines areas for important research and a research agenda to fill these gaps in the future. There are the following directions worth researching further: the application of blockchain in the agro-food supply chains, the use of IoT and AI in smart farming, the impact of technology on small-scale agro-food businessmen in developing countries. Explicitly describing these directions, this research study endeavours to advance the existing discus sion on technology adoption in the agro-food sector and provide meaningful suggestions for creating and implementing technological tools that might increase the effectiveness, sustainability, and competitive advantage of agro-food organizations.<br><br>**Keywords:** technology adoption, agro-food, entrepreneurship, supply chain, innovation |

## 1. INTRODUCTION

Over the course of three centuries in the 18-20th, industrial technology went through development, starting with steam power and mechanical application during Industry 1.0, power and computer application in Industry 2.0 and 3.0 respectively. Today, people are at Industry 4.0 which is the synergy of the ICT and smart production systems. They are all expected to bring significant improvement to the industrial efficiency, productivity, ROI and technology utilization. Thus, industries that do not adopt these technologies can hardly maximize the benefits of Industry 4.0. According to Paul (1996), the information superhighway is a virtually boundless environment for firms to compete on a global basis; Hamill (1997) notes that with internet and ICT convergence, business marketing communication is being transformed. Marketing in globalised world, the role of internet for business growth and value has been acknowledged for long (Feher & Towell, 1997; Hamill, 1997; Paul, 1996). As Ghobakhloo et al., (2011) argued in the current global business environment, all business functions are experiencing a shift in their operation through the adoption of ICT and particularly among the small and medium enterprises (SMEs).

Industry 4.0 extends the integration of ICT where information of tangible products is linked with web based applications and is integrated into the production line. Internet of Things (IoT) which is at the core of Industry 4.0

matters because of its ability to link up production procedures in various industries. IoT expands the internet by involving mobile networks social networks and smart gadgets to provid superior services and applications (Li et al., 2016). IoT is a complex global network infrastructure that links, controls, and optimizes objects by wired, wireless, or a combination of both systems (Zhang et al., 2017). In addition, IoT is capable of creating relationships between people, things and operations in a global network, improving the global competitive advantage (Del Giudice, 2016), and through networking the globe, day to day objects, sensors, and devices as well as generating, exchanging and consuming data with little human interactions (Rose et al., 2015).

That entrepreneurship is one of the major growth booster as it enhances innovation, promotes economic development as well as eradicating poverty (D'Silva, Shaffril, Uli & Samah, 2009). Youth participation in agro-food venture could increase food availability in the market and crop up employment opportunities. Agro-food sector provides extensive entrepreneurial opportunity including industries of food processing, product farming and livestock (D'Silva, Shaffril, Uli, & Samah, 2010). Previous literature carries out extensive analysis on the key factors that may impact the development of agricultural entrepreneurship so too limited information entail the factors that may impact the precipitating factors or attitude towards the Agro-Food entrepreneurship.

Despite the fact that there is considerable evidence showing that digitalization positively impacts operational performance (Davies et al., 2017; Rossini et al., 2022; Amborashang & Seman, 2022), the current discussion also underlines digitalisation's ability to improve social and environmental sustainability within organizations further (Ejsmont et al., 2020; Ghobakhloo, 2020; Reis et This new role is important as there is evident need to address key environmental standards that have been exceeded to contain the impact humans have on our environment (United Nations, 2021). While social and environmental sustainability is most often led by institutions (Amis et al., 2018), organizations, particularly multinational corporations are key agents of change on the pursuit of a fairer and more sustainable world (Heredia et al., 2023; Mustapha et al., 2023). Global players are important in that they inspire other firms to follow their example (López et al., 2019); this is because these giant organisations have global operations (Heredia et al., 2023).

New forms of digital technologies play an important role in establishing affordable, reliable, sustained and modern infrastructures; in advancing a sustainable industrial revolution for developing nations; and in increasing innovation, especially in the developing world (United Nations, 2021). Despite the increased focus on digital technologies and their application, much of the discussion is still rather conceptual and relatively little concrete data exists, especially for emerging economies of developing countries (Tortorella & Fettermann, 2018; Tortorella et al., 2019; Amentae & Gebresenbet, 2021; Bahn et al., 2021). Almost all previous research has primarily focused on developed nations only (Jackson et al., 2011; Rossini et al., 2022a, Rossini et al., 2022b).

In this paper, we use bibliometric and network analysis in order to provide a literature review of technology adoption in the context of Agro-Food Entrepreneurship. It is relatively impartial to determine the most prolific authors, their publishing affiliations, and frequently employed terms that relate the findings with other works. In contrast, network analysis is a systematic way of categorizing the research areas, defining the research pathways and exploring the potentials for subsequent research. We adhere to specific procedures for conducting bibliometric analysis (Asthana, 2022; Husain et al., 2023; Luo et al., 2023; Naz et al., 2023; Rusydiana et al., 2023; Zhu et al., 2022) and network analysis by using VOSviewer (Asthana, 2022; Kholidah et al., 2022; Laila et al., 2021; Manosso & Ruiz, 2021).

## 2. SELECTION OF DATA

Therefore, for the current study, we based our analysis on a sample drawn from the Scopus database which contains data on peer-reviewed publications of global scholarly output. For instance, Scopus began offering двн access to powerful quality refereed publications in 1966(Liu et al., 2020) and has information on over 22 800 serial titles from more than 5000 publishers, offering more than 195 million reference records (Ballew, 2009). For instance, as one of the renowned citation databases, Scopus generate a vastpool of journal articles and conference proceedings that enables the evaluation of research impact (Guz, & Rushchitsky, 2009; Jacsó, 2011; Zhu & Liu, 2020).

The first input to a bibliometric analysis of research papers is establishment of the keywords that will be used when selecting the papers. In this study, the following keywords which have been explained in the literature on Advancing Technology Adoption in Agro-Food Entrepreneurship were used. To identify bibliographic documents in

Scopus, the Boolean operator (AND) was used in that each of the following terms in one search technology AND adoption AND Agro-Food AND entrepreneurship. Search filters were applied in order to include only the documents which have been published in 2006-2024.

## 3. METHODOLOGY

In regard to the bibliographic data, we used bibliometric measures; the indicators included: no. of authors, articles, citations, institutions, and countries. The bibliometric analysis is acknowledged as one of the most important procedures of the quantitative and statistical research of the articles and citations concerning the success and impact of literature (Gao et al., 2021; Kokol et al., 2021; Phoong et al., 2022). In recent years, this approach has been increasingly applied in business researches owing to the high efficiency of deciphering and mapping of the process of the formation of scientific and evolutionary knowledge in the established fields. It critically analyzes a high volume of disparate information content to identify subtle patterns (Donthu et al., 2020; Viana-Lora & Nel-lo-Andreu, 2022).

## 4. RESULT AND ANALYSIS

The following section gives the results obtained from the bibliometric analysis techniques used in this study. We start with the findings from citation analysis and proceed to a discussion of co-citation and cross citation by author keywords. The citation analysis includes several key items: the average of articles per year, the most cited articles, articles and authors with higher and higher cooperation rate, the most producing journals, institution and country.

Table 1 lists the different categories and numbers of scholarly works: Master's candidates: 46 reviews; 34 books; 30 book chapters; 13 conference papers; 422 articles, probably research; and 1 editorial. It gives a comprehensive synthesis of the literature in an various formats and media.

Table 1: General Result

| Criteria | Quantity |
|---|---|
| Article | 422 |
| Review | 46 |
| Book | 34 |
| Book Chapter | 30 |
| Conference paper | 13 |
| Editorial | 1 |

The trend observed in terms of published articles from the year 2006 to 2024 indicates constant increase in research activity of the country; however, there is a latent phase where only a handful of articles were being published during the phase from 2006-2010. They increased gradually over the years with a more noticeable higher rate from 2015, which suggests that the research base is strengthening, and there might be more aimful attempts at publishing. The overall number of publications grew more than 3 times compared to the number in early years, and this number continued to grow up to 98 articles in 2023, which is a maximum for the observed time frame. Most importantly, even if we look into the aspect of productivity by the year 2024, the fact that there are 63 articlespublished is quite impressive and this mean that not only has the research environment evolved to maturity but is functioning at an optimum standard. This kind of rapid and consistent publication increase also shows that the institution or individuals concerned are devoted to research and it also provides evidence that the research culture of the institution or individuals involved is thriving vigorously.

Table 2: Document by year 2006-2024

| Year | No of document |
|---|---|
| 2024 | 63 |
| 2023 | 98 |
| 2022 | 68 |
| 2021 | 55 |
| 2020 | 37 |
| 2019 | 23 |

| Year | Count |
|------|-------|
| 2018 | 20 |
| 2017 | 19 |
| 2016 | 14 |
| 2015 | 4 |
| 2014 | 10 |
| 2013 | 10 |
| 2012 | 4 |
| 2011 | 4 |
| 2010 | 3 |
| 2009 | 4 |
| 2008 | 1 |
| 2007 | 4 |
| 2006 | 1 |

Table 3 shows the discipline with the highest number of publications, which includes Business, Management and Accounting, Social Sciences, Agricultural and Biological Sciences, Economics, Econometrics and Finance, Engineering with computer science discipline contributing moderately. The Energy and Decision Sciences is also explored with many statiastic publications. Also, the offered subjects have sections like Psychology, Arts and Humanities, and Mathematics. This table clearly demonstrates trends where the majority of the current research is conducted under the strands of Biochemistry, Genetics and Molecular Biology, Medicine and Health Professions along with other major fields, who has effectively captured the current research activity so passionately in this map.

Table 3: Subject Area of Research

| Research Area | No of Publication |
|---------------|-------------------|
| Business, Management and Accounting | 192 |
| Social Sciences | 158 |
| Agricultural and Biological Sciences | 117 |
| Environmental Science | 110 |
| Economics, Econometrics and Finance | 89 |
| Engineering | 64 |
| Computer Science | 63 |
| Energy | 62 |
| Decision Sciences | 37 |
| Psychology | 9 |
| Arts and Humanities | 8 |
| Mathematics | 7 |
| Biochemistry, Genetics and Molecular Biology | 6 |
| Medicine | 5 |
| Health Professions | 3 |
| Immunology and Microbiology | 3 |
| Nursing | 3 |
| Physics and Astronomy | 3 |
| Chemical Engineering | 2 |
| Earth and Planetary Sciences | 2 |
| Materials Science | 2 |
| Multidisciplinary | 2 |
| Chemistry | 1 |
| Veterinary | 1 |

Table 4 provides the percentage of documents by affiliation that indicates how each institution has contributed to the existing literature. By comparing the characteristics of the affiliations presented in this summary with other

such lists, it gives a beneficial view of the differing amounts of scholarly production across these affiliations contributing to a better understanding of research output and influence in a given field or area.

Table 4: The most Dominant Affiliation

| Affiliation | Document |
|---|---|
| Wageningen University & Research | 12 |
| Università degli Studi di Torino | 11 |
| Universidad de Castilla-La Mancha | 7 |
| Universitat de València | 6 |
| Zhejiang University | 6 |
| Universitat Politècnica de València | 6 |
| Università degli Studi Roma Tre | 6 |
| Universidad de Jaén | 6 |
| Universiti Putra Malaysia | 6 |

Table 5 outlines the document counts for the various countries where most of the papers were published and of most importance, Italy dominated the list with 90 publications, the United Kingdom with 50 documents, China with 48 documents and Spain with 45 documents. Such tendency reflects a relative focus of researched activity in European countries with Italy being the most active. From this list, India, United States and Malaysia stand out clearly suggesting active research in these areas of the world. The countries such as Germany, Australia, Greece, and other countries with middle number of publications represent indeed the general international interest to the themes under research though with different intensity. Such distribution of the identified journals indicates that even though a number of countries have many articles published in the field, there is this global interest with the field in different parts of the world.

Table 5: Document by Country

| Country | Document |
|---|---|
| Italy | 90 |
| United Kingdom | 50 |
| China | 48 |
| Spain | 45 |
| India | 31 |
| United States | 21 |
| Malaysia | 20 |
| Germany | 19 |
| Australia | 18 |
| Greece | 17 |
| Netherlands | 15 |
| Brazil | 12 |
| France | 12 |
| Indonesia | 12 |
| Portugal | 11 |
| Romania | 10 |

In addition, the bibliometric results will be also presented according to the sub-themes identified as all keywords, author keywords, and index keywords. VOSViewer can also search for the bibliometric mapping of most used keywords as search technology AND adoption AND Agro-Food AND entrepreneurship. The graphical and clustering analysis of the keywords used is depicted in the figure 1 bibliometric mapping. It means that in the journals concerning agro food entrepreneurship, the word is used in a larger form.

Table 6: Visualization of VosViewer results by cluster

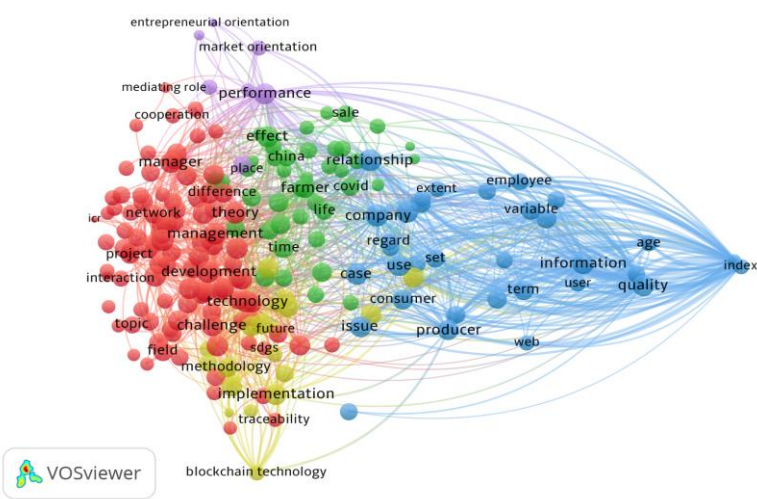| Cluster | Item |
|---|---|
| 1 | Agri food industry, agri food supply chain, agri food system, awareness, blockchain, business model, capability, circular economy, collaboration, competitiveness, development, food industry, food safety, food supply chain, formation, digitalisation, eco innovation, iinovation process, knowledge, medium enterprise, mechanism, new technology, rural area, tracebility, tranformation, sustainability development |
| 2 | Agribusiness, e commerce, business performance, community, comsumption, digital tranformation, farmer, food security, infratstructure, investment, policy maker, smallholder farmer, social network, sustainable performance, technological innovation |
| 3 | Consumer, effectiveness, index, indicator, information, determinant, company, information, producer, quality, entrepreneur orientation |
| 4 | Agriculture sector, agriculture, bioeconomy, digital economy, digital technology, diversficatio, implementation, methodology, market orientation |
| 5 | Absorptive capacity, cooperative, entrepreneurisl orientation, entrepreenurship, financial performance, performance |



Figure 1. Graphical and Clustering Analysis
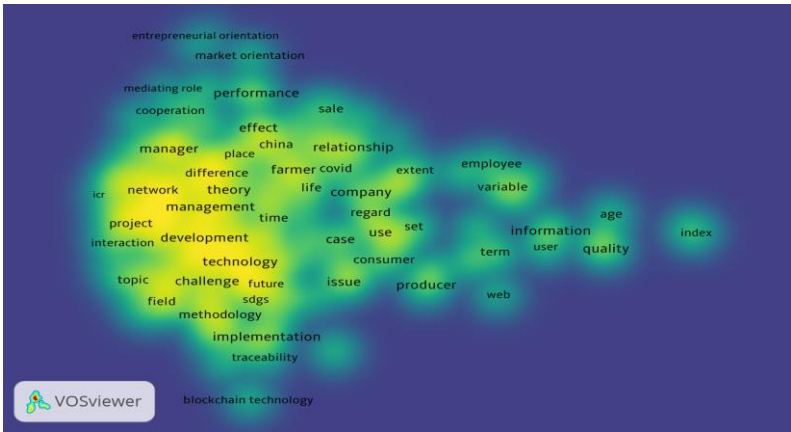


## 5. DISCUSSION AND CONCLUSION

**Technology AND Adoption AND Agro-Food AND Entrepreneurship**

This paragraph uses bibliometric and network analysis to present the study done on the distribution of the literature on technology adoption in agro-food entrepreneurship. Applying predetermined key-terms, the authors

identified 546 papers in the Scopus base. They performed title/abstract screening first to filter potentially irrelevant papers to ensure the results of the study were valid. The studies defined some important keyword categories within the literature, and these will be useful when the future researchers come searching for other avenues in the technology domain.

From the VosViewer analysis, the output came up with seven clusters. In each cluster the words technology, adoption, and agro-food AND enterpreenurship in appear. In terms of methodology, there are three terms used: adoption, implication, and exploratory. Indeed, the observational synthesis is done in a qualitative context in most of the articles identified in this study. Between data collection techniques, the two commonly referred to are case study and questionnaire. They also reveal that most of the published research articles concerned with such subjects rely on primary data.

Further research on the agro food in the technology adoption may have few datasets to support the statistics but using the block chain technology and biometric system may yield good data set for future discussion on log & transportation and sustainability of the supply chain. Therefore, the study analysis section will present an overview of trends in research being carried out in this area.

## REFERENCES

[1] Amborashang, J., & Seman, S. A. (2022). The Relationship of Entrepreneurial Knowledge on Entrepreneurial Intention among Undergraduate Students in Malaysia: Examining Moderating Effect of Self-Efficacy. *Jurnal Evolusi, 3*(1). https://doi.org/10.61688/jev.v3i1.35

[2] Amentae, T. K., & Gebresenbet, G. (2021). Digitalization and future agro-food supply chain management: A literature-based implications. *Sustainability, 13*(21), 12181.

[3] Amis, J. M., Munir, K. A., Lawrence, T. B., Hirsch, P., & McGahan, A. (2018). Inequality, institutions and organizations. *Organization Studies, 39*(9), 1131-1152.

[4] Asthana, S. (2022). Twenty-five years of SMEs in tourism and hospitality research: A bibliometric analysis. *Journal of Tourism, Heritage and Services Marketing, 8*(2), 35–47. https://doi.org/10.5281/zenodo.7358571

[5] Bahn, R. A., Yehya, A. A. K., & Zurayk, R. (2021). Digitalization for sustainable agri-food systems: potential, status, and risks for the MENA region. *Sustainability, 13*(6), 3223.

[6] Ballew, B. S. (2009). Elsevier's Scopus® database. *Journal of Electronic Resources in Medical Libraries*. https://doi.org/10.1080/15424060903167252

[7] D'Silva, J. L., Shaffril, H. A. M., Uli, J., & Samah, B. (2009). A review of contract farming and factors that impinge youths acceptance to contract farming. *European Journal of Social Sciences, 11*(2), 328338.

[8] D'Silva, J. L., Shaffril, H. A., Uli, J., & Samah, B. A. (2010). Socio-demography factors that influence youth attitude towards contract farming. *American Journal of Applied Sciences, 7*(4), 603.

[9] Davies, R., Coole, T., & Smith, A. (2017). Review of socio-technical considerations to ensure successful implementation of Industry 4.0. *Procedia Manufacturing, 11*, 1288-1295.

[10] Del Giudice, M. (2016). Discovering the Internet of Things (IoT) within the business process management. *Business Process Management Journal, 22*(2), 263-270. https://doi.org/10.1108/BPMJ-12-2015-0173

[11] Donthu, N., Kumar, S., & Pattnaik, D. (2020). Forty-five years of Journal of Business Research: A bibliometric analysis. *Journal of Business Research*. https://www.sciencedirect.com/science/article/pii/S0148296319306277

[12] Ejsmont, K., Gladysz, B., & Kluczek, A. (2020). Impact of industry 4.0 on sustainability—bibliometric literature review. *Sustainability, 12*(14), 5650.

[13] Feher, A. and Towell, E. (2010). Business use of the Internet. *Internet Research, 7*(2), 195-200. https://doi.org/10.1108/10662249710171832

[14] Gao, P., Meng, F., Mata, M. N., Martins, J. M., Iqbal, S., & ... (2021). Trends and future research in electronic marketing: A bibliometric analysis of twenty years. *Journal of Theoretical ....* https://www.mdpi.com/0718-1876/16/5/94

[15] Ghobakhloo, M. (2020), "Industry 4.0, digitization, and opportunities for sustainability", *Journal of Cleaner Production*, Vol. 252, pp. 1-19.

[16] Ghobakhloo, M., Arias-aranda, D. and Benitez-amado, J. (2011). Adoption of e-commerce applications in SMEs. *Industrial Management and Data System, 111*(8), 1238-1269. https://doi.org/10.1108/02635571111170785

[17] Guz, A. N., & Rushchitsky, J. J. (2009). Scopus: A system for the evaluation of scientific journals. International Applied Mechanics. https://doi.org/10.1007/s10778-009-0189-4

[18] Hamill, J. (1997). The internet and international marketing. *International Marketing Review, 14*(5), 300-323. https://doi.org/10.1108/02651339710184280

[19] Heredia, J., McIntyre, J. R., Rubiños, C., Santibañez, E., & Flores, A. (2023). A configuration approach to explain corporate environmental responsibility behavior of the emerging economies firms at industry 4.0. *Journal of Cleaner Production*, 395, 136383.

[20] Husain, R., Ratna, V. V, & Saxena, A. (2023). Past, present, and future of anthropomorphism in hospitality & tourism: conceptualization and systematic review. *Journal of Hospitality Marketing and Management, 32*(8), 1077–1125. https://doi.org/10.1080/19368623.2023.2232382

[21] Jackson, M., Hedelind, M., Hellström, E., Granlund, A., & Friedler, N. (2011). Lean automation: Requirements and solutions for efficient use of robot automation in the swedish manufacturing industry. *International Journal of Engineering Research & Innovation, 3*(2), 36-43.

[22] Jacsó, P. (2011). The h-index, h-core citation rate and the bibliometric profile of the Scopus database. *Online Information Review*. https://doi.org/10.1108/14684521111151487

[23] Kholidah, H., Hijriah, H. Y., Mawardi, I., Huda, N., Herianingrum, S., & Alkausar, B. (2022). A Bibliometric mapping of peer-to-peer lending research based on economic and business perspective. *Heliyon, 8*(11). https://doi.org/10.1016/j.heliyon.2022.e11512

[24] Kokol, P., Vošner, H. B., & … (2021). Application of bibliometrics in medicine: a historical bibliometrics analysis. *Health Information & ….* https://doi.org/10.1111/hir.12295

[25] Laila, N., Rusydiana, A. S., & Assalafiyah, A. (2021). The Impact of Covid-19 on The Halal Economy: A Bibliometric Approach. *Library Philosophy and Practice*, 2021. https://www.scopus.com/inward/record.uri?eid=2-s2.0-85109868436&partnerID=40&md5=8c615648914a86205206cad463873057

[26] Li, S., Tryfonas, T. and Li, H. (2016). The internet of things: a security point of view. *Internet Research, 26*(2), 337-359. https://doi.org/10.1108/IntR-07-2014-0173

[27] Liu, X., Sun, R., Wang, S., & Wu, Y. J. (2020). The research landscape of big data: a bibliometric analysis. *Library Hi Tech*. https://doi.org/10.1108/LHT-01-2019-0024

[28] López, L. A., Cadarso, M. Á., Zafrilla, J., & Arce, G. (2019). The carbon footprint of the US multinationals' foreign affiliates. *Nature communications, 10*(1), 1672.

[29] Luo, N., Wu, S., Liu, Y., & Feng, Z. (2023). Mapping social media engagement in the food supply chain. *Technological Forecasting and Social Change*, 192. https://doi.org/10.1016/j.techfore.2023.122547

[30] Manosso, F. C., & Ruiz, T. C. D. (2021). Using sentiment analysis in tourism research: A systematic, bibliometric, and integrative review. *Journal of Tourism, Heritage and Services Marketing, 7*(2), 16–27. https://doi.org/10.5281/zenodo.5548426

[31] Mustapha, N. D. B., Seman, S. B. A., Jali, M. N. B., & Muhamad, N. B. (2023). Innovation intention and market orientation towards corporate social innovation. The European Proceedings of Social & Behavioural Sciences, 132, 1–10. https://doi.org/10.15405/epsbs.2023.11.02.1

[32] Naz, F., Kumar, A., Agrawal, R., Garza-Reyes, J. A., Majumdar, A., & Chokshi, H. (2023). Artificial intelligence as an enabler of quick and effective production repurposing: an exploratory review and future research propositions. *Production Planning and Control*. https://doi.org/10.1080/09537287.2023.2248947

[33] Paul, P. (1996). Marketing on the Internet. *Journal of Consumer Marketing, 13*(4), 27-39. https://doi.org/10.1108/07363769610124528

[34] Phoong, S. Y., Khek, S. L., & Phoong, S. W. (2022). The bibliometric analysis on finite mixture model. SAGE Open. https://doi.org/10.1177/21582440221101039

[35] Reis, G., Silva, E. A. D. S. M., Silva, D. C. M., Thabane, L., Singh, G., Park, J. J., … & TOGETHER Investigators. (2021). Effect of early treatment with hydroxychloroquine or lopinavir and ritonavir on risk of hospitalization among patients with COVID-19: the TOGETHER randomized clinical trial. *JAMA Network Open, 4*(4), e216468-e216468.

[36] Rose, K., Eldridge, S. and Chapin, L. (2015). The Internet of Things: An Overview. *The Internet Society*,1-80.

[37] Rossini, M., Celesti, M., Bramati, G., Migliavacca, M., Cogliati, S., Rascher, U., & Colombo, R. (2022). Evaluation of the spatial representativeness of in situ SIF observations for the validation of medium-resolution satellite SIF products. *Remote Sensing, 14*(20), 5107.

[38] Rossini, M., Costa, F., Tortorella, G. L., Valvo, A., & Portioli-Staudacher, A. (2022). Lean Production and Industry 4.0 integration: how Lean Automation is emerging in manufacturing industry. *International Journal of Production Research, 60*(21), 6430-6450.

[39] Rossini, M., Powell, D. J., & Kundu, K. (2022). Lean supply chain management and Industry 4.0: a systematic literature review. *International Journal of Lean Six Sigma, 14*(2), 253-276.

[40] Rusydiana, A. S., Irfany, M. I., As-Salafiyah, A., & Tieman, M. (2023). Halal supply chain: a bibliometric analysis. *Journal of Islamic Marketing, 14*(12), 3009–3032. https://doi.org/10.1108/JIMA-01-2022-0009

[41] Tortorella, G. L., & Fettermann, D. (2018). Implementation of Industry 4.0 and lean production in Brazilian manufacturing companies. *International journal of production research, 56*(8), 2975-2987.

[42] Tortorella, G. L., & Fettermann, D. (2018). Implementation of Industry 4.0 and lean production in Brazilian manufacturing companies. *International journal of production research, 56*(8), 2975-2987.

[43] United Nations (2021), Tipping point' for climate action: time's running out to avoid catastrophic heating. Retrieved from https://news.un.org/en/story/2021/09/1099992

[44] Viana-Lora, A., & Nel-lo-Andreu, M. G. (2022). Bibliometric analysis of trends in COVID-19 and tourism. In Humanities and Social Sciences.nature.com. https://www.nature.com/articles/s41599-022-01194-5

[45] Wilkesmann, M. and Wilkesmann, U. (2018). Industry 4.0-organizing routines or innovations? *VINE Journal of Information and Knowledge Management Systems, 48*(2), 238-254. https://doi.org/10.1108/

[46] Zhang, Y., Zhao, L. and Qian, C. (2017). Modeling of an IoT-enabled supply chain for perishable food with two-echelon supply hubs. Industrial Management and Data Systems, 117(9), 1890-1905. https://doi.org/10.1108/IMDS-10-2016-0456

[47] Zhu, J., & Liu, W. (2020). A tale of two databases: The use of Web of Science and Scopus in academic papers. *Scientometrics*. https://doi.org/10.1007/s11192-020-03387-8

[48] Zhu, Q., Bai, C., & Sarkis, J. (2022). Blockchain technology and supply chains: The paradox of the atheoretical research discourse. *Transportation Research Part E: Logistics and Transportation Review, 164*. https://doi.org/10.1016/j.tre.2022.102824