Type of contribution:
▶ Editorial
Research Paper
Case Study
Review Paper
Scientific Data
Report of Tech. Application

e-issn. 2798-5245

Mechanical Engineering for Society and Industry
Vol. 3, No. 3 (2023) pp 114-118
Special Issue on Technology Update 2023
https://doi.org/10.31603/mesi.10787

Literature review: An effective method for identifying science and technology updates

Muji Setiyo*, Muhammad Latifur Rochman

Department of Mechanical Engineering, Universitas Muhammadiyah Magelang, **Indonesia**
muji@unimma.ac.id

Abstract

Literature reviews have been proven to help researchers and scholars identify research gaps and identify potential new research paths. This shows an exponential increase in literature review articles from 2000 to the present. Therefore, this article introduces a special issue in MESI (Volume 3, Issue 3, 2023) dedicated to a literature review, highlighting five articles covering topics as diverse as plastic waste in road materials, porous hydroxyapatite for bone grafts, magnesium biocomposites, bio-based cutting fluids for manufacturing, contact mechanics perspective for medical therapy, and the concept, technology, and application of a swirl-type microbubble generator. These articles offer important insights into their respective fields, highlighting advances, challenges, and future research directions.

Keywords: Literature review, Research path, Research gap, Technology updates

1. Introduction

Literature reviews have long been known as an effective method for identifying science and technology updates. Literature review articles have been documented in the Scopus database before 1900. Starting in the 2000s, literature review articles showed exponential growth, there were 1,776 articles recorded in 2000; 2,889 articles in 2005; 4,924 articles in 2010; 9,634 articles in 2015; 24,561 articles in 2020; and 38,537 articles in 2023 (detailed growth is presented in **Figure 1**). This number only represents the subject areas of engineering, computer sciences, environmental sciences, materials sciences, chemistry, physics and astronomy, energy, chemical engineering, and earth and planetary sciences with search syntax of (TITLE (review) AND PUBYEAR > 1825 AND PUBYEAR < 2024 AND (LIMIT-TO (DOCTYPE , "re") OR LIMIT-TO (DOCTYPE , "ar") OR LIMIT-TO (DOCTYPE , "cp")) AND (LIMIT-TO (SUBJAREA , "ENGI") OR LIMIT-TO (SUBJAREA , "MATE") OR LIMIT-TO (SUBJAREA , "ENER") OR LIMIT-TO (SUBJAREA , "COMP") OR LIMIT-TO (SUBJAREA , "PHYS") OR LIMIT-TO (SUBJAREA , "ENVI") OR LIMIT-TO (SUBJAREA , "CENG") OR LIMIT-TO (SUBJAREA , "CHEM") OR LIMIT-TO (SUBJAREA , "EART")).

Literature reviews serve several key functions in academic research and scientific writing to provide an overview and context of existing knowledge and research on a particular topic or field of study [1]. This helps readers understand historical developments, key concepts, theories, and previous findings related to the research topic. Additionally, through literature reviews, researchers can identify gaps, controversies, inconsistencies, or areas where there is limited research or conflicting evidence. Recognizing these gaps helps in framing research questions and justifies the need for further investigation. For some researchers and scholars, literature review also helps in establishing a theoretical framework for research. By reviewing existing literature, researchers can identify and integrate relevant theories, models, or conceptual frameworks on which to base their research. It also provides insight into various research methodologies, approaches, and techniques used in previous research. This helps researchers in choosing appropriate methods for their own research, understanding the strengths and limitations of different approaches. A comprehensive literature review demonstrates the credibility of the research by showing that it is built on a foundation of existing knowledge and reputable sources. This supports the rationale for the research method chosen and contributes to the validity of the findings.

Findings from existing literature provide evidence and support for the arguments or hypotheses presented in the research. This strengthens the research by basing it on existing knowledge. Based on the gaps identified, the literature review can conclude by outlining possibilities for

Publisher
Universitas Muhammadiyah Magelang

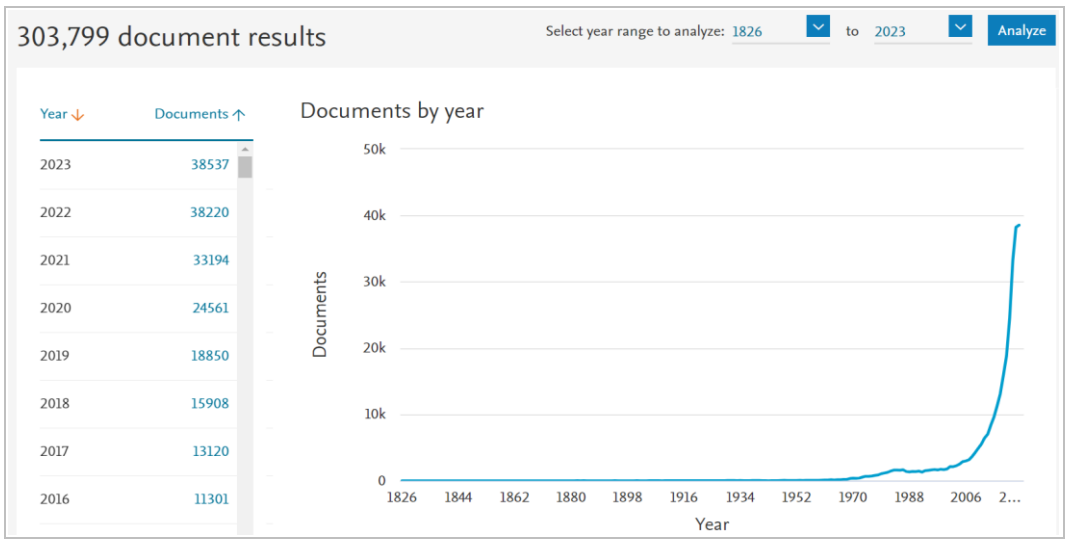

Figure 1. Growth of literature review articles in the Scopus database from 1826 to 2023 for the subject areas of engineering, computer sciences, environmental sciences, materials sciences, chemistry, physics and astronomy, energy, chemical engineering, and earth and planetary sciences (update 30/12/2023)

future research or making recommendations for further investigation, thereby contributing to the advancement of knowledge in the field. Overall, literature reviews are an integral part of academic research, helping researchers situate their work within the broader scientific conversation, guiding the direction of their research, and contributing to the overall rigor and validity of their research results.

Literature review methods have developed from traditional (narrative review), to critical review, literature review, mapping review/systematic map, meta-analysis, mixed studies review/mixed methods review, overview, qualitative systematic review/qualitative evidence synthesis, rapid review, scoping review, state-of-the-art review, systematic review, systematic search and review, systematized review, and umbrella review [2]. Although other sources categorize literature reviews only into narrative or traditional literature reviews, critically appraised topics (CAT), scoping reviews, systematic literature reviews, and annotated bibliographies [3]. There are many types and methods of literature review, depending on the field of science and the inventor of the method, but literature reviews generally have the function of evaluating literature, identifying patterns and trends in the literature, synthesizing the literature, identifying research gaps, and recommending new research topics [4]. Data sources for literature reviews are also diverse, including Google Scholar, Scopus, PubMed, Web of Sciences, Wizdom.ai, and other databases, both as a single database and in combination that is further validated [5]–[10].

2. MESI Publishes a Special Issue of Literature Reviews

In volume 3 issue 3 (2023), MESI specifically publishes a special issue for identifying science and technology updates through literature review articles.

The **first article** highlights the utilization of plastic waste to improve the properties of road material, written by Safety Husna Pangestika, et al. The use of plastic waste in asphalt mixtures aims to reduce plastic waste and improve asphalt performance. Two main methods, dry and wet, incorporate plastic into asphalt. The wet mixing method yields greater stability than the dry method. However, achieving a homogeneous mixture during the process is crucial. The optimal plastic particle size is 5 mm, and some plastics require chemical modifiers for compatibility with asphalt. Assessing plastic content based on Marshall parameters is essential, indicating improved stiffness, rutting resistance, and fatigue resistance. Yet, certain plastics like PS display conflicting performance, showing reduced deformation resistance and less elasticity. PVC plastic should only be used in the wet method due to hazardous content causing air pollution when heated. Future research should focus on environmental and economic impacts.

The **second article** discusses the effect of sintering temperature and polyvinyl alcohol composition as binder on the formation of porous hydroxyapatite as bone graft using sponge replication method, written by Baharudin Priwintoko, et al. Porous hydroxyapatite (HA) has gained significant attention in research. The manufacturing process plays a crucial role in determining pore HA quality, particularly in sponge replication methods where sintering and binder selection are key factors. Sintering temperatures range from 700°C to 1300°C, and polyvinyl alcohol (PVA) remains a widely used binder due to its ability to evaporate cleanly at specific temperatures,

leaving the material free from contamination. Various studies have met ISO 13379:2015 standards, focusing on calcium Ca/P ratio, crystalline phase composition, and compressive strength. Optimal parameters identified in this review include sintering temperatures between 900℃ to 1300℃, an HA/PVA composition of 80/20, and 15% to 19% gelatin addition, based on specific conditions and materials used. Selecting the appropriate sintering temperature and PVA composition is crucial for achieving well-characterized HA pores and meeting scaffold standards in biomedical applications. Future research should explore how different sintering temperatures and HA/PVA processes affect porous HA formation, considering variations in HA base materials to achieve optimal processes and conform to ISO 13379:2015 standards.

The **third article** highlights the development of magnesium biocomposites with hydroxyapatite or carbonate apatite reinforcement as implant candidates, written by Yusuf Subagyo, et al. This article explains that the synthesis of Mg-CAp and Mg-HAp biocomposites demonstrates their potential as promising biodegradable implants due to their favorable biocompatibility, bioabsorbability, and biodegradable properties. The addition of CAp or HAp effectively reduces the rapid degradation rate of Magnesium, showcasing promise for orthopedic implant materials, although particle consolidation improvement is necessary for enhanced properties. The ball milling time significantly influences composite properties, with a 5-hour process yielding the least toxicity and the most uniform mixture. Conventional sintering methods lack in producing high mechanical property biocomposites, necessitating alternative methods like powder metallurgy to enhance particle bonding. Coating methods, widely used in Mg-HAp and Mg-CAP research, effectively suppress degradation rates, and improve microhardness. While promising, research on Mg-HAp and Mg-CAp remains at the animal experimentation stage and has not yet been fully implemented in human applications. Overall, this review contributes vital insights for the advancement of biomaterials, particularly in bone regeneration for medical applications.

The **fourth article** explores the role of bio-based cutting fluids for sustainable manufacturing and machining processes, written by Arun Kumar Katam, et al. The review explores various cutting fluids and related technologies, emphasizing their impact on sustainable manufacturing practices. Traditional metal-cutting fluids, while effective, raise environmental and safety concerns due to non-biodegradability. Findings show that dry machining, although environmentally friendly, generates excessive heat, reduces tool life and surface quality, and restricts its use to easily machinable materials. Mineral and synthetic cutting fluids exhibit promise but pose toxicity and non-biodegradability challenges. Conversely, bio-based oils from edible and non-edible sources offer higher biodegradability but suffer from lower oxidation stability and thermal conductivity. While conventional cutting fluids remain problematic due to their environmental impact, Minimum Quantity Lubrication (MQL) emerges as an effective, eco-friendly alternative, reducing friction and improving tool life and surface finish. The combination of Bio-based Cutting Fluids (BCFs) with MQL presents a viable path toward sustainable manufacturing. Future advances in sustainable manufacturing will likely focus on enhancing bio-based coolant properties and tribological behavior through nanoparticle integration.

The **fifth article** discusses deep touch pressure for calming and comfort therapy from the perspective of contact mechanics, written by Mohamad Izzur Maula, et al. This article describes the evolution and significance of touch therapy, emphasizing its benefits in alleviating muscle pain, reducing stress, and inducing relaxation. It highlights the impact of touch or pressure on the parasympathetic nervous system, crucial for emotional well-being. The paper advocates for further research into therapeutic devices' interaction with the body, particularly focusing on deep touch pressure (DTP) tools and their contact area's role in therapeutic outcomes. It underscores the need to explore comfort levels in pressure treatments for improved compliance. Furthermore, the paper delves extensively into the potential of DTP to provide comfort effects from a contact mechanics perspective, aiming to bridge the gap between sensory therapy and the field of mechanical engineering by investigating various DTP types and pressure distribution on the body.

The **sixth article** discusses the concept, technology, and application of a swirl-type microbubble generator written by Drajat Indah Mawarni, et al. Microbubble Generator is an aeration technology that is capable of producing micron-sized bubbles. A review of various types of microbubble generators has been carried out comprehensively and the swirl-type microbubble generator shows superiority over other types. It has recently been widely explored due to its simple structure, efficiency in generating micron-sized bubbles, and potential applications in various fields. Based on optimized geometric parameters combined with suitable flow conditions, the vortex-type bubble generator is expected to produce bubbles of controlled size and concentration

that meet certain requirements. However, further research is needed to comprehensively describe fluid-gas interactions.

In the previous issues, MESI has also published literature review articles, but they did not stand as a special issue. Some of these articles include discussing the challenges of mechanical engineering in Industry 4.0 and Society 5.0 [11], [12], the role of composites for sustainable society and industry [13], recent progress on the production of aluminum oxide (Al2O3) nanoparticles [14], emissions and environmental issues of cement industry [15], alternative fuels for the transportation sector in Indonesia [16], the potential of butanol as biofuel in gasoline engines [17], carbon black [18], and strategies to achieve controlled auto-ignition (CAI) combustion [19]. We hope that these literature review articles provide new insights to readers in identifying research gaps and building new research paths in the broader field of mechanical engineering.

References

[1] S. Kraus *et al.*, "Literature reviews as independent studies: guidelines for academic practice," *Review of Managerial Science*, vol. 16, no. 8, pp. 2577–2595, 2022, doi: 10.1007/s11846-022-00588-8.

[2] M. J. Grant and A. Booth, "A typology of reviews: an analysis of 14 review types and associated methodologies," *Health Information & Libraries Journal*, vol. 26, no. 2, pp. 91–108, Jun. 2009, doi: https://doi.org/10.1111/j.1471-1842.2009.00848.x.

[3] "Library Guides: Literature Review: Types of literature reviews," Dec. 2016, [Online]. Available: https://libguides.csu.edu.au/review/Types.

[4] M. Setiyo, *Teknik Menyusun Manuskrip dan Publikasi Ilmiah Internasional*. Yogyakarta: Deepublish, 2017.

[5] M. Setiyo, D. Yuvenda, and O. D. Samuel, "The Concise Latest Report on the Advantages and Disadvantages of Pure Biodiesel (B100) on Engine Performance: Literature Review and Bibliometric Analysis," *Indonesian Journal of Science and Technology*, vol. 6, no. 3, pp. 469–490, 2021, doi: https://doi.org/10.17509/ijost.v6i3.38430.

[6] P. S. Mahajan, R. Agrawal, and R. D. Raut, "State-of-the-art perspectives on data-driven sustainable supply chain: A bibliometric and network analysis approach," *Journal of Cleaner Production*, vol. 430, p. 139727, 2023, doi: 10.1016/j.jclepro.2023.139727.

[7] Y. Yang, Z. Wei, and Z. Zhang, "Stakeholder Relationship in Construction Projects: A Mixed Methods Review," *Buildings*, vol. 13, no. 12. 2023, doi: 10.3390/buildings13123122.

[8] A. Cimprich, K. Sadayappan, and S. B. Young, "Lightweighting electric vehicles: Scoping review of life cycle assessments," *Journal of Cleaner Production*, vol. 433, p. 139692, 2023, doi: 10.1016/j.jclepro.2023.139692.

[9] D. I. Setyanansyach, M. Setiyo, and T. Raja, "Review and Bibliometric Analysis of Biogas Power Plants in Indonesia," *Advance Sustainable Science, Engineering and Technology (ASSET)*, vol. 5, no. 3, p. 2303015, 2023, doi: 10.26877/asset.v5i3.16806.

[10] B. V Venkatasubramanian and M. Panteli, "Power system resilience during 2001–2022: A bibliometric and correlation analysis," *Renewable and Sustainable Energy Reviews*, vol. 188, p. 113862, 2023, doi: 10.1016/j.rser.2023.113862.

[11] M. Setiyo *et al.*, "Industry 4.0: Challenges of Mechanical Engineering for Society and Industry," *Mechanical Engineering for Society and Industry*, vol. 1, no. 1, pp. 3–6, 2021, doi: 10.31603/mesi.5309.

[12] M. Setiyo and M. L. Rochman, "The role of mechanical engineering in the era of industry 4.0 and society 5.0," *Mechanical Engineering for Society and Industry*, vol. 3, no. 2, pp. 54–56, Dec. 2023, doi: 10.31603/mesi.10786.

[13] R. Widyorini, N. H. Sari, M. Setiyo, and G. Refiadi, "The Role of Composites for Sustainable Society and Industry," *Mechanical Engineering for Society and Industry*, vol. 1, no. 2, pp. 48–53, 2021, doi: 10.31603/mesi.6188.

[14] A. Z. Ziva, Y. K. Suryana, Y. S. Kurniadianti, A. Bayu, D. Nandiyanto, and T. Kurniawan, "Recent Progress on the Production of Aluminum Oxide (Al2O3) Nanoparticles: A Review," *Mechanical Engineering for Society and Industry*, pp. 54–77, 2021, doi: 10.31603/mesi.5493.

[15] F. B. Elehinafe, S. N. Ezekiel, O. B. Okedere, and O. O. Odunlami, "Cement industry–Associated emissions, environmental issues and measures for the control of the emissions," *Mechanical Engineering for Society and Industry*, vol. 2, no. 1, pp. 17–25, 2022, doi: 10.31603/mesi.5622.

[16] M. Setiyo, "Alternative fuels for transportation sector in Indonesia," *Mechanical Engineering for Society and Industry*, vol. 2, no. 1, pp. 1–6, 2022, doi: 10.31603/mesi.6850.

[17] S. M. N. Rahayu *et al.*, "A Review of automotive green technology: Potential of butanol as biofuel in gasoline engine," *Mechanical Engineering for Society and Industry*, vol. 2, no. 2, pp. 82–97, 2022, doi: 10.31603/mesi.7155.

[18] M. A. Ramly and M. Setiyo, "Carbon black: Production, properties, and utilization," *Mechanical Engineering for Society and Industry*, vol. 3, no. 1, pp. 1–3, 2023, doi: 10.31603/mesi.8821.

[19] I. Veza *et al.*, "Strategies to achieve controlled auto-ignition (CAI) combustion: A review," *Mechanical Engineering for Society and Industry*, vol. 3, no. 1, pp. 22–34, 2023, doi: 10.31603/mesi.7568.

Muji Setiyo is a professor in Mechanical Engineering at the Universitas Muhammadiyah Magelang (UNIMMA). He obtained a Bachelor's degree from the Universitas Muhammadiyah Yogyakarta (2009), a Master of Engineering from Pancasila University (2012), and obtained a Doctoral Degree in Mechanical Engineering from Brawijaya University (2017), all in the field of Mechanical Engineering. In 2022, he graduated from the Engineer Professional Program at Universitas Muhammadiyah Yogyakarta. Apart from teaching and researching, currently, he is active as an Editor in Mechanical Engineering for Society and Industry (MESI) and Automotive Experiences, two scientific journals published by Universitas Muhammadiyah Magelang (UNIMMA).

Muhammad Latifur Rochman is the copyeditor of Mechanical Engineering for Society and Industry (MESI) and Automotive Experiences. He is a research assistant at the Center of Energy for Society and Industry (CESI) and a final year student at the Department of Mechanical Engineering, Universitas Muhammadiyah Magelang (UNIMMA). He is actively involved in lecturer research projects and community empowerment based on the implementation of research results. Currently, he is assisting research on the integration of water heating systems with vehicle A/C systems to increase the energy efficiency ratio (EER) at CESI.