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Exploring the Field of Cognitive Sustainability

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Abstract

Cognitive Sustainability (CogSust) investigates the links between two research areas: sustainability and cognitive sciences. Sustainability can be viewed as an environmental discipline primarily, but it extends beyond this to encompass an engineering challenge and spans several other disciplines. The main aim of CogSust is to provide a holistic view of how sustainability in a broader aspect can be understood, described (modelled), and optimised for human value creation using the tools of the cognitive sciences. It results in a deeper merge of artificial and biological cognitive systems with engineering applications. This paper aims to show the development of the research field and the journal.

Keywords

Cognitive sustainability, Cognitive science, Sustainability, Multidisciplinarity, Interdisciplinarity, Cross-cutting issues

1. Introduction

Cognitive science is an interdisciplinary field that explores the nature of cognition, which refers to the mental processes and activities related to acquiring, processing, storing, and using information. This field combines insights and methodologies from various disciplines, including psychology, neuroscience, linguistics, philosophy, computer science, anthropology, and more. The primary goal of cognitive science is to understand how the mind works and to develop comprehensive theories that explain various aspects of human cognition. Researchers in cognitive science investigate topics such as perception, attention, memory, language, problem-solving, decision-making, and consciousness. By studying these phenomena, cognitive scientists aim to uncover the underlying mechanisms and processes that govern human thought and behaviour. Cognitive science utilises various research methods, including experiments, brain imaging techniques, computational modelling, and observational studies. The interdisciplinary nature of cognitive science allows researchers to approach complex questions about the mind from multiple perspectives, fostering a holistic understanding of cognition. The insights gained from cognitive science have practical applications in fields such as artificial intelligence, education, human-computer interaction, and clinical psychology.

Sustainability refers to the ability to meet the needs of the present without compromising the ability of future generations to meet their own needs. It involves balancing social, economic, and environmental considerations to ensure long-term well-being for current and future generations. Sustainability is often viewed through three interconnected dimensions. *Environmental sustainability* focuses on preserving and protecting the natural resources and ecosystems that support life on Earth. It involves practices that aim to reduce environmental impact, promote biodiversity, and minimise pollution and waste. *Social sustainability* addresses the well-being of individuals and communities, encompassing the promotion of social equity, justice, and inclusivity. It involves ensuring that fundamental human needs such as education, healthcare, and employment are fulfilled for all members of society. *Economic sustainability* emphasises the responsible use of resources to support economic growth and development over the long term. This includes promoting economic systems that are resilient and equitable and do not deplete resources at a rate faster than they can be regenerated. Achieving sustainability requires a holistic and integrated approach that considers the impact of human activities on the planet and its inhabitants. Sustainability is applied to business, agriculture, urban planning, energy, and resource management in various contexts. The goal is to create systems and practices that endure and support the well-being of current and future generations while respecting the limits of the natural environment.

Cognitive sustainability can enhance innovation by facilitating the identification of problems, the generation of ideas, and the evaluation of solutions. For instance, cognitive skills can help to recognise challenges related to resource use, pollution or social equity. Critical thinking and creativity are pivotal in brainstorming innovative solutions for sustainable development and natural resource management. Cognitive sustainability can help assess the long-term impact of innovations and support decision-making processes concerning sustainability aspects. Cognitive sustainability can drive innovation by developing educational programs that teach critical and sustainability skills and encourage collaboration between engineers and social scientists to develop interdisciplinary solutions. Furthermore, it promotes using artificial intelligence to analyse data and identify patterns that can lead to sustainable solutions.

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The concept of cognition is typically associated with awareness, rationality, subjective experience, and self-awareness in the context of cognitive and psychological processes. While cognition may not directly connect to sustainability, understanding human consciousness and cognitive processes can be relevant to sustainable practices in a broader sense. Understanding the cognitive processes influencing human behaviour and decision-making is crucial for promoting sustainable practices. Research in psychology, behavioural economics, and cognitive science can provide insights into why individuals make certain choices, how they perceive risks and benefits, and what factors influence their attitudes toward sustainability. Consciousness plays a role in environmental awareness and perception. Researchers and policymakers can design effective strategies to promote environmental consciousness and responsible behaviour by understanding how individuals perceive and relate to their environment. Promoting sustainability involves raising awareness and educating individuals about the consequences of their actions on the environment and society. The design of educational programs can benefit from insights into cognitive processes to enhance communication and engagement. Cultural and social dimensions of consciousness influence how societies approach sustainability. Cultural beliefs, values, and norms shape attitudes toward nature, consumption, and the use of resources. Understanding cultural consciousness can inform sustainable practices that align with diverse perspectives. Consciousness is tied to creativity and problem-solving abilities. Encouraging innovative thinking and conscious consideration of sustainable solutions can lead to developing environmentally friendly technologies, systems, and practices.

In summary, while consciousness may not be directly tied to sustainability, understanding human cognition, behaviour, and awareness is essential for implementing effective and meaningful sustainable practices. By incorporating cognitive science and psychology insights, stakeholders can design interventions, policies, and educational initiatives that align with individuals' and communities' values and cognitive processes, contributing to a more sustainable future. In this article, the author investigates the development of the scientific area of cognitive sustainability through related articles published by the Cognitive Sustainability Journal. In the methodology part, the author listed the referring databases that were the basis of the analysis. The results focus on the journal's main characteristics based on the given metrics of the databases.

2. Methodology

The author has investigated the two volumes of the Journal of Cognitive Sustainability (2022 and 2023). The investigation consists of 48 articles in 8 issues. Different statistical tools were used and provided by different indexing agencies. Using these tools, the author could show the development of scientific discipline and the thematic diversity, overlapping of topics, and multidisciplinarity. The journal has already been recognised by the Hungarian Academy of Sciences, Google Scholar (Martín-Martín et al. 2018), the Sherpa Romeo system (da Silva, Dobránszki, 2019), RePEc (Research Papers in Economics) (Coupé, Reed, Zimmermann, 2023), DOAJ (is a unique and extensive index of diverse open access journals from around the world), CrossRef, SemanticScholar, ErihPlus (European Reference Index for the Humanities and Social Sciences) (Lavik, Sivertsen, 2017), Index Copernicus (an online database of user-contributed all information, including profiles of scientists, as well as of scientific institutions, publications and projects established in 1999 in Poland, and operated by Index Copernicus International), Dimension (Data analytics), Scilit (Free and comprehensive content aggregator platform for scholarly publications), Lens (Explore global science and technology knowledge). All data are freely available from the Cognitive Sustainability website.

3. Results

Hungarian Academy of Sciences already recognised the journal as a reviewed scientific English language journal. It is published in Hungary, and it follows an Open Access policy.

Google Scholar indexed all 48 articles and counted 149 citations with a Hirsch index 6. After two years of existence, 149 citations are very promising. The Hirsch index is calculated based on the journal's published papers and the number of citations those papers have received. Specifically, a journal has an h-index of *h* if they have *h* papers that have each been cited at least *h* times. The h-index provides a simple and intuitive measure of a journal's impact. It is widely used in academia to evaluate the scientific output and compare the impact. The distribution of citations is increasing (Fig. 1):

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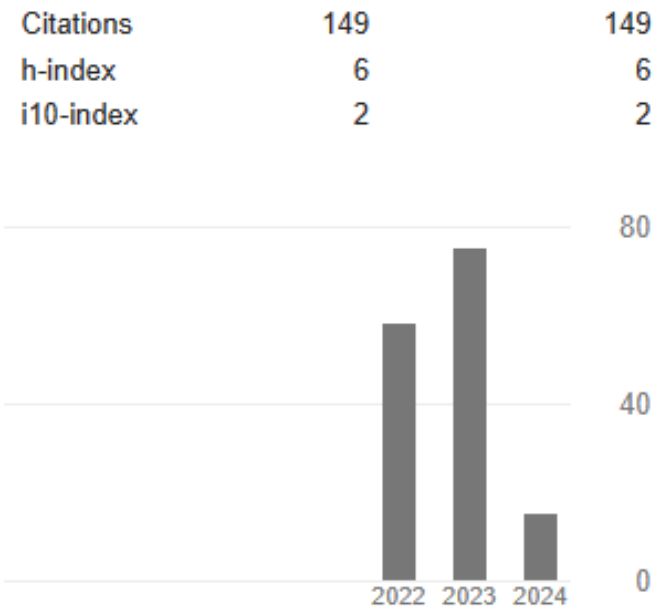

Fig. 1. Distribution of citations in Google Scholar
Source: https://scholar.google.com/citations?user=yZ7RomsAAAAJ&hl=en

According to ErihPlus (European Reference Index for the Humanities and Social Sciences), the journal considered disciplines such as Business and Management, Demography, Economics, Environmental Studies, Human Geography and Urban Studies, Interdisciplinary research in the Humanities, Interdisciplinary research in the Social Sciences, Law, Political Sciences and International Relations, Science and Technology Studies, Social Statistics and Informatics, Sociology. As can be seen, a large variety of scientific disciplines were recognised in the Cognitive Sustainability Journal case, which strongly coincides with the multidisciplinary scope of the journal.

Index Copernicus lists the journal in the following disciplines: Green & Sustainable Science & Technology and Decision Sciences.

In Dimension, all 48 investigated articles are accessible with 66 citations and 1.38 average citations (Fig. 2):

Fig. 2. Distribution of citations in Dimension
Source:
https://app.dimensions.ai/discover/publication?search_mode=content&search_text=cognitive%20sustainability&search_type=kws&search_field=full_search&and_facet_source_title=jour.1442874

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Scilit also recognises the journal as having all 48 open-access papers. The database states that 4.2 % of papers are made in international collaboration, 15 are from Hungary, and the top subjects are very diverse: Transportation, Environmental Engineering, Computer Science, Energy and Fuel Technology.

Lens has already recognised the journal, with 49 papers, and one is already in Online First. Most submissions come from Budapest University of Technology and Economics and the Hungarian National Bank.

4. Analysis

The author can state that different databases have different grouping and segregation methods that automatically and independently categorise the journals. The Lens database shows that citations are not evenly distributed over time. Older articles are attracting more citations that are well known in conservative scientific disciplines (Fig. 3.):

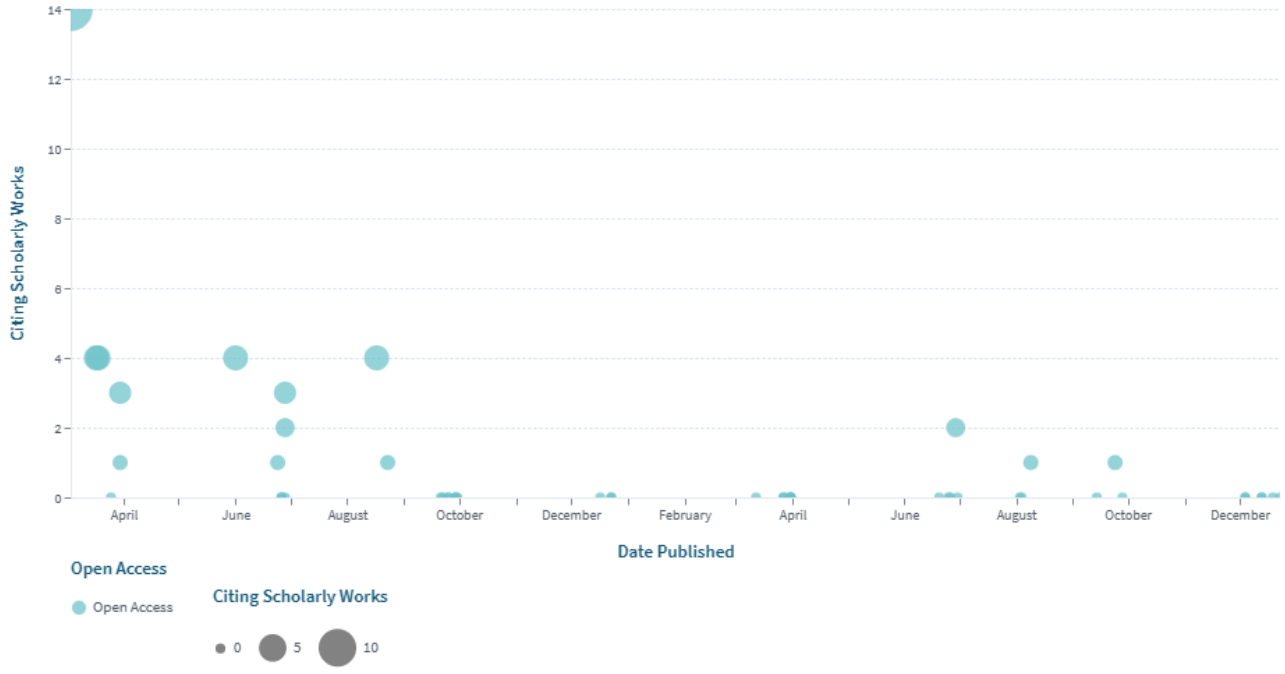

Fig. 3. Distribution of citations in Lens database
Source:
https://www.lens.org/lens/search/scholar/analysis?p=0&n=10&s=date_published&d=%2B&f=false&e=false&l=en&authorField=author&dateFilterField=publishedYear&orderBy=%2Bdate_published&presentation=false&preview=true&stemmed=true&useAuthorId=false&sourceTitle.must=Cognitive%20Sustainability

The field of study is also very broad, and it is in line with the scope of the journal (Fig. 4):

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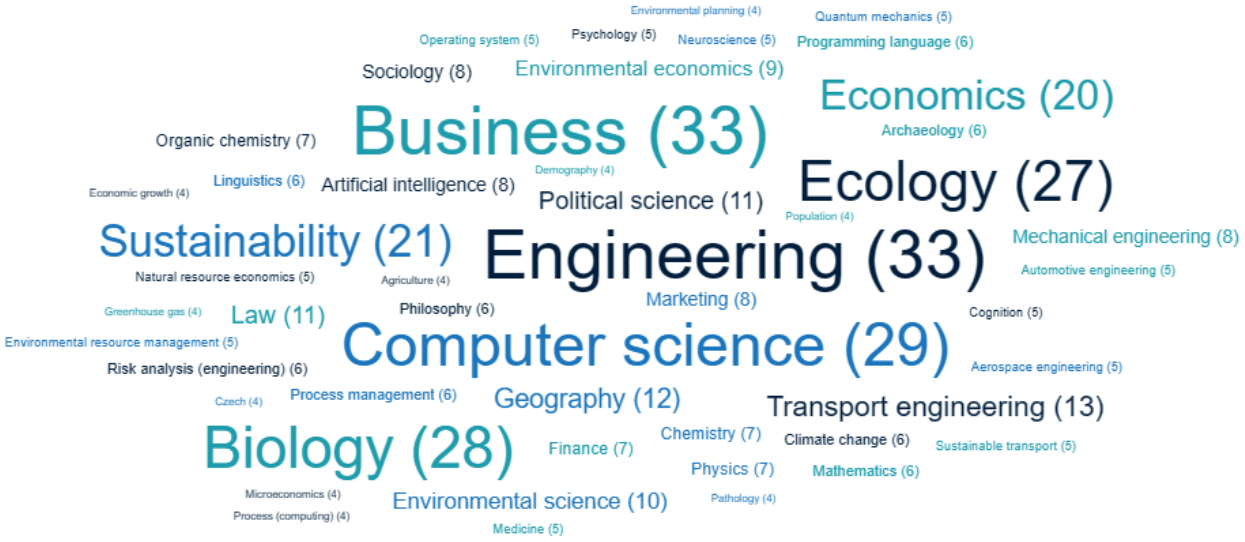

Fig. 4. Distribution of citations in Lens database
Source:
https://www.lens.org/lens/search/scholar/analysis?p=0&n=10&s=date_published&d=%2B&f=false&e=false&l=en&authorField=author&dateFilterField=publishedYear&orderBy=%2Bdate_published&presentation=false&preview=true&stemmed=true&useAuthorId=false&sourceTitle.must=Cognitive%20Sustainability

The most cited paper in the journal concerns the research that aims to define the concept of cognitive sustainability and explore its validity through an interdisciplinary approach. Results show that digital development allows for extended experiential cognition and can aid in addressing sustainability. The study identifies key dimensions and parameters of cognitive sustainability and highlights its potential for analysing and developing sustainable processes (Zoldy et al., 2022). The second most cited paper is more technology-oriented. It examines the effects of different OME3-5 mixtures on emissions and combustion in a commercial diesel engine. Results show that increasing OME3-5 content reduces PM emissions, improves the NO_x-PM trade-off, and increases brake thermal efficiency. However, there may be challenges with increased NO_x emissions and low heat capacity and viscosity in real-world applications (Virt and Arnold, 2022). The third most cited paper discusses the economy. It provides an overview of the green bond market in Hungary, analysing seven sectors and their support for sustainable development goals. The most supported goal is SDG 7, focusing on pollution prevention, energy efficiency, clean transportation, and water- and wastewater management. Corporate awareness of green issues is high in four sectors (Becsi et al., 2022).

7 Conclusion

In conclusion, Cognitive Sustainability can provide a multidisciplinary background for innovation that can address the most relevant environmental and socio-economic challenges. Cognitive sustainability is an emerging field that examines the intersection of human cognition and sustainability practices. Considering cognitive sustainability, the impact of digital culture and digitalisation on sustainability transition can be examined. On the other hand, cognitive well-being in a sustainable future can put it into perspective. By fostering critical thinking and problem-solving skills, we can create a more sustainable future for ourselves and future generations. A recent study shows that the Cognitive Sustainability Journal has been recognised within the scientific community. However, further research and development are necessary to enhance the research field.

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