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Systemic Model: Strategy for Digital Empowerment in the Sustainable Development of Societies

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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 Digital Empowerment and Sustainable Development. 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 2017-2022, achieving the identification of 89 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 on the proposed topic is referenced through a qualitative analysis. Among the main findings made through this research, it is found that the United Kingdom, with 13 publications, was the country with the highest scientific production registered in the name of authors affiliated with institutions in that nation. The Area of Knowledge that made the greatest contribution to the construction of bibliographic material related to the study of Digital Empowerment in the midst of Sustainable Development in societies was Social Sciences with 44 published documents, and the most used Publication Type during the period indicated above were Journal Articles with 52% of the total scientific production.

Keywords: *Digital Empowerment, Sustainable Development, Systemic Model.*

1. Introduction

The evolution of digital industry 4.0 has emerged as a formidable force that is transforming the social fabrics of modern societies and the economic models employed by large economies. As we navigate the digital age in the 21st century, we find that technological innovation and sustainable development harness the transformative potential of digital empowerment with a much more critical approach. In the present era where rapid digitalization, where the synergy between technological advancement and sustainable social development is not only desirable; It has become a social construct to be able to manufacture a global community that is much more resilient, inclusive and prepared in a changing world.

At the epicenter of this ambitious effort is a systematic model, which executes strategic ideas to exploit digital improvement, which is perfectly connected to the principles of sustainability. One of the benefits of being able to use this systematic model is to be able

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to revolutionize the traditional paradigm and employ digital empowerment and manage to explore the areas of connectivity or the adoption of new technologies. It's an intricate plan, meticulously designed to address the intricate web of challenges and opportunities that arise at the intersection of digitalization and societal progress.

The systematic model, which is based on the characteristics of being able to recognize that sustainable development through digital empowerment needs to dimension a more holistic and integrated approach. Exploring the networks of connectivity factors, weaving economic, social and environmental considerations into a cohesive strategy. The overall goal is not only to boost economies, but also to ensure that the benefits of digitalization are equitably distributed, fostering social inclusion and environmental responsibility. In essence, being able to implement this model would allow communities and organizations to set off towards new horizons, envisioning digital empowerment as a driving force that allows positive social transformation for sustainable development.

In the same way, being able to develop strategies for digital empowerment needs to address certain complex specifications which span between technology and sustainability. From promoting universal digital literacy and ensuring equitable access to technology to leveraging data analytics for evidence-based decision-making and championing green practices, the systematic model offers a comprehensive roadmap for navigating the digital frontier in the pursuit of sustainable development.

Throughout this text, we delve into the intricate layers offered by this systematic model, which is based on being able to analyze and codify the technological components and thus understand the new innovations in strategies for digital improvement in the sustainable development of society. By being able to identify the components that digital empowerment employs in the context of sustainability, we aim to light the way to a future where technology not only accelerates progress, but does so in a socially inclusive, environmentally conscious, and ethically sound way. Join us on this journey through the intersection of technology and sustainability, as we unravel the intricate threads of a systematic model poised to shape the future of our global society. For this reason, this article seeks to describe the main characteristics of the compendium of publications indexed in the Scopus database related to the variables Digital Empowerment and Sustainable Development, as well. Such as the description of the position of certain authors affiliated with institutions, during the period between 2017 and 2022.

2. General Objective

To analyze, from a bibliometric and bibliographic perspective, the preparation and publication of research papers in high-impact journals indexed in the Scopus database on the variables Digital Empowerment and Sustainable Development during the period 2017-2022.

3. Methodology

This article is carried out through a research with a mixed orientation 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 variables Digital Empowerment and Sustainable Development. On the other hand, examples of some research works published in the area of study mentioned above are analyzed from a qualitative perspective, based on a bibliographic approach that allows describing the position of different authors on the proposed topic. It is important to note that the entire search was carried out through Scopus, managing to establish the parameters referenced in Figure 1.

3.1. Methodological design

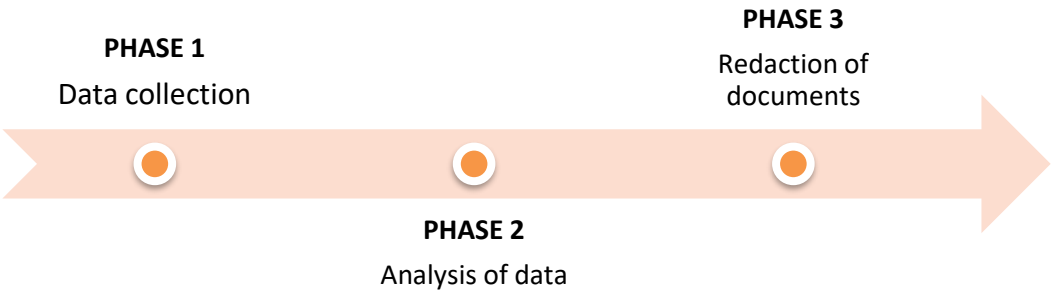

Figure 1. Methodological design
Source: Authors' own creation

3.1.1 Phase 1: Data collection

Data collection was carried out from the Search tool on the Scopus website, where 89 publications were obtained from the following filters:

TITLE-ABS-KEY (food AND security, AND food AND industry, AND sustainability) AND PUBYEAR > 2016 AND PUBYEAR < 2023 AND (LIMIT-TO (AFFILCOUNTRY , "Brazil") OR LIMIT-TO (AFFILCOUNTRY , "Mexico") OR LIMIT-TO (AFFILCOUNTRY , "Colombia") OR LIMIT-TO (AFFILCOUNTRY , "Chile") OR LIMIT-TO (AFFILCOUNTRY , "Venezuela") OR LIMIT-TO (AFFILCOUNTRY , "Uruguay") OR LIMIT-TO (AFFILCOUNTRY , "Peru") OR LIMIT-TO (AFFILCOUNTRY , "Guatemala") OR LIMIT-TO (AFFILCOUNTRY, "Ecuador") OR LIMIT-TO (AFFILCOUNTRY , "Cuba") OR LIMIT-TO (AFFILCOUNTRY , "Costa Rica") OR LIMIT-TO (AFFILCOUNTRY , "Argentina")

- Published documents whose study variables are related to the study of the Digital Empowerment and Sustainable Development variables.
- Limited to the period 2017-2022.
- Without distinction of country of origin.
- Without distinction of area of knowledge.
- No distinction of type of publication.

3.1.2 Phase 2: Construction of analytical material

The information collected in Scopus during the previous phase is organized and then classified by graphs, figures and tables as follows:

- Co-occurrence of words.
- Year of publication
- Country of origin of the publication.
- Area of knowledge.
- Type of publication.

3.1.3 Phase 3: Drafting of conclusions and outcome document

In this phase, the results of the previous results are analysed, 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.

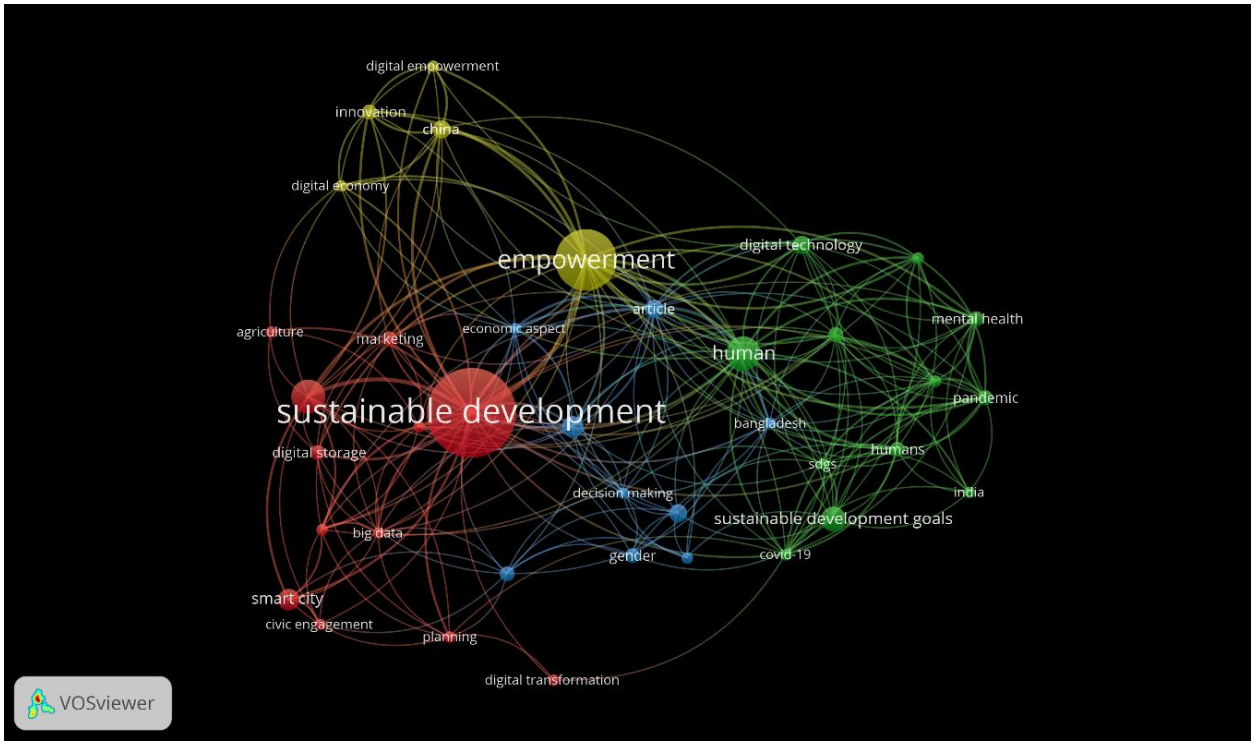

Figure 2. Co-occurrence of words

Source: Authors' own elaboration (2023); based on data exported from Scopus.

Sustainable development was the most frequently used keyword within the studies identified through the execution of Phase 1 of the Methodological Design proposed for the development of this article. Empowerment is among the most frequently used variables, associated with variables such as Digital Technology, Digital Economy, Innovation, Decision Making, Sustainable Development, Digital Storage, Biomass, Big Data, Digital Transformation. The design and implementation of an effective strategy for digital empowerment plays a fundamental role in the sustainable development of contemporary societies. This importance lies in various aspects ranging from access to information to citizen participation and economic boost. The adoption of digital technologies drives innovation and entrepreneurship. It facilitates the creation of startups and the expansion of existing businesses by providing digital tools that improve efficiency, productivity, and market reach. This contributes significantly to sustainable economic development. Therefore, the strategy for digital empowerment facilitates active citizen participation through online platforms. It enables people to contribute to decision-making, express opinions and participate in policy-making, thereby strengthening democracy and participatory governance.

4.2 Distribution of scientific production by year of publication

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

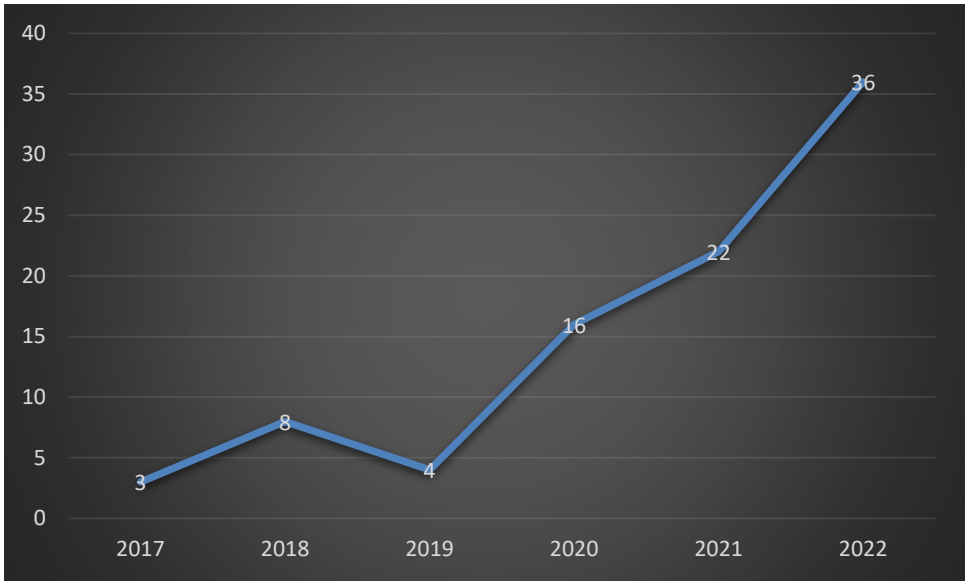

Figure 3. Distribution of scientific production by year of publication.

Source: Authors' own elaboration (2023); based on data exported from Scopus

Among the main characteristics evidenced through the distribution of scientific production by year of publication, the number of publications registered in Scopus was in 2022, reaching a total of 36 documents published in journals indexed on this platform. This can be explained thanks to articles such as the one entitled "Innovation Logic and Optimization of Basic Digital Governance in China under Digital Empowerment and Digital Sustainability" In this study, an analysis of the literature using CiteSpace software and NVivo shows that the research perspectives of grassroots digital governance are broad, But there is a lack of communication and cooperation among research subjects, and a cooperative network of close and benign interaction has not been created. Formed. There are many hot topics in the research, which focus mainly on five aspects: digitalization, grassroots governance, digital governance, digital technology, and the digital field. The topic of these articles is shifting towards digital empowerment, technological empowerment, and "digital intelligence governance." These characteristics and problems correspond to the practice of digital governance at the grassroots level in China. Therefore, in the theory and practice of Chinese-based digital governance, we should adhere to the problem-oriented principle and take "problem-driven" as the basic logic of grassroots digital governance. At the same time, it is necessary to consider the complexity of China's grassroots communities and stages of governance technology, adhere to the principles of integrated development and collaborative innovation, and adopt "mixed governance" as the main logic of grassroots digital governance. Broadly speaking, we need to achieve optimization in grassroots digital governance innovation from three aspects: strengthening the integration of grassroots digital systems, improving the ability to solve grassroots digital governance problems, and advancing the transformation of grassroots digital governance with incremental governance. Logic(Li, 2022)

4.3 Distribution of scientific production by country of origin.

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

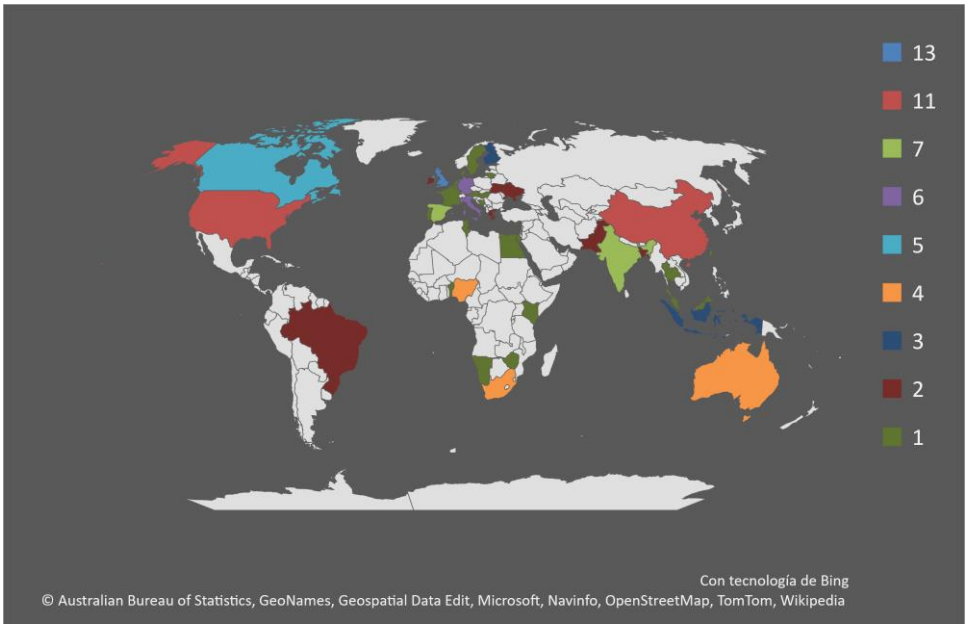

Figure 4. Distribution of scientific production by country of origin.

Source: Authors' own elaboration (2023); based on data provided by Scopus.

Within the distribution of scientific production by country of origin, registrations from institutions were taken into account, establishing the United Kingdom as the country of this community, with the highest number of publications indexed in Scopus during the period 2017-2022, with a total of 13 publications in total. In second place, China with 11 scientific papers, and the United States occupying the third place presenting to the scientific community, with a total of 7 papers among which is the article entitled "Investigating the effect of technology-based village development towards the smart economy: an application of variance-based structural equation modeling" The purpose of this research was to build a citizen science perspective model for a smart economy in a smart village ecosystem using the Structural Equation Model – Partial Least Squares (SEM-PLS) approach. This study proposes a novelty: measuring villagers' readiness to build a smart economy in a smart village ecosystem based on the strength of community support. We propose an evaluation of the perspective of developing a smart economy in a smart village through the level of citizen science that integrates exogenous variables of community support for the environment, citizen character, empowerment, entrepreneurship, innovation and smart economy. The citizen science model towards a smart economy showed a high level of predictive relevance, which was 87.2%. The citizen science model towards a smart economy can also explain empirical data with a GoF value of 0.488. This research showed that indicators of information and communication technology (ICT), ICT literacy, access to education and facilitation of research and development (R+D), motivation for smart villages, and innovation in villages were driven by family participation. Collaboration with the private sector, local government, and communities drives the village's smart economy. The SEM PLS approach has not been widely used in research on the smart village component, especially the relationship between citizen science and smart economics. Therefore, this research can fill the gap in smart village research, which is still dominated by a descriptive approach.(Tosida, 2022)

4.4 Distribution of scientific production by area of knowledge

Figure 5 shows the distribution of the elaboration of scientific publications based on the area of knowledge through which the different research methodologies are implemented.

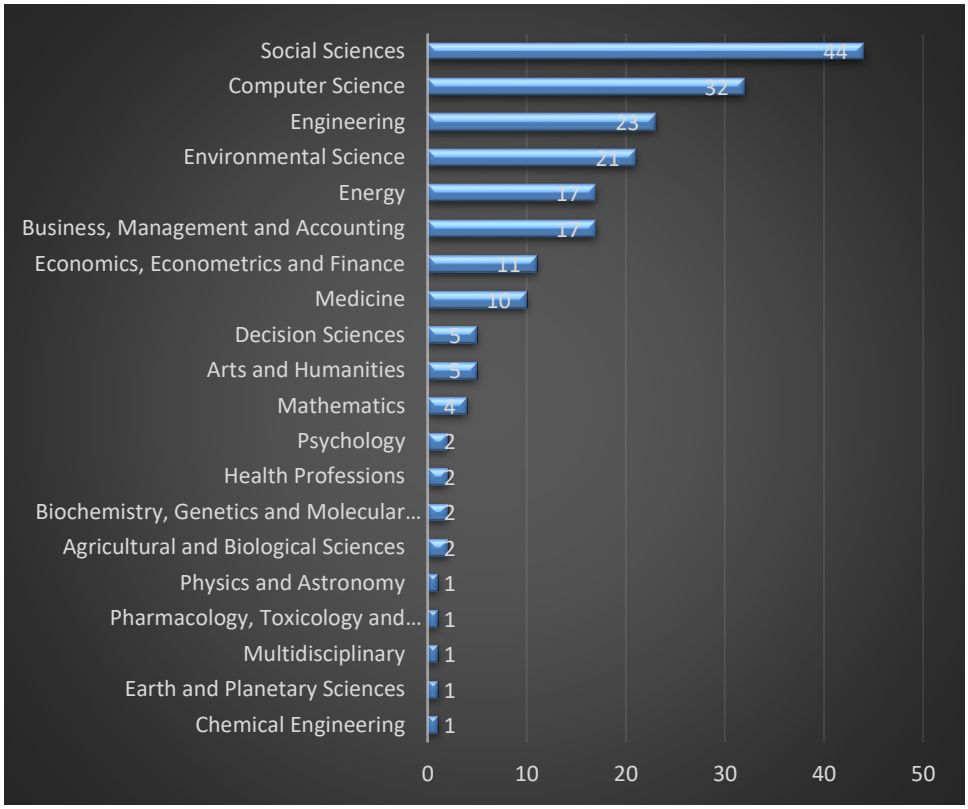

Figure 5. Distribution of scientific production by area of knowledge.

Source: Authors' own elaboration (2023); based on data provided by Scopus.

Social Sciences was the area of knowledge with the highest number of publications registered in Scopus with a total of 44 documents that have based their methodologies Digital Empowerment and Sustainable Development. In second place, Computer Science with 32 articles and Engineering in third place with 23. The above can be explained thanks to the contribution and study of different branches, the article with the greatest impact was registered by Social Sciences entitled "Business search based on digital technology of marginalized communities" From an interdisciplinary perspective, this article examines existing research in digital technology, entrepreneurship and development studies to identify whether these three fields can help us understand how these issues can be addressed. problems from a non-commercial strategy approach and propose a conceptual model. We analyzed papers published between 1994 and 2018 in these fields to map the collective state of research and provide a conceptual framework. We believe this will help establish a relationship between digital technology, entrepreneurship and inclusive development. It will also help us understand how to transform the benefits of technology into jobs and income for marginalized communities. This study will encourage researchers to investigate how the United Nations Sustainable Development Goals (SDGs) can be achieved.(Ghauri, 2022)

4.5 Type of publication

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

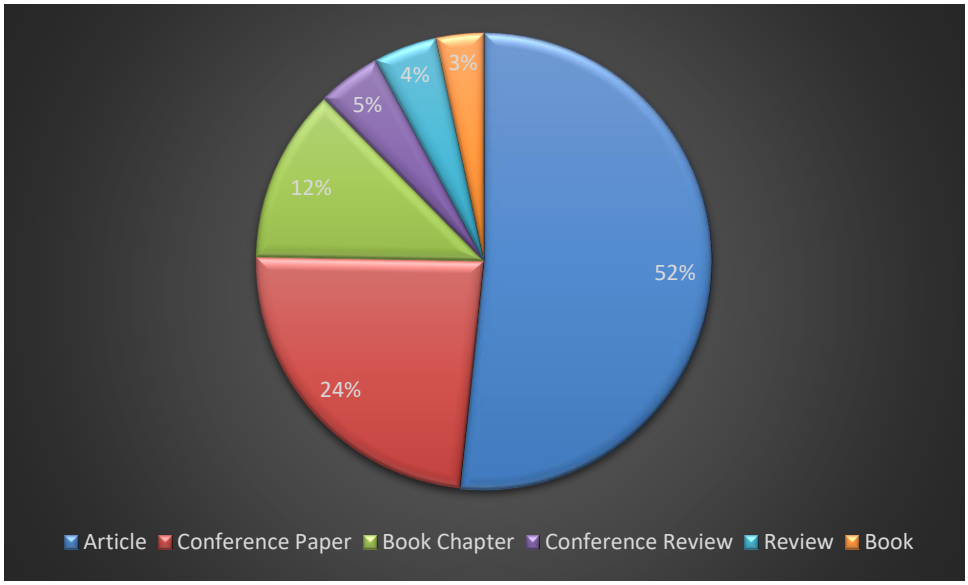

Figure 6. Type of publication.

Fountain: Authors' own elaboration (2023); based on data provided by Scopus.

The type of publication most frequently used by the researchers referenced in the body of this document was the one entitled Journal Articles with 52% of the total production identified for analysis, followed by Session Papers with 24%. Chapter of the Book are part of this classification, representing 12% of the research papers published during the period 2017-2022, in journals indexed in Scopus. In the latter category, the one entitled "Explaining geospatial variation in mobile phone ownership among rural women in Bangladesh: a multilevel and multidimensional approach" stands out. This study aims to review the MPO correlates of rural women in Bangladesh and explain the geospatial variation at the administrative district level in their MPO by controlling for the effect of the sociodemographic correlates of MPO at the individual and household level. In addition, this study attempts to investigate the possibilities of MPO in terms of the scope of its use. This study used the latest nationally representative cross-sectional data from the 2019 Bangladesh Multiple Indicator Cluster Survey. This study reveals that district-level preparedness was a potential source of geospatial variation in the prevalence of MPO among rural women in Bangladesh. The lowest level of preparedness was observed in northwestern Bangladesh. Comparatively older women with better education and media exposure were considerably more likely to suffer from MPO. Older heads of households, especially men, and heads with lower levels of education, hindered women's MPO. This study identified the MPO as a key determinant of its scope of use. In addition, to increase MPO at a faster rate, strategies should target less empowered women, particularly those who lived in districts with less education.(Rahman, 2022)

5. Conclusions

Through the bibliometric analysis carried out in this research work, it was possible to establish that Brazil was the country with the highest number of records published in the Digital Empowerment and Sustainable Development variables, with a total of 13 publications in the Scopus database. In the same way, it was possible to establish that the application of theories framed in the area of Social Sciences, were used more frequently in the implementation of systematic models for the execution of strategies that help the digital improvement in the sustainable development of society, starting from this premise, we reach a juncture in which the promise of a harmonious future becomes palpable. The journey undertaken has been one of nuanced exploration, analysing the intricate interplay between technology, society and sustainability. At the conclusion of this discourse, it is

evident that the strategies encapsulated in this model serve as catalysts for transformative change, paving the way for a future in which the digital realm becomes an instrument of progress, inclusion, and environmental stewardship. The beauty of the systematic model lies in its adaptability, which offers a dynamic framework in which it is able to adapt to the needs of today and to be able to provide solutions to the changing challenges that we find in the communities. By prioritizing digital literacy as the epicenter, the model lays the foundation for an empowered citizenry capable of navigating the complexities of the digital age. In addition, the emphasis on inclusive access to technology ensures that the dividends of progress are not limited to a privileged few, but are shared equitably among diverse socioeconomic strata, fostering a more just and inclusive society. Basically, we can say that being able to integrate digital empowerment strategies in a society that is in constant search of sustainable development affirms that decision-making provided in series of data within a systematic model transforms information into a powerful source for positive change. By being able to exploit this knowledge, societies can make much more comprehensive decisions, where efficiency, innovation and sustainable development are promoted.

In addition, the model champions eco-friendly practices, recognizing the intrinsic link between digitalization and environmental impact. By promoting sustainable technological solutions and fostering a culture of environmental responsibility, the systematic model mitigates the potential negative consequences of rapid digital advancement. In doing so, it aligns technology with the broader ethos of sustainability, ensuring that progress does not come at the expense of our planet. By embracing the principles embedded in this model, we embark on a collective journey towards a brighter, more equitable, and sustainable digital future.

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References

Aarón Jonary Santiaguín-Padilla, F. C.-C.-M.-O.-V.-F.-A.-G. (2023). Wastewater from the Fishing Industry: Challenges and Opportunities in the Recovery of Proteins and Peptides with High Biological and Functional Value- A Review. Mexico.

Chiva, V. S., Berlanga, C. J., Martínez, C. R., & Climent, J. (2017). Advanced oxidation processes in the integral water cycle.

Cid Rubio, B. (2023). Removal and recovery of nutrients from wastewater. SPAIN.

Ghauri, P. F. (2022). Digitally technology-based business search for marginalized communities. UNITED KINGDOM.

Herrera-Chávez, S., Montañez-Cervantes, A. M., Bravo-Jiménez, V. G., Vázquez-Diaz, M. A., & Hernández, J. M. (2021). Application of coupled advanced electrochemical oxidation processes for tannery wastewater treatment. YOUTH IN SCIENCE, 10.

Hou, C., & Ma, C. (2017). An integrated microbial desalination cell-driven capacitive deionization system as an electrochemical means for wastewater treatment, electricity generation and desalination. ECS TransactionsVolume 77, Issue 7, Pages 91 - 982017 Symposium on Solid-State Electronics and Photonics in Biology and Medicine 4 - 231st ECS Meeting 2017New Orleans28 May 2017through 1 June 2017Code 128191.

Khan, S. U., Khan, H., Anwar, S., Khan, S., Boldrin Zanoni, M. V., & Hussain, S. (2020). Computational and statistical modeling for parameters optimization of electrochemical decontamination of synozol red dye wastewater. Chemosphere.

Li, J. Z. (2022). Innovation logic and optimization of grassroots digital governance in China under digital empowerment and digital sustainability. CHINA.

López, R. M., Castellanos, O. O., Lango, R. F., Sosa, V. C., & Ortiz, .. B. (2021). Advanced oxidation as an alternative treatment for wastewater. A review. UTE Approach, 12(4), 76-97.

Melián-Navarro, A. ,.-Z. (2016). Water reuse for agriculture and the environment. SPAIN.

Morató Farreras, J. S. (2016). Sustainable technologies for the purification and treatment of wastewater. Spain.

Ortiz-Martínez, A., Godínez, L. A., Martínez-Sánchez, C., García-Espinoza, J., & Robles, I. (2021). Preparation of modified carbon paste electrodes from orange peel and used coffee ground. New materials for the treatment of dye-contaminated solutions using electro-Fenton processes. Electrochimica Acta.

Páez, C. A., Giraldo, A. J., & Ocampo, G. T. (2005). Construction of an electrochemical reactor for electrocoagulation as an alternative method in wastewater decontamination. Revista Universidad de Caldas, 145-157.

Pérez, J., Llanos, J., Sáez, C., López, C., & Cañizares, P. (2017). Treatment of real effluents from the pharmaceutical industry: A comparison between Fenton oxidation and conductive-diamond electro-oxidation. Journal of Environmental Management, 216 - 223.

Rahman, M. M. (2022). Explaining Geospatial Variation in Mobile Phone Ownership Among Rural Women in Bangladesh: A Multi-Level and Multi-Dimensional Approach. SOUTH ASIA.

Tosida, E. T. (2022). Investigating the Effect of Technology-Based Village Development on the Smart Economy: An Application of Variance-Based Structural Equation Modeling. INDONESIA.

Chiva, V. S., Berlanga, C. J., Martínez, C. R., & Climent, J. (2017). Advanced oxidation processes in the integral water cycle.

Herrera-Chávez, S., Montañez-Cervantes, A. M., Bravo-Jiménez, V. G., Vázquez-Diaz, M. A., & Hernández, J. M. (2021). Application of coupled advanced electrochemical oxidation processes for tannery wastewater treatment. YOUTH IN SCIENCE, 10.

Hou, C., & Ma, C. (2017). An integrated microbial desalination cell-driven capacitive deionization system as an electrochemical means for wastewater treatment, electricity generation and desalination. ECS TransactionsVolume 77, Issue 7, Pages 91 - 982017 Symposium on Solid-State Electronics and Photonics in Biology and Medicine 4 - 231st ECS Meeting 2017New Orleans28 May 2017through 1 June 2017Code 128191.

Khan, S. U., Khan, H., Anwar, S., Khan, S., Boldrin Zanoni, M. V., & Hussain, S. (2020). Computational and statistical modeling for parameters optimization of electrochemical decontamination of synozol red dye wastewater. Chemosphere.

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Ortiz-Martínez, A., Godínez, L. A., Martínez-Sánchez, C., García-Espinoza, J., & Robles, I. (2021). Preparation of modified carbon paste electrodes from orange peel and used coffee ground. New materials for the treatment of dye-contaminated solutions using electro-Fenton processes. Electrochimica Acta.

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Pérez, J., Llanos, J., Sáez, C., López, C., & Cañizares, P. (2017). Treatment of real effluents from the pharmaceutical industry: A comparison between Fenton oxidation and conductive-diamond electro-oxidation. Journal of Environmental Management, 216 - 223.

dos Santos, A. J., Brillas, E., Cabot, P. L., & Sirés, I. (2020). Simultaneous persulfate activation by electrogenerated H2O2 and anodic oxidation at a boron-doped diamond anode for the

treatment of dye solutions. Science of the Total Environment, 747 doi:10.1016/j.scitotenv.2020.141541

dos Santos, A. J., da Costa Cunha, G., Cruz, D. R. S., Romão, L. P. C., & Martínez-Huitle, C. A. (2019). Iron mining wastes collected from mariana disaster: Reuse and application as catalyst in a heterogeneous electro-fenton process. Journal of Electroanalytical Chemistry, 848 doi:10.1016/j.jelechem.2019.113330

Elaissaoui, I., Akrout, H., Grassini, S., Fulginiti, D., & Bousselmi, L. (2019). Effect of coating method on the structure and properties of a novel PbO2 anode for electrochemical oxidation of amaranth dye. Chemosphere, 217, 26-34. doi:10.1016/j.chemosphere.2018.10.161

Espinoza Márquez, E., Soto Zarazúa, G. M., & Pérez Bueno, J. J. (2020). Prospects for the use of electrooxidation and electrocoagulation techniques for membrane filtration of irrigation water. Environmental Processes, 7(2), 391-420. doi:10.1007/s40710-020-00439-2

Fernandes, A., Chamem, O., Pacheco, M. J., Ciríaco, L., Zairi, M., & Lopes, A. (2019). Performance of electrochemical processes in the treatment of reverse osmosis concentrates of sanitary landfill leachate. Molecules, 24(16) doi:10.3390/molecules24162905

Fernández-Marchante, C. M., Souza, F. L., Millán, M., Lobato, J., & Rodrigo, M. A. (2021). Does intensification with UV light and US improve the sustainability of electrolytic waste treatment processes? Journal of Environmental Management, 279 doi:10.1016/j.jenvman.2020.111597

Garavand, K., & Mosivand, S. (2021). Electrocrystallized NiO nanoparticles for riverwater treatment applications. Applied Physics A: Materials Science and Processing, 127(1) doi:10.1007/s00339-020-04185-y

García-Espinoza, J. D., Robles, I., Durán-Moreno, A., & Godínez, L. A. (2021). Photo-assisted electrochemical advanced oxidation processes for the disinfection of aqueous solutions: A review. Chemosphere, 274 doi:10.1016/j.chemosphere.2021.129957

Georg, S., de Eguren Córdoba, I., Sleutels, T., Kuntke, P., Heijne, A. T., & Buisman, C. J. N. (2020). Competition of electrogens with methanogens for hydrogen in bioanodes. Water Research, 170 doi:10.1016/j.watres.2019.115292

Ghanbari, F., Wang, Q., Hassani, A., Wacławek, S., Rodríguez-Chueca, J., & Lin, K. -. A. (2021). Electrochemical activation of peroxides for treatment of contaminated water with landfill leachate: Efficacy, toxicity and biodegradability evaluation. Chemosphere, 279 doi:10.1016/j.chemosphere.2021.130610

Guo, X., & You, S. (2017). Characterization of hydrodynamics and electrochemical treatment of dye wastewater in two types of tubular electrochemical reactors. Paper presented at the IOP Conference Series: Earth and Environmental Science, , 81(1) doi:10.1088/1755-1315/81/1/012008 Retrieved from www.scopus.com

Hanumanthappa, S., Shivaswamy, M., & Mahesh, S. (2019). Optimization of batch electrochemical coagulation for treatment of real textile wastewater using stainless steel electrodes by ccd of rsm. Desalination and Water Treatment, 146, 85-97. doi:10.5004/dwt.2019.23619

Hegde, S. S., Surendra, B. S., Talapatadur, V., Murahari, P., & Ramesh, K. (2020). Visible light photocatalytic properties of cubic and orthorhombic SnS nanoparticles. Chemical Physics Letters, 754 doi:10.1016/j.cplett.2020.137665

Hou, C. H., & Ma, C. Y. (2017). An integrated microbial desalination cell-driven capacitive deionization system as an electrochemical means for wastewater treatment, electricity generation and desalination. Paper presented at the ECS Transactions, , 77(7) 91-98. doi:10.1149/07707.0091ecst Retrieved from www.scopus.com

Jakab, A., Pode, R., Pop, A., Schoonman, J., Orha, C., & Manea, F. (2017). TIO2-modified zeolite-carbon nanotubes composite electrode for photoelectrodegradation of pentachlorophenol from water under uv irradiation. WIT Transactions on Ecology and the Environment, 216, 133-142. doi:10.2495/WS170121

Ken, D. S., & Sinha, A. (2021). Dimensionally stable anode (Ti/RuO2) mediated electro-oxidation and multi-response optimization study for remediation of coke-oven wastewater. Journal of Environmental Chemical Engineering, 9(1) doi:10.1016/j.jece.2021.105025

Khan, S. U., Khan, H., Anwar, S., Khan, S., Boldrin Zanoni, M. V., & Hussain, S. (2020). Computational and statistical modeling for parameters optimization of electrochemical decontamination of synozol red dye wastewater. Chemosphere, 253 doi:10.1016/j.chemosphere.2020.126673

Kim, J. H., Maitlo, H. A., & Park, J. Y. (2017). Treatment of synthetic arsenate wastewater with iron-air fuel cell electrocoagulation to supply drinking water and electricity in remote areas. Water Research, 115, 278-286. doi:10.1016/j.watres.2017.02.066

Lin, S., Mackey, H. R., Hao, T., Guo, G., van Loosdrecht, M. C. M., & Chen, G. (2018). Biological sulfur oxidation in wastewater treatment: A review of emerging opportunities. Water Research, 143, 399-415. doi:10.1016/j.watres.2018.06.051

Liu, Y., Deng, Y. -., Zhang, Q., & Liu, H. (2021). Overview of recent developments of resource recovery from wastewater via electrochemistry-based technologies. Science of the Total Environment, 757 doi:10.1016/j.scitotenv.2020.143901

Łuba, M., Mikołajczyk, T., Pierożyński, B., Smoczyński, L., Wojtacha, P., & Kuczyński, M. (2020). Electrochemical degradation of industrial dyes in wastewater through the dissolution of aluminum sacrificial anode of Cu/Al macro-corrosion galvanic cell. Molecules, 25(18)doi:10.3390/molecules25184108