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The Emergence of Green Finance in the Digital Age: Catalyst for a Sustainable and Innovative Economy

L'émergence de la finance verte à l'ère numérique: Catalyseur d'une économie durable et innovante.

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Summary:

This article explores the complex interconnection between digitization, green finance, and economic sustainability, highlighting the transformative potential of digitization for a greener economy. Adopting a rigorous research methodology, we examine the foundations of digitization and green finance, identifying the challenges and opportunities inherent in their convergence. The principles and objectives of green finance, inspired by thinkers such as Zadek and Elkington, are confronted with the advances of digitization. Our theoretical analysis reveals complex synergies between digitization and green finance, highlighting their implications for transparency, market efficiency, impact measurement, investment diversification, and innovation. However, these synergies pose challenges such as data security and regulation, requiring a responsible approach.

In examining the challenges of digitizing green finance, we highlight the contributions of renowned researchers such as Rob Bauer, Andreas G. F. Hoepner, and Ioannis Oikonomou. Data privacy and regulatory challenges emerge as significant obstacles to a successful transition to greener, more sustainable finance. Our four-step methodology offers a balanced analysis of technological and regulatory challenges, exploring theoretical perspectives and potential solutions. Experts such as Rob Bauer, Andreas G. F. Hoepner, Ioannis Oikonomou, and Carolyn M. Wilkins offer innovative strategies for overcoming these obstacles, emphasizing the importance of collaboration and proactive regulation.

Our article contributes to understanding the relationship between digitization, green finance, and economic sustainability. Although the transition to green digital finance presents challenges, the theoretical recommendations offer promising avenues for a more responsible and innovative economy. Our analysis encourages ongoing reflection and determined action to build a more sustainable future.

Keywords: Innovation; Green Finance; Economic Sustainability; Technological Challenges; Catalyst.

African Scientific Journal
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Introduction

In an ever-changing world, the intersection between digitization, green finance, and economic sustainability is of crucial importance (Zadek, 2021). Today's environmental challenges demand responsible economic transformation, with digitization emerging as a central player in promoting a greener, more sustainable economy. Our paper embarks on an in-depth exploration of this vital issue, employing a rigorous theoretical research methodology. Drawing from the foundational realms of digitization and green finance, our approach meticulously uncovers the challenges and opportunities intrinsic to their integration. The examination of the principles and objectives of green finance is juxtaposed against the backdrop of digitization's technological advances. Notably, key challenges surface, including data security and regulation, illuminating intricate facets in the context of the digitization of green finance. An extensive discussion emerges on how these challenges could potentially impede the transition to a greener, more sustainable economy.

Continuing our exploration, we delve into the potential synergies between digitization and green finance from a theoretical perspective, elucidating how these two fields can mutually reinforce each other. The discourse extends to the potential benefits that digitization can bring to green finance, encompassing transparency, market efficiency, impact measurement, investment diversification, and innovation. Concluding the introduction, we present our research methodology, meticulously detailing the steps taken to navigate this complex issue. The exposition includes our specific findings and personal contributions, addressing the central question of our research. In summary, our paper provides an informed perspective on the indispensable role of digitization as a catalyst for green finance, contributing to a more responsible and innovative economy. We aspire that this profound exploration of the links between digitization, green finance, and economic sustainability will inspire novel ideas and actions in the pursuit of a more sustainable future for all.

African Scientific Journal
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I. Digitization and Green Finance: The Basics

1.1 Introduction to the principles and objectives of green finance

The founding principles of green finance are firmly rooted in concepts from eminent thinkers such as Simon Zadek and John Elkington. Zadek, a strong advocate of integrating environmental, social, and governance (ESG) considerations, was instrumental in developing the idea that these factors should guide financial choices. Elkington's innovative "Triple Bottom Line" concept broadens the traditional view of profitability by incorporating social and environmental impacts. The United Nations Principles for Responsible Investment reinforce this ESG integration in investment strategies. Michael Porter and Mark Kramer put the spotlight on "Creating Shared Value", demonstrating that companies can play a key role in resolving societal issues while still making a profit. These foundations call for greater transparency and financial responsibility.

The objectives of green finance are converging towards the creation of a sustainable and socially responsible economy. Porter, Kramer, and the United Nations Principles for Responsible Banking Initiative play crucial roles. The Task Force on Climate-related Financial Disclosures aims to increase the transparency of climate risks. The PRI encourages investors to integrate ESG considerations into their investment decisions. Researchers such as Elkington stress the importance of measuring social and environmental impact. Overall, the objectives encompass diversity, inclusion, and social justice, aligning financial interests with environmental and social priorities.

1.2 Introduction to digitalization and its impact on green finance.

The rapid evolution of digitalization offers fascinating new opportunities for green finance, as highlighted by experts such as Simon Zadek and Michael Jantzi. Zadek recognizes the transformative potential of digitization to increase transparency and accountability. According to Jantzi, technological advances, particularly in data analysis, are transforming the way investors assess ESG criteria. Don and Alex Tapscott's "Blockchain Revolution" highlights how blockchain technology can improve the transparency of financial transactions in green finance.

African Scientific Journal
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Vol : 3, Numéro 21, Décembre 2023

1.3 Exploring the synergies between digitization and green finance from a theoretical perspective.

Exploring the synergies between digitization and green finance, from a theoretical perspective, reveals a complex and ever-changing landscape. Simon Zadek focuses on data transparency, highlighting the crucial role of digitization in the collection and analysis of ESG data. Eugene Fama sheds light on how digitization contributes to market efficiency by rapidly integrating ESG information into asset prices. Jed Emerson and Antony Bugg-Levine highlight the need to measure the real impact of social and environmental investments, benefiting from the ability of digitization to quantify this impact. Robert Merton explores diversification theory, showing how digitization facilitates access to a diverse range of green investments. Clayton Christensen highlights the potential of digitization to drive innovation in green finance.

These complex synergies are crucial to the development of sustainable finance, enhancing transparency, market efficiency, impact measurement, investment diversification, and innovation. However, they pose challenges such as data protection, security, and regulation, requiring a responsible approach to ensure a sustainable transition to digital green finance.

II. Challenges of Digitizing Green Finance

2.1 Identification of the main challenges associated with the digitization of green finance, including data security and regulation.

The transition to green finance, which seeks to integrate environmental considerations into financial decisions, faces several major challenges, among which data security and regulation occupy a central place. Renowned experts such as Rob Bauer have addressed these crucial aspects of the digitization of green finance. Rob Bauer, Emeritus Specialist in Sustainable Finance, has explored the issue of data security and regulation in the context of the digitization of green finance. His research highlights the potential risks associated with the collection and storage of sensitive data related to green investments. He also proposes the measures needed to mitigate these risks, underlining the importance of guaranteeing the confidentiality and protection of sensitive financial information.

Andreas G. F. Hoepner, a leading researcher in the field of green finance, focuses on assessing the risks associated with responsible investment, with particular emphasis on the regulatory challenges created by the digitization of green finance. His work offers essential insights into

African Scientific Journal
ISSN : 2658-9311
Vol : 3, Numéro 21, Décembre 2023

how regulators can accompany this process while preserving financial stability, underlining the importance of striking a balance between digital innovation and financial security. Ioannis Oikonomou, another influential researcher, has explored the ramifications of the digitization of green finance, looking in particular at crucial issues such as data security. His contributions enrich our understanding of the issues involved in managing environmental data in this context, highlighting the importance of adopting secure practices in the collection and use of this sensitive data. Carolyn M. Wilkins, an expert in financial regulation issues, discussed how regulators can adjust their frameworks to support the digitization of green finance, while ensuring investor protection and the stability of the financial system. Her perspectives highlight the need to develop appropriate regulatory policies to support this evolution while minimizing potential risks.

2.2 Discussion of how these challenges can hinder the transition to greener, more sustainable finance.

At the heart of sustainable finance debates lies the analysis of the obstacles that complicate the transition to greener, more sustainable finance. Leading thinkers such as Rob Bauer, Andreas G. F. Hoepner, Ioannis Oikonomou, and Carolyn M. Wilkins have highlighted the potential challenges that lie ahead in this crucial evolution. Data security emerges as a major concern, with a particular focus on Rob Bauer, who carefully assessed the risks associated with collecting and storing sensitive data related to green investments.

Concerns about the confidentiality and protection of sensitive financial information represent a significant barrier to the widespread adoption of greener financial practices. The reluctance of investors and financial institutions to share sensitive data persists as long as adequate data security guarantees are not in place. Andreas G. F. Hoepner, meanwhile, highlighted the regulatory challenges inherent in the digitization of green finance. The absence of clear regulatory frameworks can hinder the growth of green finance, as it becomes difficult for financial players to understand and comply with regulatory requirements. Clear guidelines are essential to enable investors and financial institutions to fully engage in responsible investment practices.

Ioannis Oikonomou enriched this debate by exploring the digitization of green finance, highlighting crucial issues including data security. Carolyn M. Wilkins addressed how regulators can adjust their frameworks to promote the digitization of green finance while

African Scientific Journal
ISSN : 2658-9311
Vol : 3, Numéro 21, Décembre 2023

ensuring investor protection and financial system stability. His research offers essential avenues for resolving regulatory challenges, highlighting the need for proactive adaptation of existing frameworks. To overcome these obstacles, it is becoming imperative to establish robust regulations and data security standards in the field of green finance. Close collaboration between financial players, researchers, and regulators is needed to develop regulatory frameworks that encourage the transition to greener finance while ensuring data security (Hoti, S., McAleer, M., & Pauwels, L. L. (2007). Together, these efforts will create an environment conducive to the sustainable growth of green finance, harmoniously reconciling environmental and financial objectives.

III. Methodology

This article uses a comprehensive four-step approach to explore how digitization can facilitate the transition to greener, more sustainable finance while addressing the various technology and regulatory challenges. To begin with, we conducted a thorough review of existing academic literature to gain an in-depth understanding of the theoretical underpinnings of digitization, green finance, and regulatory hurdles. Following this, we identified the main challenges arising from the digitization of green finance, with a particular focus on technological and regulatory aspects. In the third stage, we examined theoretical perspectives and potential solutions to overcome these challenges and accelerate the transition to greener, more sustainable finance. Finally, I contributed my ideas and discoveries to this discussion, bringing additional value and improving understanding of the subject. By employing this methodology, we were able to offer a comprehensive and balanced analysis of the issues involved in digitizing green finance, highlighting opportunities and theoretical solutions that can contribute to a more sustainable economy.

African Scientific Journal
ISSN : 2658-9311
Vol : 3, Numéro 21, Décembre 2023

IV. Perspectives and Solutions

4.1 Analysis of theoretical opportunities for overcoming the challenges of digitizing green finance.

Examining potential strategies for overcoming the obstacles encountered in the transition from green finance to a digital platform represents a crucial element in the financial sector's advancement towards sustainability and environmental responsibility. Renowned academics and experts such as Rob Bauer, Andreas G. F. Hoepner, Ioannis Oikonomou and Carolyn M. Wilkins have made significant contributions to this perspective, offering valuable insights into potential avenues for progress. Rob Bauer, a renowned authority on sustainable finance, examined how digitization can act as a catalyst for green finance. His analysis highlights the central role of data in the evaluation of environmentally friendly investments. Thanks to digitization, vast quantities of data relating to environmental and social criteria can be collected, stored, and analyzed. This data can be used to assess the sustainability of investments, enabling investors to make informed decisions. Bauer also highlights the potential of blockchain technology to establish transparent and unforgeable records of green investments, thereby promoting trust between stakeholders. Andreas G. F. Hoepner, a leading researcher in green finance, examines the regulatory challenges associated with digitization. His research shows that regulations must evolve to adapt to the digital transformation underway in the financial sector. With the automation of transactions and the growing use of artificial intelligence, regulations need to be agile and flexible, guaranteeing investor protection while fostering innovation. Regulators need to work closely with industry professionals to develop regulatory frameworks that encourage the adoption of digital technologies while preserving financial stability.

Ioannis Oikonomou offers a unique perspective on the impact of digitization on environmental data management, highlighting how it can improve the efficiency of environmental data collection, analysis, and communication. This in turn enables investors to better understand the risks and opportunities associated with sustainable development, facilitating informed decision-making on responsible investment. Financial regulation expert Carolyn M. Wilkins explains how regulators can adapt their practices to support the digitization of green finance. She stresses

the importance of creating a regulatory framework that fosters innovation while ensuring investor protection and financial system stability. This involves establishing specific standards

African Scientific Journal
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Vol : 3, Numéro 21, Décembre 2023

and guidelines for green financial products and practices, as well as closely monitoring technological advances and associated risks. Overall, this theoretical analysis highlights the myriad opportunities presented by digitization to strengthen green and sustainable finance.

It demonstrates that technology not only has the potential to address current challenges but also opens up new avenues for accelerating the transition to environmentally and socially responsible finance. The contributions of these researchers highlight the wealth of ideas and perspectives that are likely to shape the future of green finance in an increasingly digitized world.

4.2 Examination of potential solutions from a conceptual point of view to accelerate the transition to greener, more sustainable finance despite the obstacles.

In examining potential solutions for accelerating the transition to greener, more sustainable finance, despite the challenges that currently exist, several innovative strategies and theoretical approaches were identified. Respected researchers and experts in sustainable finance, including Rob Bauer, Andreas G. F. Hoepner, Ioannis Oikonomou, and Carolyn M. Wilkins, highlighted some noteworthy solutions. Rob Bauer, an expert in sustainable finance, proposed the concept of "integrated green finance". This approach highlights the need for greater collaboration between financial players, businesses, governments, and civil society. By taking advantage of digitalization, this approach aims to improve communication and collaboration between these stakeholders. By seamlessly integrating environmental data, financial performance metrics, and sustainable development goals, integrated green finance has the potential to align the interests of all parties involved and facilitate the transition to greener financial practices.

Andreas G. F. Hoepner stresses the importance of taking proactive steps to regulate the digitization of green finance. The suggestion is to establish comprehensive regulatory frameworks that foster innovation, protect investors, and maintain financial stability. By implementing specific standards for green financial products and practices, regulators can create a favorable environment for the growth of green finance while minimizing potential risks to the financial system. Ioannis Oikonomou proposes the use of emerging technologies such as artificial intelligence (AI) and machine learning to improve the collection and analysis of environmental data. This integration of AI can facilitate the identification of green investment opportunities in real-time, enabling investors to make more informed decisions. This approach harnesses the power of digitization to improve the accessibility and efficiency of green finance.

African Scientific Journal
ISSN : 2658-9311
Vol : 3, Numéro 21, Décembre 2023

Carolyn M. Wilkins calls for greater collaboration between regulators, financial players, and researchers to establish best practices for the digitization of green finance. Through this collaboration, industry guidelines and codes of conduct can be developed to encourage the adoption of digital technologies while preserving investor confidence.

Having scrutinized various conceptual solutions for accelerating the transition to greener, more sustainable finance, it becomes clear that digitization has the potential to make a significant contribution to this transformation process. The recommendations put forward by these esteemed researchers testify to the importance of fostering collaboration, implementing smart regulations, and promoting technological progress to overcome obstacles and pave the way towards a financial sector that is not only environmentally conscious but also socially responsible.

V. Results

With regard to the objectives of green finance, Michael Porter and Mark Kramer have made significant contributions by introducing the concept of "shared value creation", emphasizing that companies can play a central role in solving societal challenges while remaining profitable. The UN's Responsible Banking Initiative plays a key role in encouraging the banking sector to adopt more sustainable practices. The Task Force on Climate-related Financial Disclosures (TCFD) was set up to improve transparency on climate-related risks for companies and investors, thereby promoting informed decision-making on climate-related issues. In addition, the United Nations' Principles for Responsible Investment (PRI) have played a major role in encouraging institutional investors to integrate ESG considerations into their investment decisions. In addition, researchers such as John Elkington, with his TBL model, stress the importance of evaluating corporate performance not only in terms of financial gains, but also in terms of social and environmental impact. The work of these esteemed authors underlines the importance of green finance, digitization and their interconnection in guiding financial decisions towards more responsible practices, while also contributing to solving today's social and environmental challenges. In addition, Michael Jantzi, founder of Jantzi Research (now Sustainalytics), contributed to the advancement of green finance by highlighting the importance of technological advances, particularly in data analysis, in revolutionizing the way investors assess and integrate ESG criteria into their investment portfolios. Robert Merton also made notable contributions, exploring diversification theory and showing how digitization is facilitating access to a wide range of green investments. Finally, Clayton Christensen

African Scientific Journal
ISSN : 2658-9311
Vol : 3, Numéro 21, Décembre 2023

highlighted the potential of digitization to drive innovation in green finance, leading to more efficient business models and the development of new sustainable financial solutions. An in-depth look at the principles and objectives of green finance reveals a solid foundation developed by renowned authors and experts. Among these influential figures, Simon Zadek, a fervent advocate of integrating environmental, social, and governance (ESG) considerations into financial decision-making, played an important role in establishing the idea that ESG factors should guide financial choices. Similarly, John Elkington introduced the revolutionary concept of the Triple Bottom Line (TBL), which encourages companies to assess their performance in terms of social and environmental impact, not just financial returns. The UN's Principles for Responsible Investment (PRI), developed in collaboration with experts in sustainable finance, have been widely adopted by institutional investors, reinforcing the idea that integrating ESG principles is vital for sustainable and responsible finance. Michael Porter and Mark Kramer introduced the concept of "Creating Shared Value", demonstrating that companies can actively contribute to solving societal problems, while at the same time reaping economic benefits.

VI. Discussion

When examining the relationship between digitization and green finance, it becomes clear that the subject is multifaceted and constantly evolving. Many influential academics have contributed to our understanding of this link, offering diverse perspectives on how digitization and green finance are linked and how they will shape the future of sustainable finance. One such scholar was Simon Zadek, who highlighted the importance of data transparency in green finance. He emphasized how digitization plays a crucial role in the collection, analysis, and dissemination of data related to environmental, social, and governance (ESG) factors. By leveraging technology, investors are able to make informed decisions about sustainable investments. This increased transparency is at the heart of digitization, as it provides access to a vast pool of data enabling an accurate assessment of companies' ESG performance. By introducing the concept of efficient markets, Eugène Fama laid the foundations for understanding how the digitization of financial markets contributes to their efficiency. This is achieved by rapidly integrating relevant environmental, social and governance (ESG) information into asset prices. As a result, investors can make more informed decisions about sustainability risks and opportunities, increasing interest in green finance. In addition, researchers such as Jed Emerson and Antony Bugg-Levine have stressed the importance of measuring the real impact of social and environmental investments, and digitization offers

African Scientific Journal
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Vol : 3, Numéro 21, Décembre 2023

powerful tools for quantifying and tracking this impact accurately and transparently. Thanks to technology, real-time data on the environmental and social results of investments can be collected, enabling investors to clearly understand the effects of their actions. Robert Merton, meanwhile, explored diversification theory and demonstrated how digitization facilitates access to a diverse range of green investments. Thanks to online platforms and digital markets, investors can allocate their resources more efficiently, thereby reducing the risks associated with green finance. Finally, Clayton Christensen highlighted the potential of digitization to drive innovation in green finance by enabling the creation of new financial solutions and improving the efficiency of business models. The advent of digitization has created fertile ground for the growth of sustainable finance.

The insights provided by these authors and their theories highlight the complex connections between digitization and green finance. These connections are of the utmost importance for the advancement of sustainable finance, as they improve transparency, market efficiency, impact measurement, investment diversification and foster innovation. However, these synergies are not without their obstacles, particularly in terms of data protection, security and regulation. These challenges need to be addressed to ensure a responsible and sustainable transition to digital green finance.

African Scientific Journal
ISSN : 2658-9311
Vol : 3, Numéro 21, Décembre 2023

Conclusion

Let's delve into the intertwining of digitization, green finance and economic sustainability, highlighting the crucial importance of this convergence for our collective future. Our analysis reveals a complex but promising landscape, where technology and responsible finance are converging to shape a greener, more sustainable economy. One of the key findings of our research lies in the theoretical synergies between digitization and green finance. We have illustrated how these two fields can reinforce each other, promoting transparency, market efficiency, impact measurement, investment diversification and innovation. These theoretical advantages point the way to a future where financial decisions fully integrate environmental, social and governance (ESG) considerations, creating a financial world aligned with global sustainability priorities. Nevertheless, our research has not sidestepped the challenges that accompany this transformation, notably data security and regulation, requiring concerted action and innovative solutions.

Using our theoretical research methodology, we have made our own contribution to this burgeoning field. By highlighting specific opportunities and challenges, we are helping to broaden understanding of the complex relationship between digitization, green finance and economic sustainability. This contribution is part of an ongoing dialogue aimed at shaping a more responsible and innovative economy. In summary, our paper has examined the foundations, challenges, prospects and solutions associated with the digitization of green finance. It has shown that digitization can be a key driver for promoting green finance and economic sustainability. In this ever-changing world, it is our responsibility to continue this reflection and act with determination to build a greener, more sustainable and more responsible future for generations to come.

New avenues of research

Some of these avenues of research could also be explored in conjunction to create a holistic approach to digital green finance. For example, by combining megadata analysis with blockchain, it is possible to create real-time environmental impact tracking systems, thereby improving transparency and accountability. What's more, integrating digital green finance education into training programs can help develop a skilled workforce capable of effectively managing these new technologies in the service of economic sustainability. By collaborating with businesses, regulators and non-profit organizations, innovative public-private partnerships

African Scientific Journal
ISSN : 2658-9311
Vol : 3, Numéro 21, Décembre 2023

can be developed to promote digital green finance and accelerate the transition to a more responsible economy. In sum, these new avenues of research offer fertile ground for multidisciplinary and integrated approaches to solving the challenges of green finance in an ever-changing digital world, while exploiting opportunities to foster economic sustainability.

African Scientific Journal
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Vol : 3, Numéro 21, Décembre 2023

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