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How does artificial intelligence influence on company's green intellectual capital?

Kako veštačka inteligencija utiče na zeleni intelektualni kapital kompanije?

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Abstract: The research paper investigates the artificial intelligence (AI) influence on company's green intellectual capital and its components in New York Stock Exchange (NYSE) listed companies in the period od 30th of November until now. A qualitative textual content lexical analyses were done on 8.667 pages and 2.553.016 words. The study identified 3 main outcomes: (1) profitability; (2) green relational capital component; (3) green organizational capital component. The study proves that the biggest US listed companies indexed on S&P 500 index communicate intensively in public discourse about importance of artificial intelligence and its influence on green intellectual capital components. The results provide new insights into importance of AI as a new driver of competitive advantage.

Keywords: artificial intelligence, green intellectual capital, NYSE.

Sažetak: Istraživački rad istražuje uticaj veštačke inteligencije (AI) na zeleni intelektualni kapital kompanije i njegove komponente u kompanijama koje kotiraju na njujorškoj berzi (NYSE) u periodu od 30. novembra do sada. Urađena je kvalitativna leksička analiza tekstualnog sadržaja na 8.667 stranica i 2.553.016 reči. Studija je identifikovala 3 glavna ishoda: (1) profitabilnost; (2) komponenta zelenog relacionog kapitala; (3) komponenta zelenog organizacionog kapitala. Studija dokazuje da najveće američke kompanije koje su indeksirane na S&P 500 indeksu intenzivno komuniciraju u javnom diskursu o značaju veštačke inteligencije i njenom uticaju na komponente zelenog intelektualnog kapitala. Rezultati pružaju nove uvide u značaj AI kao novog pokretača konkurentske prednosti.

Ključne reči: veštačka inteligencija, zeleni intelektualni kapital, NYSE.

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INTRODUCTION

In an era marked by unprecedented technological advancements and an urgent global need for sustainability, the fusion of Artificial Intelligence (AI) and corporate environmental responsibility has emerged as a pivotal frontier. As businesses worldwide grapple with the imperative of reducing their carbon footprint and embracing eco-conscious practices, AI stands poised to revolutionize the way organizations approach sustainability. This research paper delves into the intriguing intersection of AI and Green Intellectual Capital, embarking on a journey to unveil the intricate relationship between these two dynamic forces.

The concept of Green Intellectual Capital (GIC), a multifaceted notion at the juncture of environmental awareness and knowledge-based assets, represents an invaluable resource for contemporary enterprises. It encompasses a company's capacity to develop, assimilate, and utilize knowledge and innovations that promote environmental sustainability, thereby contributing to long-term viability (Dukić

et al. 2023). Con-currently, AI, characterized by its remarkable capacity for data processing, predictive analytics, and autonomous decision-making, is rapidly transforming industries, including those striving to enhance their environmental performance.

This paper aims to explore the profound influence of Artificial Intelligence on a company's Green Intellectual Capital, delving into the various dimensions through which AI catalyzes sustainable practices. It embarks on a comprehensive analysis that not only illuminates the benefits AI can bring to eco-conscious enterprises but also sheds light on potential challenges and ethical considerations that arise in this evolving landscape.

The study navigates through a compelling exploration of AI's role in enhancing resource efficiency, reducing waste, enabling predictive maintenance, and fostering environmentally conscious consumer engagement. Furthermore, it critically examines how AI-driven innovations are shaping corporate strategies for sustainability reporting, stakeholder engagement, and competitive positioning. Throughout this journey, the paper strives to uncover the synergies and tensions that characterize the intricate relationship between AI and Green Intellectual Capital.

As organizations are increasingly confronted with the imperative of harmonizing economic growth with environmental stewardship, understanding the symbiotic bond between AI and Green Intellectual Capital becomes not only pertinent but also pivotal. This research endeavors to provide insights and recommendations that empower companies to harness AI as a catalyst for environmentally sustainable practices while reinforcing their intellectual capital for a greener and more prosperous future.

The paper is organized in the following order: first chapter reviews the latest literature on green intellectual capital, its components and AI as a driver of competitive advantage. Second chapter focuses on the qualitative research methodology and empirical results. Finally, we conclude our paper with final remarks and discussion.

1. LITERATURE REVIEW

1.1. Role of Artificial Intelligence in the corporate world

In today's fast-paced business environment, staying competitive is a paramount concern for organizations across industries. Artificial Intelligence has emerged as a transformative force with the potential to revolutionize business operations and strategies. This literature review explores the evolving landscape of AI and its crucial role in helping companies gain a competitive edge.

AI has become instrumental in augmenting decision-making processes within organizations. Authors Chen et al. (2022) highlight that AI's ability to process and analyze vast datasets provides businesses with timely and data-driven insights. These insights empower companies to make informed decisions, adapt to market changes swiftly, and outperform competitors who rely on traditional decision-making methods. One of the most recognized applications of AI is in improving customer experiences. AI-driven personalization, as examined by Ledro et al. (2022), allows businesses to tailor products, services, and marketing efforts to individual customer preferences. This leads to higher customer satisfaction, increased brand loyalty, and a competitive advantage in customer-centric industries. AI's role in automating routine tasks and processes is well-documented. Pedretti et al. (2021) assert that automation through AI leads to significant cost savings and operational efficiencies. Companies can allocate resources more strategically, reduce errors, and allocate human labor to higher-value tasks, all of which contribute to competitiveness. Predictive analytics powered by AI is invaluable for anticipating market trends and customer behaviors. As indicated by Waltersmann et al. (2021), AI models can provide accurate predictions and forecasts, helping companies adjust their strategies, pricing, and product development in advance of market shifts, thereby maintaining a competitive advantage.

AI's role in supply chain management has grown exponentially. Research by Atwani et al. (2022) shows that AI can optimize supply chain operations by predicting demand, reducing inventory costs, and improving delivery times. Companies with agile and efficient supply chains are better positioned to respond to market fluctuations and customer demands. AI has also emerged as a catalyst for innovation. Mariani et al. (2023) discuss how AI accelerates product development by assisting in research, design, and testing processes. This leads to faster time-to-market for innovative products and services, a key factor in gaining a competitive edge. AI is a powerful tool for competitive intelligence. Madureira et al. (2023) illustrate how AI-driven analysis of competitors' activities, pricing strategies, and market positioning can provide valuable insights for refining one's own strategies, helping companies maintain a competitive advantage.

Artificial Intelligence has become a linchpin for companies seeking to achieve a competitive advantage in today's dynamic business environment. From data-driven decision-making and customer experience enhancement to automation, predictive analytics, and supply chain optimization, AI offers a mult-

itude of pathways to gain an edge in the market. However, successful implementation of AI strategies requires careful planning, investment, and a commitment to ethical and responsible AI practices. As the field of AI continues to evolve, its role in achieving a company's competitive advantage is likely to become even more pronounced.

1.2. Link between AI and green intellectual capital

Green intellectual capital refers to an organization's knowledge, skills, and intangible assets related to environmental sustainability and responsible business practices. As environmental concerns gain prominence, the intersection between AI and GIC is increasingly relevant. This literature review explores the evolving relationship between AI and GIC, highlighting key research findings and implications.

Artificial Intelligence has the potential to significantly impact an organization's sustainability initiatives. Researchers like Hamurcu & Eren (2020) emphasize that AI-driven optimization can enhance energy efficiency, resource utilization, and waste reduction in manufacturing and operations. By minimizing environmental footprints, companies can accrue green intellectual capital. Effective management of environmental knowledge is central to the development of GIC. (Shibin et al., 2016) discuss how AI-based knowledge management systems can capture, share, and disseminate environmentally relevant information across an organization. Such systems help in the cultivation of GIC by enabling employees to access and apply green knowledge effectively. Eco-innovation is a critical component of green intellectual capital. AI-driven tools and techniques facilitate eco-innovation by streamlining the design, development, and implementation of sustainable products and processes (Hussain et al., 2023). AI-driven simulations, for example, can optimize product designs for reduced environmental impact.

The integration of AI in supply chain management contributes to GIC by enhancing supply chain sustainability. Burki (2018) argues that AI-powered supply chain analytics can optimize sourcing, transportation, and logistics decisions to reduce emissions and resource consumption. This optimization aligns with GIC objectives. Accurate environmental reporting and regulatory compliance are essential for building green intellectual capital. AI-driven systems can assist in automating data collection, analysis, and reporting processes (Chen et al., 2020; Petković, 2022). This automation ensures transparency and facilitates adherence to environmental regulations.

The circular economy model focuses on reducing waste and reusing resources. AI plays a pivotal role in identifying opportunities for circular practices (Torugsa & O'Donohue, 2016). Companies that adopt AI-driven circular economy strategies can build GIC through resource efficiency and sustainability. Measuring the impact of AI on GIC is a growing area of research. Researchers like Fang et al. (2023) explore methodologies for quantifying the contribution of AI to GIC. Metrics such as energy savings, emissions reductions, and improved environmental compliance are crucial for assessing this link. The relationship between Artificial Intelligence and green intellectual capital is multifaceted and evolving. AI has the potential to transform organizations' sustainability practices by optimizing operations, enhancing knowledge management, fostering eco-innovation, and ensuring environmental compliance. The resulting benefits in terms of resource efficiency, reduced environmental impact, and sustainable growth contribute directly to the development of green intellectual capital. However, successful integration of AI and GIC requires a strategic approach, investment in AI technologies, and a commitment to sustainability principles.

1.3. Company's success coming from AI and green intellectual capital

As organizations increasingly recognize the importance of sustainability and the potential of AI, the convergence of these two forces has become a focal point in the pursuit of financial success. This literature review explores the relationship between AI, Green Intellectual Capital, and how this association influences a company's financial performance.

Several studies have emphasized the positive relationship between AI-driven sustainability initiatives and financial performance. Notably, research by (Fan et al., 2023) demonstrates that AI-enabled sustainability practices contribute to cost reduction, resource optimization, and enhanced operational efficiency. These factors translate into improved financial performance as companies can reduce expenses and achieve competitive advantages in cost-sensitive markets. The presence of GIC within an organization is a strategic asset that can be leveraged to enhance the financial impact of AI. Petković & Džamić (2020) emphasize that GIC encompasses valuable environmental knowledge and expertise, which can facilitate the successful integration of AI for sustainable innovation. This synergy leads to improved financial performance as organizations can develop and market eco-friendly products and services, tapping into a growing consumer segment. AI plays a pivotal role in facilitating eco-innovation, a core component of GIC.

Chen et al. (2023) argue that AI-driven eco-innovation not only aligns with sustainability goals but also opens up new market opportunities. Companies that invest in AI to drive sustainable product development and process optimization can capture market share, increase revenue, and enhance their financial performance. AI contributes to efficient environmental reporting and regulatory compliance, bolstering stakeholder trust. Liu et al. (2022) highlight that AI-driven data analysis and reporting help companies meet environmental standards and transparency expectations. This, in turn, attracts socially responsible investors and consumers, which can positively impact financial performance.

The literature review underscores that the relationship between Artificial Intelligence, Green Intellectual Capital, and company financial performance is complex and multifaceted. AI enhances sustainability practices, cost efficiency, and innovation capabilities. Meanwhile, GIC forms the knowledge foundation necessary for successful AI integration, sustainability alignment, and the capture of market opportunities. The financial benefits of this relationship are evident through reduced operational costs, increased revenues from sustainable offerings, supply chain efficiency, and improved stakeholder trust. However, successful harnessing of this synergy demands a strategic commitment to sustainability principles, responsible AI practices, and continuous investment. As the AI-GIC nexus continues to evolve, research and business practices should evolve in tandem to fully exploit its potential for driving financial success while addressing pressing environmental concerns.

2. METHODOLOGY

2.1. Preparation and explanation of corpus text

Sample is composed of publicly listed US companies listed on New York Stock Exchange (NYSE) and indexed in the most famous index S&P 500 index. The corpus text was taken from 30th of November because that was the day when a ChatGPT by OpenAI company was officially launched.

The initial sample text is composed of 103 different Trade Journals and Reports officially published by the selected companies. The selected number of papers has 8.667 pages and 2.553.016 words. The whole text was copied into the txt format, and applied in the IRaMuTeQ software. The software has a managerial dictionary translated in corporate English language. The software's dictionary will allow the whole sample corpus text to group or lemmatize into different clusters. Each clusters is related to a specific topic, and words are grouped around topic they belong. In that way, we will identify different groups or drivers, their intensity in public speaking and particular narratives.

2.2. Analysis of Text by IRaMuTeQ software

The software IRaMuTeQ will be used for the purposes of this study. The software was developed by Pierre Ratinaud from the University Toulouse, France in 2008. Until now, the software has been used for numerous not only managerial papers, but also other sciences as well. What makes this software special is the Bibliometric package from R software and Python language required to do any qualitative analysis. The textual analysis emphasizes the position of the work in some semantic textual space because that is what forms the meaning. It is important that the word frequency and words connected to each other are two main rules (Albertini, 2021). The Reinert method that will be applied in the study allows us to create a strategic plan defined through the textual analysis on the topic of artificial intelligence and green intellectual capital.

3. RESULTS AND DISCUSSION

Here we applied Reinert's method analysis.

Reinert's method

The corpus text has 29.863 forms, 76.320 text segments, 25.025 lemmas, which covered 82.57% of the whole initial text. The 3 main categories are presented in the Figure 1.

Figures 1 and 2 showed us better understanding of the relationship between the variables or categories in the factor plan. Each word has to be repeated at least 10 times in order to be considered in the clustering analysis. Three main categories are present in our results, where all categories are separated from each other. This means that the variables are independent and clear. Cluster 1 in red is related to the companies' profitability. This cluster directly correlates to the clusters 2 and 3. Cluster 2 and 3 are linked to each other. Cluster 2 represents green relational capital, whereas cluster 3 green organizational capital. The most present cluster is the cluster number 2 with 45.5%, then is cluster 1 with 38% and finally, it is the cluster number 3 with 16.5% of coverage. We can conclude that company's profitability brings green relational capital and green organizational capital influenced by AI drivers.

Category 1 in red is about profitability (revenue, sales, profits, net income, earnings, etc). Category 2 in green is related to the green relational capital (sustainable relationships with customers, clients, solutions, digital, customer base, customer satisfaction, etc.). Category 3 in blue is linked to the green organizational capital (sustainable organizational system, organizational culture, infrastructure, software, values, etc.).

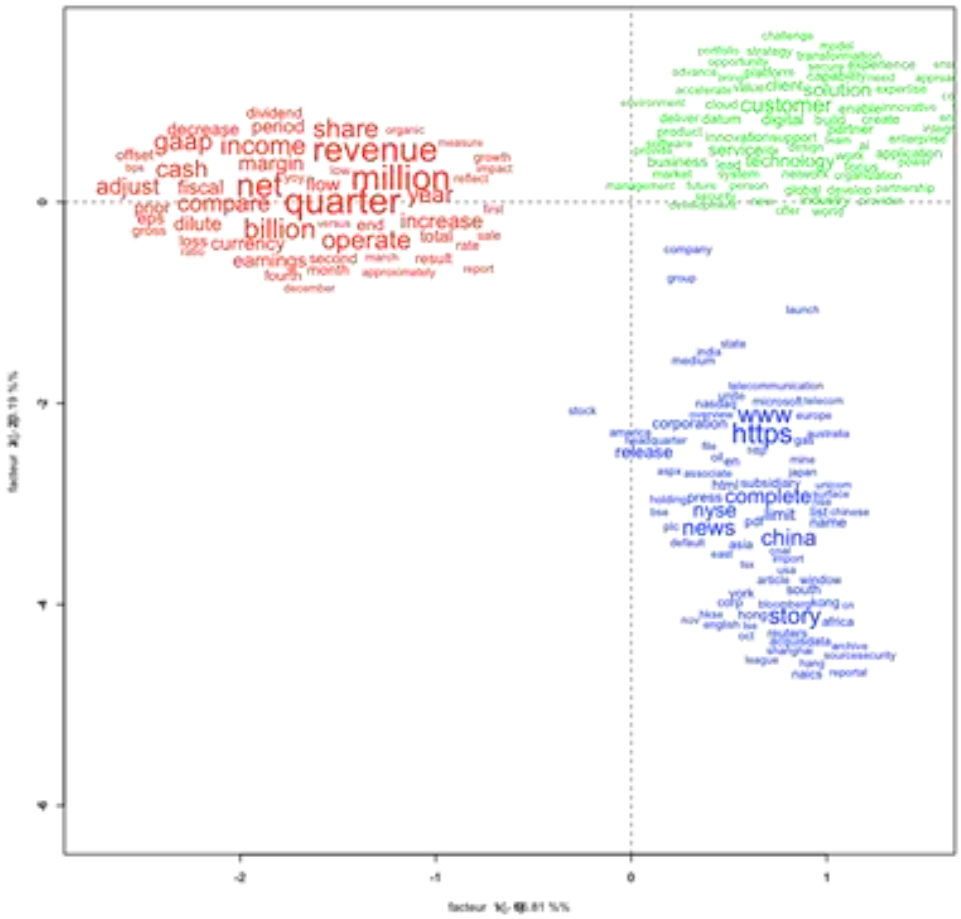

Figure 1. Semantic clouds of 3 categories of corporate news published by observed companies
Source: Author's calculation

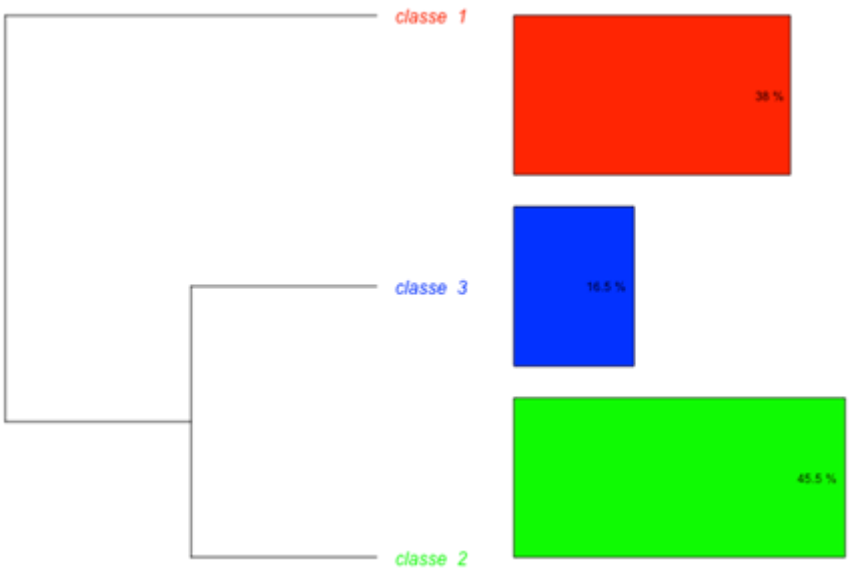

Figure 2. Dendrogram of 3 main classes of corpus text
Source: Author's calculation

Table 1. Categories revealed in the phase 1

Category	Color code	Name	% of forms analyzed
Category 1	Red	Profitability	38%
Category 2	Green	Green Relational Capital	45.5%
Category 3	Blue	Green Organizational Capital	16.5%

Source: Author's calculation

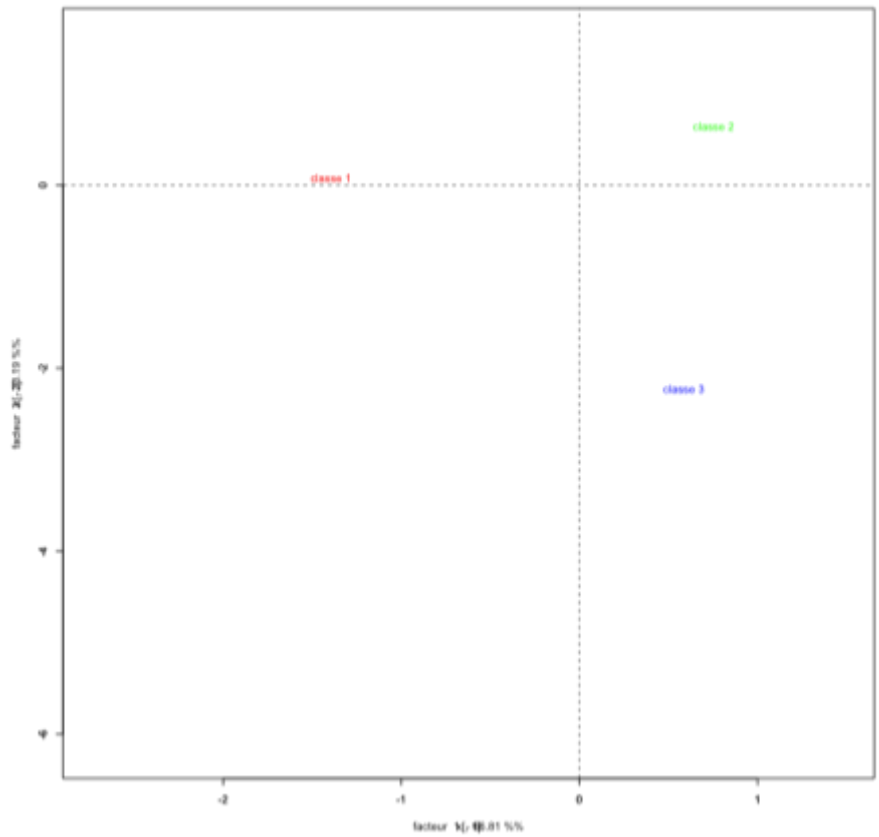

Figure 3. Location of the classes in the Factor plan
Source: Author's calculation

Three main variables are positioned in the factor plan presented in the Figure 3 above. Factorial analysis calculates the strength and positive or negative relationship with other variables. Factorial analysis calculates chi-square correlation values for each variable and frequencies, as well as produces distances of words from the initial corpus text. X-axis presents distance and distribution from variables. Y-axis indicates a tangibility of relationship between variables. The position of every variable is very important and it shows how the five variables are distributed. Both abscissa and ordinate can have positive or negative values. Cluster 1 is positioned in the negative abscissa and positive ordinate. Cluster 2 is positioned in the positive abscissa and positive ordinate. Cluster 3 is positioned in positive abscissa, but negative ordinate. We can conclude that clusters have close and strong tangible relationship.

CONCLUSION

In conclusion, the exploration into the influence of Artificial Intelligence on a company's Green Intellectual Capital has unveiled a complex and dynamic relationship that carries significant implications for modern businesses. In an era marked by the urgent need for sustainability and unprecedented technological advancements, this research paper has delved deep into the intricate interplay between these two transformative forces.

We began our journey by defining Green Intellectual Capital as the amalgamation of environmental awareness and knowledge-based assets, representing a crucial resource for contemporary enterprises. This concept encapsulates a company's capacity to create, assimilate, and leverage knowledge and innovations to foster environmental sustainability, ultimately contributing to long-term viability.

Simultaneously, we explored AI, characterized by its remarkable capabilities in data processing, predictive analytics, and autonomous decision-making. AI has rapidly disrupted industries across the spectrum, including those committed to enhancing their environmental performance. Throughout our investigation, we have unearthed the profound impact of AI on Green Intellectual Capital, uncovering a multitude of dimensions through which AI serves as a catalyst for sustainable practices.

Our comprehensive analysis illuminated the benefits that AI can bestow upon eco-conscious enterprises. We examined AI's role in optimizing resource efficiency, reducing waste, enabling predictive maintenance, and facilitating environmentally conscious consumer engagement. Moreover, we critically assessed how AI-driven innovations are reshaping corporate sustainability strategies, from reporting and stakeholder engagement to competitive positioning (Petkovic, 2023). In this dynamic landscape, we identified both synergies and tensions that shape the intricate relationship between AI and Green Intellectual Capital.

As organizations worldwide grapple with the imperative of aligning economic growth with environmental responsibility, this research underscores the pivotal nature of understanding and harnessing the symbiotic bond between AI and Green Intellectual Capital, especially with green relational capital and green organizational capital components. This knowledge is not merely pertinent; it is essential for companies striving to navigate the ever-evolving sustainability landscape effectively.

In closing, this research endeavor provides valuable insights and recommendations to empower businesses to leverage AI as a potent tool for driving environmentally sustainable practices while concurrently reinforcing their intellectual capital. By embracing this convergence of technology and environmental stewardship, companies can embark on a path toward a greener, more prosperous, and sustainable future, effectively addressing the challenges and opportunities of our time.

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