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The Effects of Green Intellectual Capital on Business Performance: Evidence from Serbia

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Investing in green intellectual capital can create competitive advantage of companies in the long term. In short term, however, more orchestration is required for investment into green resources to boost financial and non-financial performance of business. The aim of this paper is to present the effects of Green Intellectual Capital (Green Human Capital, Green Structural Capital, and Green Relational Capital) on companies' business performance (including their financial and non-financial indicators). For this purpose, primary data were collected from targeted companies operating in the Serbian market (N=344) using a structured questionnaire. The results confirm the positive effects of Green Human Capital and Green Relational Capital on both financial and non-financial indicators of researched companies. Green Structural Capital was not found to have an impact on the companies' financial performance. These findings can contribute to 1) owners and managers in creating sustainable business models, 2) regulators in creating policy frameworks and incentives for sustainable development and 3) other business analysts focused on the green intellectual capital development in companies.

Keywords: *Green Intellectual Capital; Financial Performance; Business Performance; Serbia.*

Introduction

It might be superfluous to claim that intellectual capital plays a pivotal role in business success in the 21st century corporate setting. The concurrent literature is overwhelmed with evidence on the interplay between intellectual capital and financially and non-financially measured business performance (Radonic *et al*., 2021; Milosevic *et al.*, 2021). This is particularly the case in knowledge-intensive industries. In such industries, intellectual capital is important, if not a paramount driver of success. On the other hand, much less has been debated on the effects of green intellectual capital on business performance.

Ever since the inception of the idea of green intellectual capital (Chen, 2008), the concept has been receiving increasing attention from both scholars and practitioners. Early works were focused on defining the main determinants of green intellectual capital and delineating the causal relationship between green intellectual capital and the competitive advantage of firms (Chang & Chen, 2012). The contemporary body of knowledge, however, builds on the conceptual and empirical knowledge on the examination of the antecedents and consequences of green intellectual capital. Some studies inspect the causes of the creation of green intellectual capital (Yong *et al*., 2019; Malik *et al*., 2020), others explore the effects that it makes on various business phenomena, such as corporate environmental performance (Nisar *et al*., 2021), sustainable performance (Yusliza *et al*., 2019; Yusoff *et al*., 2019), process innovation (Jirakraisir *et al*., 2021), and product innovation (Delgado-Verde *et al*., 2014). Surprisingly, only a paucity of research radars has been directed toward the possible effects that green intellectual capital could have on the financial success of firms.

This study aims to fill this research gap. In this paper we examine the relationship between green intellectual capital (its components – green human capital, green structural capital and green relational capital) and the financial and non-financial business performance of companies. To address this aim, we have collected primary data from Serbia. Serbia is an interesting case study for at least two reasons: (a) the actions of the European Union to become the first climate-neutral region by 2050 are planned for candidate countries, such as Serbia and other West Balkan countries, and (b) any investments in climate-related programs in non-EU countries require complex planning, implementation and monitoring (Knez *et al*., 2022).

Our study is cross-sectional by nature and captures only momentum in the examination of the influence of environmental capacities on business performance, as is the case with other similar recent studies (Rehman *et al.,* 2021; Marco-Lajara *et al.,* 2022). However, the original value of this study is based on 1) the conceptual model and 2) geographical context. As for the conceptual model, green intellectual capital has usually been examined as a predictor of a competitive position of companies putting it into a strategic context. Even when it was examined as a financial performance predictor, it has been viewed as a side effect and having moderating, rather than a direct effect on the financial position and success. (Chaudry *et al*., 2016; Xu & Wang, 2018). As for the geographical context, Serbia and transitional countries in general lack evidence on the effects of intellectual capital on business performance (Radonic *et al*., 2021), let alone the green intellectual capital. Moreover, countries from South-East Europe have been scarcely included in the green intellectual capital streams of research. The lack of similar research performed in Serbia makes this study significant in providing insights into the unique challenges and opportunities facing companies in the country in their transition towards more profitable business practices. By examining the effects of gen intellectual capital on Serbian companies, this study fills an important gap in the literature and provides valuable insights for both academia and practitioners.

Our study contributes to the existing research field in several ways. First, we find that Green Human Capital and Green Relational Capital have positive effects on both financial and non-financial performance of companies. From a grand scheme of things, this contributes to the development of meaningful discussions in sustainable strategies for businesses that put focus on both profit and planet. Second, we find that Green Structural Capital does not have any statistically significant effect on business performance. Accordingly, structural component of green intellectual capital might be considered as strategic resource (Wang & Juo, 2021) rather than short-term driver of business performance. Finally, our study contributes to the development of knowledge on the effects of environmental resources on business performance in emerging markets. Currently, there are no unequivocal findings on this topic from each market, since some studies find positive, some find negative and some find mixed results (Yusoff *et al.,* 2019).

The remainder of this paper is organized as follows. Section 1 reviews the literature, elaborates on the conceptual model and develops the study hypotheses. Section 2 delineates the research strategy by thoroughly explaining the methodology – the research instrument, variables, and measures, sampling procedure, data collection and processing. Section 3 elaborates on the results and presents the pre-analysis (descriptive statistics, internal reliability and correlation matrix) and main analysis (regression models). Section 4 contextualizes the results by explaining the key findings, contributions, and implications. Section 5 is reserved for the conclusion where we explain the original values and limitations of this study, as well as provide some recommendations for follow-up studies.

Literature Review

In this section we provide the background to our research. In specific, we delineate the hypothesized causality between the green intellectual capital and business (financial performance). We view green intellectual capital as a resource and business performance as an output, following the other studies dealing with green intellectual capital (Yusliza *et al*., 2020; Suki *et al*., 2022). The extent body of knowledge sees green intellectual capital not only as a resource, but a competitive advantage driving force (Dang & Wang, 2022).

Business Performance Aspects

Results-driven environments have set the financial framework for achieving sustainable competitiveness. However, non-financial indicators have become key success factors in managing intellectual capital. On the other hand, intellectual capital measurement itself has been uncharted, even though there has been a business continuity of researching it in academia and industry. By reflecting on a theory of intellectual capital, the theory itself refers to a paradigm that views a firm's intangible assets as a source of value and competitive advantage. The theory has been extensively researched in various academic disciplines. One seminal reference in this field is the work of Edvinsson and Malone (1997), who were among the first to introduce the concept of intellectual capital and to propose a framework for managing it. This perspective emphasizes the significance of systematic and strategic management of intangible assets such as knowledge, skills, and relationships, as they play a crucial role in determining an organization's financial performance, reputation, and ability to innovate and grow. From the aspect of managing intellectual capital, the relationship between intellectual capital, firm performance, innovation, sustainability and other outcomes has been widely discussed for over three decades (Bontis, Keow, & Richardson, 2000; Chen & Hitt, 2005; Wang & Hsu, 2012). In more recent studies, organizational performance has been considered as a key metric affected by intellectual capital. Jaskyte and Dressler (2020) have found that the intellectual capital components of human, social, and structural capital have a significant positive impact on organizational performance. Similarly, Jafari, Ahmadpour, and Rasti-Barzoki (2020) examined the effect of intellectual capital on organizational innovation. Due to a high complexity of intellectual capital, there is a requirement of applying diverse measurement methodologies, including both financial and non-financial indicators, as well as scenario analysis (Uziene, 2010). (Radonic *et al*., 2020) have stated the importance of non-financial metrics as part of measuring the intellectual capital influence on business performance in Serbian ICT sector, analyzing 22 constructs aligned to four intangible assets segments – human, relational, structural and innovation capital. Ever since the 90's, intellectual capital has been extensively debated (Hall, 1992; Sveiby, 1998). Undeniably, the importance of intellectual capital has grown significantly over the years, affecting both, financial and non-financial aspects of businesses (Inkinen, 2015). Renowned authors Kaplan and Norton (2004) have underlined the importance of intellectual capital by

evaluating its participation in the total asset value with the rate of over 75 %, affecting general performance and business valuation. Therefore, companies with a higher level of intellectual capital utilization could achieve higher valuations (Berzkalne & Zelgalve, 2014; Dzenopoljac *et al*., 2016). The nature of intellectual capital and one of its key characteristics – synergy, makes it hard to partially evaluate its constituents, rather it is suggested to take a holistic approach (Radonic *et al*, 2020). Besides *synergy*, intellectual capital also exposes the other three characteristics: *scalability*, *sunkness* and *spillovers*. The ease of multiplying the knowledge, especially in the tech era, supports the higher level of scalability, as well as spillovers, described as the potential benefit of the other companies through utilizing the open-source know-how. Additionally, as part of the sunkness, intellectual capital is hard to copy, making it difficult to recover in case of failure, but also making it hard to predict the future effects of effective management of intellectual capital (Haskel & Westlake, 2018). Despite that IC has been widely discussed and its role and importance recognized, the role of green intellectual capital as part of it has remained an open puzzle.

Even though intellectual capital has been a widely discussed topic since the 80's, green intellectual capital on the other hand gained momentum in the 00's (Benevene et al., 2021). The study performed by Chen (2008) was one of the first to analyze green intellectual capital as part of IC and its role in achieving a competitive advantage. After Chen, many authors have analyzed the concept of green intellectual capital and its constituents (green human capital, green structural capital and green structural capital), pointing out the impact on sustainable performance (Yusliza *et al*., 2020; Yusoff *et al.,* 2019), social responsibility (Jia-Xin Liu *et al*., 2016), as well as sustainable competitiveness and financial performance (Agyabeng-Mensah & Tang, 2021). Benevene et al. (2021) have put green intellectual capital in the spotlight of focusing on sustainability as well as generating and managing environmental knowledge. Despite both intellectual capital and green intellectual capital using the same framework, intellectual capital doesn't necessarily focus on environmental and sustainable aspects of businesses in order to gain a competitive advantage. In studies by Yusoff *et al*. (2019) and Yusliza *et al*. (2020), sustainable performance is being determined by three groups of indicators – economic performance indicators, environmental performance indicators and social performance indicators. Economic performance indicators are associated with the reduction of costs and energy consumption. Environmental performance indicators on the other hand are determined by the ability of an organization to reduce air emission and energy consumption, to reduce material usage, but also by complying with environmental standards (Yusliza *et al*., 2020). Moreover, the adoption of green innovation is considered as equally important for estimating the impact of green intellectual capital on sustainable competitiveness. In a study performed by Ali *et al.* (2021) the results have indicated that green human and green structural capital have a significant and positive impact on the adoption of green innovation, while green relational capital has shown a positive, but unsignificant impact on the adoption of green innovation. By perceiving the environmental aspect, Serbia hasn't fully reached the EU environmental standards, including the emission of CO2, poor waste management system and poor air quality (Pantic & Milijic, 2021), leaving this group of indicators worth discussing. Furthermore, the quality of facilities, including the facility maintenance in Serbia is a novelty in academia discussions (Vukmirovic *et al*., 2020). Social performance indicators are the last component of sustainable performance. They include social welfare, as well as the health and safety aspect for all stakeholders, with a special accent on community and employees (Yusliza *et al*., 2020). Most of these studies rely on sustainability performance indicators presented in a study by Chow & Chen (2012). Chen (2008) and Chow & Chen (2012) were one of the first to set boundaries between economic and non-economic indicators regarding green intellectual capital. Health and safety were mentioned for the first time, applying it to all stakeholders, internal and external. On the other hand, the environmental dimension of performance has been widely discussed, especially in emerging countries. Waste management, environmental trainings (Del-Castillo-Feito *et al*., 2021) and renewable energy usage (Kamoun *et al*., 2020) are only some aspects of measuring the success through environmental performance.

A more general and holistic approach to the impact of IC on business performance has been taken in a study by Sharabati *et al*., (2010), dividing the indicators into three groups – profitability, productivity and market value. In addition, a vast majority of studies of this kind were performed in emerging countries, primarily focusing on the manufacturing industry, while the service industry remains unexplored.

Although the aim of this study is to prove the impact of green intellectual capital on business performance, including financial and non-financial indicators, it is also to keep the optimal balance between these aspects. Many argue the importance of financial in opposite to non-financial indicators. In regard to green intellectual capital, Stancu *et al*. (2015) have put profitability in front of corporate social responsibility and moral issues, pointing out organization efficiency, better waste management practices, motivated by better economic performances. Similarly, Maletic *et al*. (2015) have also agreed on the importance of profitability and economic indicators and their positive impact on environmental performance. Agyabeng-Mensah & Tang, (2021) were the first ones to analyze the profitability growth indicators, including the growth in sales, gross profit, net profit, but also ROA (return on assets) and ROI (return on investment) indicators in utilizing green human capital.

Despite the difficulties of measuring non-financial performance, it is crucial to integrate them into the analysis, as they correlate with financial performance indicators. For a better holistic approach of green intellectual capital, academia and practice agree on including both groups of performance indicators. By perceiving financial and non-financial parameters as part of business performance, through productivity, profitability and market value, the authors of this study intend to fill the gap in literature, forming the hypothesis presented in the following sections.

As indicated by the European Green Deal, the European commission has put forward a new European Growth Model based on the transition towards a green, digital and resilient economy. A strong emphasis is put on coordinated actions

with the private sector specifying that "[t]he investments needed in order to complete the twin transitions and to enhance resilience will need to come primarily from the private sector" (European Commission, 2022).

European companies heavily rely on investments in intellectual capital. Consequently, new policies and practices will be required for investments in green intellectual capital and its constituents (green human capital, green relational capital and green structural capital). The private sector will account for major investments, but their motivation to extensively invest in this area might be inquiring. If these investments do not lead to improved business performance as required by European capital markets, the system of motivation might fail. Thus, the relationship between green intellectual capital and business performance remains at the forefront of both scholarly and practical agenda.

The extent body of knowledge recognizes some mixed effects of green intellectual capital on competitive advantage (Chen, 2008; Agyabeng-Mensah & Tang, 2021), sustainable performance (Yusliza *et al*., 2020; Yusoff *et al*., 2019), and social responsibility (Jia-Xin Liu *et al*., 2016). The direct effects of green intellectual capital on financial and non-financial performances are far from being a fully elaborated topic.

There is a lack of evidence from a number of EU member states, let alone the candidate and neighboring countries. Particularly scant evidence comes from Serbia and other West-Balkan countries.

Green Human Capital and its Impact on Business Performance

Literature is rich in evidence regarding the significance of human capital for achieving improved organizational performance (Felício *et al*., 2014). Building upon the Human Capital Theory, it is considered that knowledge enhances individuals' productivity and efficiency, as their cognitive abilities increase (Davidsson & Honig, 2003). Therefore, it can be stated that employee skills and knowledge play a pivotal role in providing companies with ongoing business success (Subramaniam & Youndt, 2005). In a face-paced business environment, employees need to embrace new knowledge and skills, i.e. the know-how, as it is vital for a business to sustain. Undoubtedly, one of the key issues in contemporary business is environmental performance. Organizational learning and knowledge sharing have been associated as important factors for achieving high economic performance (Bilan *et al*, 2018), but also for environmental knowledge and awareness among employees (Munawar *et al*, 2022). On that note, environmental knowledge as part of green human capital has been discussed as one of the key parameters in adopting green innovation, but also for achieving higher efficiency performance (Munawar, *et al,* 2022). Cramer (2005) suggests that businesses ought to develop and integrate new values into their strategies with people, planet and profit being their three key aspects. According to Chen (2008), green human capital encompasses employees' knowledge, skills, capabilities, experience and commitment regarding environmental management and environmental consciousness. Nowadays, companies' strategic commitments are directed towards hiring and retaining individuals who are practicing environmental awareness, i.e., behave in an environmentally conscious manner (Malik *et al*., 2020). This implies recruiting those employees who show interest in implementing principles of environmental management into their work practices and contribute to more sustainable manners of doing business. Likewise, companies organize green training programs in order to provide employees with knowledge on energy conservation, sustainable use of natural resources and obtaining the highest amount of output from the least amount of inputs (Anwar *et al*., 2020). Consequently, green human capital ensures numerous advantages for companies, such as productivity enhancement, cost reduction and attraction of eco-friendly and cost-conscious customers, thus resulting in higher profitability (Agyabeng-Mensah & Tang, 2021). Development of environmental responsibility as a core value and implementing such human resource practices can benefit companies in the development of better corporate image (Mansoor *et al*., 2021) in order to achieve a specific competitive advantage and increase their market share (Alam & Islam, 2021). Accordingly, this study hypothesizes that:

H1a: Green human capital has a positive impact on financial performance.

H1b: Green human capital has a positive impact on non-financial performance.

Green Structural Capital and its Impact on Business Performance

Alongside green human capital, literature provides evidence on the positive effect of green structural capital on financial performance as well (Yusoff *et al*., 2019). The complexity and rareness of these two components make them difficult to imitate, which is the essence of achieving a competitive advantage (Khan *et al*., 2021). This claim is based on Youndt & Snell (2004) view who identify that a strong tie between human and structural capital leads to product and process innovation, effective problem solving and customer satisfaction, thus resulting in improved organizational performance and value creation. Green structural capital is a sum of organizational capabilities, commitments and culture, managerial philosophies and mechanisms, knowledge management and information technology systems, operation processes and company intellectual property regarding environmental protection and sustainable product development (Chen, 2008). Since doing business in a green way has become a topic of interest for primary stakeholders as well as governing bodies, it is of utmost importance for organizations to coordinate their business practices with this concern (Yong *et al*., 2019). When implementing sustainable business practices, green structural capital is an indispensable component as it acts as a supporting factor in the process of environmental transition (Amores-Salvado *et al*., 2021). Yusliza *et al*. (2020) proved that by implementing the concept of environmental sustainability, companies succeed in achieving improved business performance. By introducing green production protocols and principles, companies can achieve waste minimization, enhance productivity and production efficiency, but also benefit from charging

premium prices for green products (Chen, 2008). Accordingly, this study hypothesizes that:

H2a: Green structural capital has a positive impact on financial performance.

H2b: Green structural capital has a positive impact on non-financial performance.

Green Relational Capital and its Impact on Business Performance

Drawing upon social capital theory, Akintimehin *et al*. (2019) argue that by establishing a solid social network of mutual values and beliefs, a business entity can benefit from diverse assets provided by the network and realize outstanding non-financial and financial performance. Accordingly, Blonska *et al*. (2013) state that by failing to build relational capital, participants in the business process can lack benefits provided by others and even suffer harmful consequences. Based on a literature review, Yong *et al*. (2019) state that relational capital could be defined as an intangible asset which relies on establishing, fostering and preserving outstanding relationships with other organizations, groups or individuals which might affect a company's market position. According to Chen (2008), green relational capital is a company asset which comprises its interactive relationships with internal and external stakeholders regarding corporate environmental management and green innovation practices and allows for generating a profit and achieving competitive advantages. Literature proves that by establishing a good relationship with green suppliers, companies can reach goals of sustainable business concept (Ullah *et al*., 2021), which proved to have a positive effect on their financial performance and business survival (Muhamad & Muhamad, 2021). Environmental collaboration with customers proved to have a positive impact on substantial quality improvement, which is one of the pillars of customer satisfaction and results in customer loyalty and financial gain (Feng *et al*., 2018). Accordingly, Yu *et al*. (2021) proved that by introducing supplier and customer green management practices, supplier and customer relational capital realizes a positive impact on companies' financial performance. Accordingly, this study hypothesizes that:

H3a: Green relational capital has a positive impact on financial performance.

H3b: Green relational capital has a positive impact on non-financial performance.

Business Case for Green Intellectual Capital Development in Serbia

The Serbian business environment is steadily evolving to become more sustainable. On the one hand, the SME sector in Serbia has witnessed an increase in investments into green resources with a clear positive effect on their business performance (Zakic, Popovic & Miskic, 2020). On the other hand, the corporate sector in Serbia is increasingly recognizing the importance of sustainability for long-term business success and is adopting sustainable business practices and investing in green projects (Petrovic & Cosic, 2018). The development of green intellectual capital in Serbia is also attracting interest from investors seeking to invest in sustainable businesses and projects (Nikolic-Ristanovic *et al.*, 2019). However, businesses in Serbia still face challenges in transitioning to a green economy, such as a lack of access to financing, limited awareness of sustainable practices, and inadequate infrastructure (Svarc *et al.*, 2020).

Using the Sustainable Development Goals Index Score (SDG Index Score) as a proxy, Serbia held the 35th position in the world in the total progress towards achieving all 17 UN Sustainable Development Goals in 2021 (Sustainable Development Report, 2022), making it the second in the West Balkans region. Seen through the lens of the Environmental Performance Index (Wolf et al., 2022), Serbia is ranked as 79/180 country with only one country in the West Balkan region performing worse than Serbia. Accordingly, generalizability of the findings on any sustainability research (as of this study) is related to medium to low environmental performing countries.

Methodology

In this section we elaborate on the research strategy by addressing the following questions:

1. What was the scope of this study and why was this study carried out (summary of the aim of the study)?
2. Who was examined (the sampling procedure)?
3. How was data collected (development of a research instrument, research technique, examined variables and operationalization of measures)?
4. How and when was the data processed?

Summary of the Aim of the Study

The aim of this study was to analyze the effects of green intellectual capital on business (financial and non-financial performance) of Serbian companies, as shown in Figure 1.

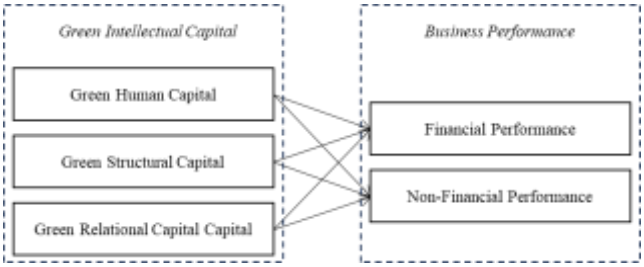

Figure 1. Theoretical Model for the Influence of Green Intellectual Capital on Business Performance

As thoroughly explained in the Literature review section, we view Green Intellectual Capital as a resource of the company. Investing in such resources is costly and might not always provide direct business (financial or non-financial) effects. Novel studies either find no relation between Green Relational Capital and non-financial indicators (Asiaei *et al.*, 2022).

Sampling Procedure

We examined owners or general managers of Serbian companies. Owners and general managers were selected as key informants.' Accordingly, we aimed at collecting data from a nationally representative sample to provide generalizability of the study findings on a country-wide level.

In particular, this study was based on a stratified sample of companies from two separate lists (the first one from the companies listed at the Development Fund of the Republic of Serbia and the other one from the companies cooperating with the University of Belgrade). One the one side, the Development Fund of the Republic of Serbia is a state institution whose main activity is granting loans and issuing guarantees at subsidized interest rates. Economic entities planning to expand and improve their business apply to the Development Fund. In the database of the Development Fund there are about 31,000 active economic entities that have loans and guarantees in repayment. The companies targeted with this questionnaire were the ones applying for research and innovation co/financing schemes at the Development Fund. The respondents were either owners or Chief Executive Officers/General managers of the targeted companies.

On the other side, the list of companies created at the University of Belgrade (more precisely Faculty of Organizational Sciences) has around 700 entries. This list includes e-companies that cooperate with the University of Belgrade on various research and innovation programs (Benkovic *et al.,* 2022). The companies from this list were used only to balance the sample, since it includes mostly large corporations which usually do not apply for state grants. After removing the duplicates, the total population of companies was 2.327. Out of this population, the total of 344 questionnaires were correctly filled, making the response rate 14.78 %. Respondents were key informants in the field of management procedures and business performance of the targeted companies. In terms of this paper, the 'key informant' relates to the experienced executive officer in the company knowledgeable about green intellectual capital on one side and business performances (financial and non/financial) of the company they represent.

Research Instrument & Research Technique

This survey is based on primary data collected by a questionnaire specifically developed for the purposes of this study. The independent variables were measured on a Likert-type scale. This part of the questionnaire was largely inspired by the groundbreaking work of Chen (2008) and the number of follow-up studies, which is explained in-depth for each variable in the Variables and measures subsection.

The dependent variables were measured on a Likert-type scale, as well. The main rationale for this decision is a relatively low comparability of objective data when the sample is based on a nation-wide rather than industry-specific sample. This creates a number of potential biases – Common Source Bias (Kim & Daniel, 2019) and Perceptive Bias (Radonic & Milosavljevic, 2019), all of which have been recognized in the limitations section of the conclusion of this paper. Nonetheless, this research approach has already been used in recent studies inspecting the effects of green intellectual capital on business performance (see Asiaei *et al.,* 2022), which is further grounded in management accounting literature.

The questionnaire was distributed in an online form using Computer Assisted Web Interviewing (CAWI) as a technique. The main rationale behind the use of online rather than an offline questionnaire were safety measures imposed by the coronavirus pandemic.

Variables and Measures

The questionnaire had five sections. In the first section, the demographic data was captured for both respondents and companies they represented. In specific, the inquiries were related to age, gender, work experience and the role (function) that the examinee has in the company that they represent. As for the company demographics, we singled out one size-related criterion – number of employees.

Sections 2–3 were aimed at collecting data on independent variables. 1) Green Human Capital, 2) Green Relational Capital, and 3) Green Structural Capital. All the independent variables were multi-itemed and based on already existing scales developed in the extent body of knowledge (Chen, 2008; Yusliza *et al.,* 2019; Yusoff *et al.,* 2019). The respondents were asked to assess the independent variables - Green Human Capital, Green Relational Capital, and Green Structural Capital – on a 7-point Likert-type scale (where 1 stands for 'highly agree' and 7 stands for 'highly disagree'). This perceptive scale is widely used even in the most recent studies on green intellectual capital (Asiaei *et al.,* 2021; Sheikh. 2021; Ullah, Mehmood & Ahmad, 2022).

The specific items (n=5) examined for the variable Green Human Capital were: 1) Contribution to EP, 2) Competences for EP, 3) Environ-Friendly Products, 4) Cooperation for EP, and 5) Full managerial support for EP.

The specific items (n=8) examined for the variable Green Relational Capital were: 1) Superior EP Management System, 2) Sufficient No of staff for EP, 3) Investments in EP, 4) Adequate Operations to EP, 5) Knowledge Management Favourable to EP, 6) Committees for Progress in EP, 7) Detailed Rules for EP, and 8) Reward System for EP.

The specific items (n=5) examined for the variable Green Structural Capital were: 1) Product Design in Compliance to EP, 2) Environ. Satisfied Customers, 3) Relations with Vendors in EP Manner, 4. Relations with Clients in EP Manner, and 5) Relations with Stakeholders in EP Manner.

Finally, Section 4 of the questionnaire was aimed at collecting data on dependent variables – financial and non-financial performance measures. For both financial and non-financial measures, a number of authors use objective rather than perceptual data. This is particularly suitable for case studies (Todorovic & Cupic, 2017; Ignasiak-Szulc, Juscius & Bogatova, 2018) or single sector/industry comparisons (Milosavljević, Milanović & Benković, 2016). Since our sample consisted of highly incomparable companies in terms of their industry, size and target markets, the use of objective data could potentially mislead the readers. For instance, comparing Return on Investment (ROI) of two companies in two different industries might be highly misrepresentative. Our research strategy (based on the use of e perceptual measures of financial performance) has been frequently used in the other studies dealing with heterogeneous sample and a causal effect that include various internal or external factors and financial performance (Leonidou *et al.,* 2015; Yu *et al.,* 2019). Accordingly, we used the scale based on perceived success

developed by Braam & Nijssen (2004), and operationalized in Milosavljevic *et al*., (2019). A 10-scale consisted of measuring financial performance (Earnings Before Interest and Tax - EBIT, Return on Investment - ROI, Sales Growth, Market Share, and Operating Cash Flow - CF) and non-financial performance (Product Development, Market Development, Research and Development - R&D, Cost Reduction Programs and Employee Development).

The respondents were asked to assess the performance of their company on a 7-point Likert-type scale (where 1 stands for 'highly below the industry average' and 7 stands for 'highly above the industry average').

Data Processing

Data was collected in the period from February to March 2022 and inserted into the Statistical Package for Social Sciences (version 24). Frequencies and descriptive statistics were used for the interpretation of data. Cronbach Alpha was used for the internal reliability analysis. The Pearson moment two-tailed correlation was used to examine interdependencies among Durbin-Watson and Variance Inflation Factors for testing possible multi- and auto-correlation. Finally, OLS regression was used to test the study hypotheses.

Results

In this section, we explain the sample features, provide a detailed pre-analysis, and hypotheses testing.

Sample Features

In total, we have collected 344 responses. Since the total number of companies in Serbia is approximately 90,000 (Statistical Office of the Republic of Serbia, 2020), this sample size is close to the national representativeness (the confidence level 95 %, and margin of error of 5 %) The sample was slightly disbalanced in terms of gender as 59.9 % were female and 38.1 % were male respondents (the remainder selected 'other' as an option). In terms of the work experience of respondents within the company they represented, the majority were highly experienced ('More than 20 years'=34.6 %; 'Between 11 and 20 years'=44.8 %). Only 4.4 % of respondents had less than 5 years of experience within the company. As for the function they had in the company, owners or Chief Executive Officers made about a third of the sample (33.4 %), followed by Chief Financial Officers (17.7 %) and Chief Marketing Officers (14.8 %). Other executive functions were jointly represented by 19.5 % of respondents and the remainder of 11.0 % of respondents were non-executive roles.

As for the size of the companies included in the sample, the distribution was relatively even, as shown in Table 1. This distribution represents the added value of different strata (company size) to the overall GDP of Serbia.

Table 1

Distribution of Companies in the Sample by Size (No of Employees)

No of employees	Frequency	Percent	Valid Percent	Cumulative Percent
10 or less (micro)	99	28.8	28.8	28.8
11 to 50 (small)	109	31.7	31.7	60.5
51 to 250 (medium)	16	4.7	4.7	65.1
More than 250 (large companies)	120	34.9	34.9	100.0
Total	344	100.0	100.0	
Revenue	**Frequency**	**Percent**	**Valid Percent**	**Cumulative Percent**
Nonprofit/revenue organizations	26	7.6	7.6	7.6
Less than 100.000 eur	76	22.1	22.1	29.7
100.000 - 250.000 eur	45	13.1	13.1	42.7
250.000 - 1.000.000 eur	64	18.6	18.6	61.3
1.000.000 - 10.000.000 eur	69	10.1	10.1	81.4
10.000.000 - 100.000.000 eur	39	113	113	92.7
Over 100.000.000 eur	25	7.3	7.3	100.0
Total	344	100.0	100.0	

Source: authors' calculation

The vast majority of the sample represented respondents working in trade (retail and wholesale) with over 25 % of results, 15 % in manufacturing, 12 % in service industries. The rest is combined of construction, IT, transportation and other industries. All the industries abovementioned contribute significantly to the overall GDP of the Republic of Serbia.

Pre-analysis

Prior to the hypotheses testing, we first conducted a pre-analysis including descriptive statistics (means and standard deviations) for individual items. As displayed in Table 2, respondents clearly marked the elements of Green Structural Capital as the most critical asset. As for the dependent variable – respondents in general claimed that the financial success of their companies outperforms the non-financial measures. The best ranked measure was Sales Growth (Mean=4.160, STD=1.763), whereas the worst ranked was R&D (Mean=3.799, STD=1.870).

Table 2

Descriptive Statistics for the Individual Items

Item (independent var.)	Mean	STD	Item (dependant var.)	Mean	STD
1. Contribution to EP	4.139	1.813	1. EBIT	4.090	1.755
2. Competences for EP	4.023	1.761	2. ROI	4.026	1.693
3. Environ.-Friendly Products	4.291	1.935	3. Sales Growth	4.160	1.763
4. Cooperation for EP	4.046	1.885	4. Market Share	3.951	1.758
5. Full managerial support for EP	4.326	1.994	5. Operating CF	3.991	1.705
Green Human Capital	**4.165**	**1.760**	**Fin. Perf.**	4,044	1,628
1. Superior EP Management System	3.983	1.947	1. Product Devel.	3.802	1.801
2. Sufficient No of staff for EP	3.698	1.900	2. Market Devel.	3.837	1.857
3. Investments in EP	3.651	1.962	3. R&D	3.799	1.870
4. Adequate Operations to EP	3.916	1.986	4. Cost Red. Prog.	3.927	1.777
5. Knowledge Mngt Favorable to EP	3.843	1.912	5. Employee Devel.	3.884	1.848
6. Committees for Progress in EP	2.887	1.953	**Non-fin. Perf.**	3,850	1,660
7. Detailed Rules for EP	3.541	2.024			
8. Reward System for EP	2.791	1.989			
Green Structural Capital	**3.538**	**1.737**			
1. Product Design in Compl. to EP	4.061	2.127			
2. Environ. Satisfied Customers	4.070	2.042			
3. Relat. with Vendors in EP Manner	4.073	1.996			
4. Relat. with Clients in EP Manner	4.041	1.981			
5. Relat. with Stakeh. in EP Manner	4.067	2.016			
Green Relational Capital	**4.062**	**1.961**			

Source: authors' calculation

Afterwards, we analyzed descriptive statistics (means and standard deviations) and the internal reliability analysis of multi-itemed constructs, (Green Human Capital, Green Structural Capital, Green Relational Capital, Financial Performances, and Non-Financial Performances), and the correlation analysis which is shown in Table 3.

Table 3

Descriptive Statistics, Reliability Analysis and Correlation Matrix

Variable	Mean	STD	α	2	3	4	5
Green Human Capital	4.165	1.760	.965	.830**	.824**	.640**	.688**
Green Structural Capital	3.538	1.737	.961		.820**	.626**	.632**
Green Relational Capital	4.062	1.961	.981			.694**	.668**
Financial Performance	4.044	1.628	.966				.840**
Non-Financial Performance	3.850	1.660	.946				

(*) $p<0.05$; (**) $p<0.00$; α – Cronbach's Alpha

Source: authors' calculation

As shown in Table 2, respondents marked all the elements of green intellectual capital (independent variables) as moderately developed in their companies. Green Human Capital received the highest average score (Mean=4.165, STD=1.760), followed by Green Relational Capital (Mean=4.062, STD=1.961). Green Structural Capital was marked as the least developed (Mean=3.538, STD=1.737). As for the dependent variables, on average companies were better performing by financial than by non-financial measures.

Table 2 also displays the results for the internal reliability analysis, since all the observed variables were multi-itemed constructs. All the results for the Cronbach Alpha test were above the standard threshold of $\alpha>0.700$ used in social sciences. None of the obtained results for internal was below .900 indicating very high internal reliability of the scale. This is an expected finding, having in mind that all the constructs (variables and their measures) were rewarded from previously empirically tested research measures.

As for the correlation analysis presented in Table 3, we found a number of positively correlated relationships among the observed variables. In fact, all the correlations within the matrix were statistically significant, and the majority of them were either 'high' ($r>.800$) or 'moderate to high' ($r>0.600$). Statistically significant and high correlation coefficients were found among all the independent variables (Green Human Capital, Green Structural Capital, and Green Relational Capital), on the one hand, and between both dependent variables (Financial Performances, and Non-Financial Performances), on the other hand. Statistically significant and moderately high correlation coefficients were found between independent and dependent variable.

Hypotheses Testing

Following the aim of this study, we conducted two regression analyses by using OLS regression. In the first model, the dependent variable was Financial Performance. The results for the first model are presented in Table 4.

Table 4

Regression Analysis for Financial Performance as the Dependent Variable

Dependent var.:	Unst.Coeff		St.Coeff.	t	Sig.	
Financial Performance	**B**	**SE**	**Beta**			**VIF**
(Constant)	1.473	.161		9.142	.000	
Green Human Capital	.154	.071	.166	2.153	.032	4.033
Green Structural Capital	.087	.071	.093	1.222	.223	3.946
Green Relational Capital	.399	.062	.481	6.401	.000	3.833
P value <.001	**R**	.706	**Adj R^2**	.494	**DW**	2.233
	R^2	.499	**SE**	1.157	**F**	112.763

Source: authors' calculation

Having in mind a number of statistically significant correlations found in the pre-analysis, we tested the model for possible auto- and multi-collinearity. As displayed in Table 3, the result for the Durbin-Watson test was DW=2.233, which is between the traditional thresholds (1.5<DW<2.5). This implies the lack of auto-collinearity. As per the multi-collinearity, we tested the Variance Inflation Factor (VIF), and the results for each variable were below the threshold of VIF<10.000, indicating the absence of multi-collinearity. The value of F-statistics was 112.763, and the consequent p-value was p<0.001.

Accordingly, we proceeded with hypotheses testing. The regression model obtained through OLS regression was statistically significant at p<.001. The total variance explained was R^2=.499. As seen through the lens of hypotheses testing, we confirmed H1a (Beta=.166, p<0.05) and H3a (Beta=.481, p<0.01). In other words, Green Human and Green Relational Capital are statistically proven predictors of financial performance. On the other hand, there is no statistical support for H2a, and Green Structural Capital is not a statistically confirmed predictor of financial performance.

In the second model, we tested the predictors of Non-Financial Performance by, once again, using OLS regression. The results for the second model are presented in Table 5.

Table 5

Regression Analysis for Non-financial Performance as the Dependent Variable

Dependent var.:	Unst.Coeff		St.Coeff.	t	Sig.	
Non-Financial Performance	**B**	**SE**	**Beta**			**VIF**
(Constant)	1.080	.163		6.623	.000	
Green Human Capital	.371	.072	.393	5.140	.000	4.033
Green Structural Capital	.069	.072	.072	.949	.343	3.946
Green Relational Capital	.242	.063	.285	3.827	.000	3.833
P value <.001	**R**	.712	**Adj R^2**	.502	**DW**	2.246
	R^2	.507	**SE**	1.171	**F**	116.421

Source: authors' calculation

As shown in Table 5, the Durbin-Watson test was 1.756, and the Variance Inflation Factor (VIF=1.593). These findings indicate the absence of auto- or multi-collinearity. The result for the F value was 16.245, and the significance of p<.001.

Finally, we tested the second set of hypotheses. A combined effect of three independent variables explained more than half of the variability in non-financial performance (R^2=.502). As is the case with the previous model, two out of three variables were solid predictors of the non-financial performances of the sampled companies. Individually, Green Human Capital account for nearly 40% (Beta=.393, p<0.01) and Green Relational Capital account for nearly 30 % (Beta=.285, p<0.01) of the variability of the non-financial performance of the sampled companies. Thus, we confirmed H1b and H3b. Once again, there is no empirical evidence to support the theoretical supposition that Green Structural Capital affects non-financial performance.

Discussion

In this section, we summarize key findings, contextualize the main results into broader literature and explain the main implications of this study.

Key Findings

The main aim of this study is to examine the effects of green intellectual capital on business performance. More specifically, we tested three intellectual capital constituents (Green Human Capital, Green Relational Capital, and Green Structural Capital) adopted from the existing literature, focusing primarily on the green aspects of human, relational and structural intellectual capital as independent variables. On another note, 10 indicators have been observed as dependent variables, representing the overall business performance.

The results of this study have indicated that Green Human Capital and Green Relational Capital have a significant positive effect on both financial and non-financial business performance. Accordingly, companies with more developed Green Human Capital and Green Relational Capital are more likely to achieve higher

financial and non-financial business performance indicators on the market. On the other hand, the consequences of utilizing or building the Green Structural Capital on financial or non-financial business performance have not been confirmed in this study.

The findings the findings have revealed a meaningful correlation, supported by statistical significance, between green intellectual capital and overall business performance, encompassing both quantitative financial measures and qualitative non-financial indicators. In essence, it is hypothesized that organizations with a more robust green intellectual capital, primarily green human and green relational capital, are anticipated to reap greater market-based benefits, leading to enhanced financial and non-financial performance indicators.

Contributions

The study contributes to the emerging stream of research that advocates examining the effects of business sustainability aspects on overall performance. It is worth noting that there is a growing body of research highlighting the positive effects of Environmental, Social, and Governance (ESG) factors on shareholders' return on investment. A study by Flammer (2015) states that "firms with strong performance on material sustainability issues significantly outperform firms with poor performance on these issues, suggesting that investments in sustainability issues are shareholder-value enhancing." This indicates that companies that prioritize ESG practices and effectively manage environmental and social risks can generate financial benefits for their shareholders long-term.

From a geographical perspective, this study makes a significant contribution by offering evidence from an emerging non-EU country with aspirations of EU membership. This adds to the existing literature by providing insights from a unique context that is undergoing economic and regulatory changes. Furthermore, the study enhances the understanding of managing green intellectual capital by providing valuable information on effective strategies for managing the intangible assets related to environmental sustainability within companies.

The findings of this study align with the results from the study by Yusliza et al. (2020), which also emphasized the positive impact of investing in Green Intellectual Capital on economic performance. This consistency in results suggests that organizations across different regions and contexts recognize the importance of these specific forms of GIC in driving performance outcomes. In a parallel vein, a cognate inquiry conducted in another emerging country has yielded analogous findings. Asiaei et al. (2022) have shown a mediating role of environmental performance systems (EPMS) in relationship between GIC and organizational (non-financial) performance. Unlike the study performed in Serbia, the research results presented by Asiaei et al. (2022) have recognized the positive effects of Green Structural Capital on environmental performance as a non-financial indicator. The dearth of statistically significant evidence in the Serbian study regarding the influence of Green Structural Capital on company performance accentuates the exigency to adopt novel frameworks that capture and manifest its effects, recognized by Serbian companies.

In summary, the study on the effects of GIC in Serbia contributes to the existing literature by confirming the positive effects of investing in Green Human and Green Relational Capital on both financial and non-financial indicators. While the impact of Green Structural Capital remains inconclusive, this study provides insights specific to the Serbian context. These findings align with the results of the study by Yusliza et al. (2020) and complement the research by Asiaei et al. (2022) by highlighting the mediating role of environmental performance measurement systems. Furthermore, the broader research on ESG demonstrates the link between sustainability practices and shareholders' return on investment, supporting the business case for ESG integration as part of green practices.

Implications

This study has twofold implications: (i) for researchers and (ii) for practitioners. As for researchers, this study further proofs the concept of measuring green intellectual capital developed in recent studies (Chen, 2008; Asiaei *et al.*, 2021; Sheikh. 2021; Ullah, Mehmood & Ahmad, 2022). Additionally, this study advances the knowledge on the effects of green intellectual capital from long-term and strategic effects which was advocated in the concurrent body of knowledge (Malik *et al.*, 2020) to short-term effects on business performances.

As for the practical implications, this study might be interesting to company strategists and business planners. The results of this study confirm that investments in green intellectual capital provide not only strategic competitive advantage, but advance contemporary business performance. The interrogative remains for the investments in Green Structural Capital. The profit-oriented society might not foresee the importance of structural capital ‘green’ aspects, as it’s not affecting profitability or other financial, but non-financial indicators as well.

Conclusions

This study provides an overview of the effects of green intellectual capital on business performance and is the first attempt to provide such insights from companies operating in the Serbian market. This issue has received significant attention from scholars, as achieving sustainable economic development is one of the pillars of the EU's new growth strategy. Nevertheless, this study offers significant contributions to the existing body of knowledge as it observes the impact of green intellectual capital on both financial and non-financial performance of companies from an EU candidate country. From a practical standpoint, this study offers implications and recommendations for policyholders and decision makers. Research results imply that companies in Serbia invest in Green Human Capital and Green Relational Capital as they are aware of the positive effects they have in reaching profit objectives. On the other hand, no statistically significant impact of Green Structural Capital on business performance was found.

This study has a few limitations. First, it employs a perceptual scale to measure the effects of green intellectual capital on business performance. This approach is seldom used in concurrent literature. However, we recognize it as potentially judicious and subjective. Therefore, our

recommendation for further research is that these findings should be confirmed by a set of objective data. This is somewhat easier with dependent than independent variables. Second, a cross-sectional study was applied to investigate the dynamic measures. Both dependent variables (financial and non-financial performance) and independent variables (green intellectual capital) change over time. An avenue for new research is related to time series analyses of the examined phenomena. Third, additional studies should include more variables as it is assumed that companies which achieve better financial performance are more likely to invest in sustainability initiatives. Samples of companies taken in this study are heterogeneous and as such, they are valuable to this research providing a more diverse representation of the population of interest. On another note, these results should not be generalized and applied to all industries and companies of different sizes, primarily due to the lack of comparability. As a potential expansion to this study, the authors recommend forming a more homogenous sample, analyzing a specific industry or company structure. Finally, as the results come from the Serbian market, this study is geographically constrained. Therefore, theoretical generalization and spill-over to other markets, different industries and company sizes would be a judicious judgment rather than a grounded supposition.

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