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# Assessment of the Level of Green Intellectual Capital Development - Polish Enterprises Case Study

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***Abstract:***

***Purpose:*** *Green Intellectual Capital (GIC) is more and more frequently considered to be a new environmental strategy of company development. The purpose of the research was to assess the scope of implementation of GIC-centered practices under Polish conditions concerning its three components, i.e., green human resources, green organizational capital, and green relational capital.*
***Design/Methodology/Approach:*** *The study was conducted in 2020 on a random sample of 150 Polish producing enterprises. The method used in the study was CATI. As a first step, the author identified practices that lead to GIC formation. As a second step, she assessed the scope of implementation of the said practices under Polish conditions. The level of implementation of the GIC model was determined with the application of a five-level Likert scale.*
***Findings:*** *The study demonstrated that Polish enterprises do not apply a full degree of practices that lead to GIC fostering. The practices are relatively unknown to Polish companies. It was established that the degree of implementation of the model in Poland is 49.1%, which translates into the 3rd level of maturity in the adopted five-level scale.*
***Practical Implications:*** *The findings of the presented research may stimulate interest in GIC among Polish organizations and extend the scope of application of GIC-oriented practices to support sustainable company development. The management may use the applied research approach to estimate the extent to which they can mobilize the organization's GIC to implement integrated sustainable development outcomes in their business practices.*
***Originality/Value:*** *This research article is a pioneer attempt to evaluate the degree of implementation of practices oriented at GIC development in Poland. The research enriches the still limited set of literature devoted to GIC. It contributes to subject literature for it detects a gap in the implementation of GIC-forming practices in Polish business circles and develops methodologies for its measurement.*

***Keywords:*** *Green Intellectual Capital, Green Human Capital, Green Organizational Capital, Green Relational Capital, sustainable development.*

***JEL codes:*** *M12, M14, Q56, 015.*

***Paper type:*** *Research article.*

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## 1. Introduction

Over recent years, there has been a shift in the approach to company resources. In the era of the information society, intangible assets have become strategic due to their increasing participation in contemporary enterprises' corporate value. These assets construe a specific type of capital referred to as intellectual capital. The category of intellectual capital has been brought to light relatively recently. The research and publications in the field have been the widening imbalances between the book value and market appraisal of companies listed on global stock exchanges.

The issue of intellectual capital is of interest to several researchers. Numerous studies confirm the positive impact of intellectual capital on company performance and effectiveness (Zeghal and Maaloul, 2010; Clarke *et al.,* 2011; Vishnu and Gupta, 2014; Inkinen, 2015; Andreeva and Garanina, 2016, Obeidat *et al.,* 2017), gaining a competitive edge (Chahal, and Bakshi, 2015) and innovation development (Leitner, 2011; Wu *et al.,* 2017). Despite the above, the issue of green intellectual capital development continues to generate little attention (Chang and Hen, 2012; Rezaei *et al.,* 2016, Yusoff *et al.,* 2019). The author intended to bridge the research gap in this area is subject literature, at least to some extent. The GIC model deserves special attention for it fits in the canon of sustainable corporate management based on the triple bottom line principle (Elkington, 1997).

In the present era of environmental protection, companies have become more focused on environment-friendly methods of attaining corporate goals to ensure sustainable development perspectives. Progressive degradation of the natural environment due to human exploitation brought about the need to introduce business strategies involving balancing economic, environmental, and social objectives (ISO 26000). In this respect, the "greening" practices popularized in many industries have shifted the approach to organizational resource use (Albort-Morant *et al.,* 2016). One of such practices is to base corporate operations on GIC.

The research findings presented in this study are an empirical verification of the scope of implementation of the GIC model in Polish enterprises. The research focuses on the level of implementation of practices oriented at green human capital, green organizational capital, and green relational capital development with the application of the author's own measurement model based on a set of quality indices. This research article contributes to subject literature for it detects a gap in the implementation of GIC-fostering practices in Poland and develops a respective measurement method. In the opinion of the study author, the presented research findings may generate interest in the issue of GIC among Polish organizations and expand the level of implementation of the concept as a tool for sustainable business development.

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## 2. The Essence of Green Intellectual Capital

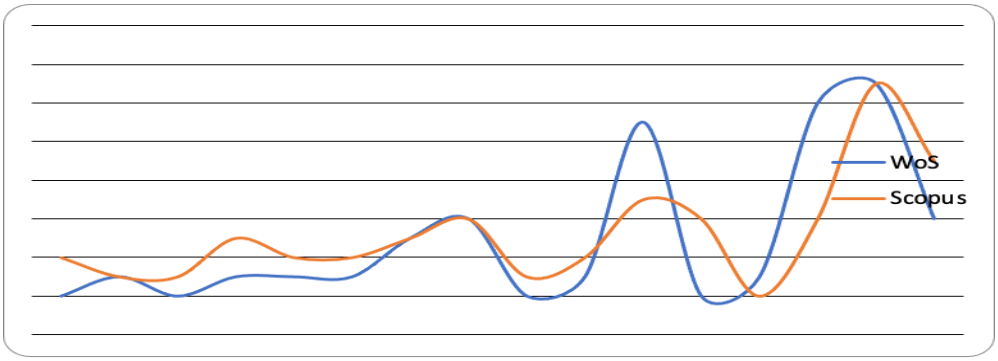
The knowledge-based economy is where intangible assets have taken over tangible assets (Chen, 2012), so the major generator of an added value in contemporary organizations is intellectual capital (Bramhandkar *et al.*, 2007). It is paralleled with "knowledge, which can be evaluated" (Edvinsson and Malone, 1997) and reflected in the difference between the book and market values of an organization (Stewart and Stephanie, 1994). It constitutes a sum of hidden assets not included in financial reports and encompasses what is in employees' minds and what remains with the company when employees leave for home (Ross and Ross, 1997).

Intellectual capital is a conglomerate of multiple constituents based on knowledge. Its most frequent components fall into three key categories (Bontis, 2000; Hsu and Fang, 2009; Shih, 2010):

- human component, i.e., intellectual potential found in employees (their knowledge, skills, abilities, experience, predispositions, personality traits, motivation, etc.);
- organizational (structural) capital composed of, among other things: organizational culture, systems, methods and processes and organizational and information infrastructure facilitating the transfer of knowledge within an organization and the use of human potential;
- relational capital (architecture of network) is related to the totality of links with the organization's stakeholders.

Interest in one of IC's forms referred to as green intellectual capital has aroused relatively recently (Chen, 2008). An analysis of several publications devoted to GIC issues in international databases (Figure 1) demonstrates that the issue has been explored for less than twenty years, which indicates that the concept is still in an early phase of development.

***Figure 1.*** *Number of publications with the term "Green Intellectual Capital" in selected international databases*




***Source:*** *Own creation.*

GIC is defined as a "total of knowledge about the use of the process of environmental management in order to gain competitive advantage" (López-Gamero et al. 2011). This knowledge can appear in various forms, such as tacit knowledge of employees or as database records. Using an analogy to IC, one can identify the following components in the GIC structure (Chen, 2008; Allameh, 2018, Yusliza *et al.*, 2020; Malik *et al.*, 2020):

- green human capital,
- green organizational (structural) capital,
- green relational capital.

Table 1 shows characteristic features of the above-mentioned components.

***Table 1.*** *Components of Green Intellectual Capital*

| Component Name | Characteristic features |
|---|---|
| Green Human Capital | Green human capital is the entirety of knowledge, skills, abilities, experience, attitudes, wisdom, and creativity of employees with respect to environmental protection |
| Green Organizational Capital | The totality of organizational solutions, systems of knowledge management, systems of remuneration, IT systems, databases, mechanisms of management, operational processes, philosophy of management, organizational culture, patents, copyrights, and trademarks related to environmental protection or green innovation in the company |
| Green Relational Capital | the total of interactive company relations with customers, suppliers, members of the network and partners regarding corporate management of the environment and green innovation, which allow one to gain competitive advantage |

***Source:*** *Compiled on the basis of (Chen, 2008; Yong et al., 2019, Yusliza et al., 2020).*

Green Intellectual Capital is an important carrier of an added value concerning environmental performance. It is difficult to imitate or substitute any resources which form it, for nature is concealed, and their application yields synergies. However, organizations have limited abilities to exercise control over its components (Bombiak, 2016).

The key component is green human capital. It is made up of employees demonstrating environmental knowledge, employing environment-friendly practices in and outside the workplace. This capital is not the property of the organization but its employees (Hussi, 2004; Mention and Bontis, 2013), and that is why it is not fully controlled by the former. Consequently, it is the employee who decides about his/her capital engagement for corporate purposes. This makes effective GIC management challenging. Similar difficulties concerning control are observed in green relational capital, which is partially fostered by external stakeholders. Nonetheless, the major stumbling blocks to the popularization of green intellectual capital as a model supporting the organization's environmental strategy and an obligatory element of financial reports are difficulties to measure it.

So far, no universal method of GIC appraisal has been developed. In subject literature, diagnostic models referring to GIC are scarce. The following approaches are used in the process of identification and measurement of IC (Sveiby, 2010):

- market approach (Q-Tobin coefficient, MV-BV);
- approaches based on financial methods (VAIC, KCE, CIF, EVA);
- approaches based on qualitative methods (Skandia Navigator, Balanced Scorecard, IC-Index, Intangible Asset Monitor).

Still, they must be adapted to the specific nature of GIC. What is more, none of the methods may be considered satisfactory from the point of view of financial accounting requirements due to their flaws and limited application. The difficulties in GIC measuring are due to problems with quantification of its individual intangible components, which justifies the use of qualitative factors. Such an approach was used in the present study.

## 3. Materials and Methods

The research was an attempt to identify actions taken as part of GIC fostering. The research's underlying objective was to evaluate the level of implementation of the GIC model in Polish enterprises. In the course of analyses, the following research problems were addressed:

- what is the level of maturity in GHC development?
- what is the level of maturity in GOC development?
- what is the level of maturity in GRC development?

The level of maturity was assessed based on the 5-point Likert scale, where 1 signified low maturity and 5 high maturities. The following methodology of maturity assessment was adopted:- level 1 – practices followed by 0-20% of the studied entities;

- level 2 – practices followed by 21-40% of the studied entities;
- level 3 – practices followed by 41-60% of the studied entities;
- level 4 – practices followed by 61-80% of the studied entities;
- level 5 – practices followed by 81-100% of the studied entities.

The applied research approach allowed an assessment of Polish companies' maturity concerning GIC model implementation, which is crucial given the important role of GIC in the growth of corporate competitiveness (microeconomic level) and sustainable development policy (macroeconomic level).

A diagnostic survey method was used to collect data. The survey was conducted in 2020 on a random population of 150 Polish producing enterprises with their seats in Poland. The method used in the study was CATI. The study sample was selected on a layer basis. To ensure representative sampling, 25 entities from each of the six

Polish regions, i.e., the Central, Southern, Eastern, North-Western, South-Western, and Northern Poland, were randomly selected. All of the respondents were managers employed in studied enterprises. The characteristic features of the study population are shown in Table 2.

***Table 2.*** *Profiles of studied enterprises*

| **Criterion** | **Number of Enterprises** | **Percentage** |
|---|---|---|
| Employment number: | | |
| 50-249 employees | 110 | 73.3 |
| 250-499 employees | 33 | 22.0 |
| 500-749 employees | 22 | 2.7 |
| Over 500 employees | 3 | 2.0 |
| Time on the market: | | |
| up to 5 years | 2 | 1.3 |
| 5-7 years | | |
| 7-9 years | 2 | 1.3 |
| Over 9 years | | |
| | 2 | 1.3 |
| | 144 | 96.0 |
| Type of ownership: | | |
| spółka z o.o (*limited liability company*) | 104 | 69.3 |
| spólka akcyjna (*joint-stock company*) | 20 | 20 |
| spółka jawna (*general partnership*) | 10 | 6.7 |
| spółka komandytowa (*limited partnership*) | 3 | 2.0 |
| private ownership | 2 | 1.3 |
| cooperative | 1 | 0.7 |
| Scope of operations: | | |
| international | 86 | 57.3 |
| European | 32 | 21.3 |
| national | 53 | 53 |
| regional | 1 | 0.7 |
| local | 5 | 3.4 |
| Capital structure | | |
| - Polish | 111 | 74.0 |
| - foreign | 23 | 15.3 |
| - mixed | 16 | 60.7 |
| Respondent's position: | | |
| CEO | 7 | 4.7 |
| HR Director | 20 | 13.3 |
| Financial Director | 17 | 11.3 |
| Commercial Director | 4 | 2.7 |
| President | 8 | 5.3 |
| Head of Plant | 4 | 2.7 |
| Chief Accountant | 21 | 14.0 |
| Head of HR Department | 48 | 32.0 |
| Other management | 21 | 14.0 |

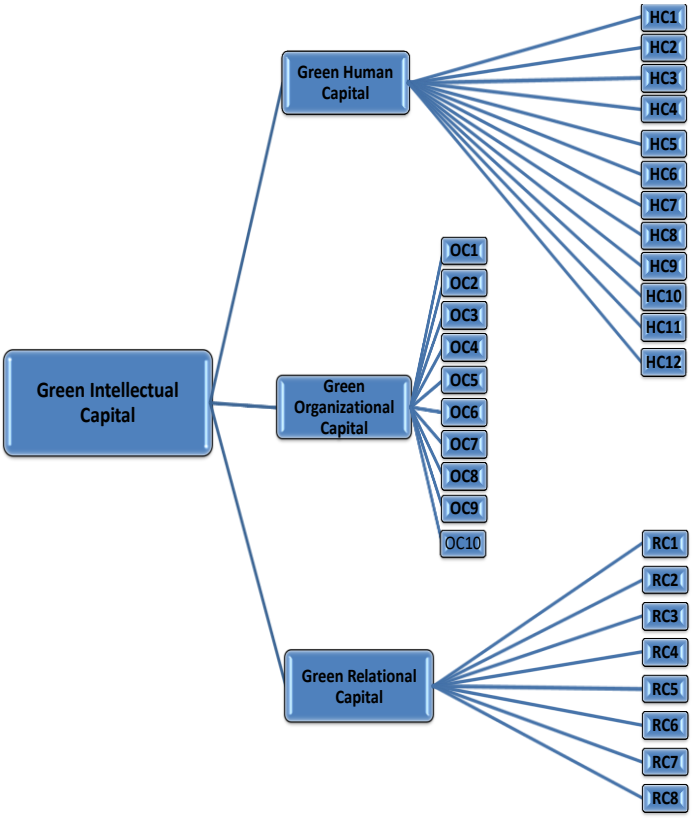
***Source:*** *Own creation.*

Most of the enterprises participating in the study employed between 50 and 249 staff members (73.3%) and operated on the market for over 9 years (96%). The most frequent type of ownership of young organizations was limited liability company (69.3%). A geographical coverage of the enterprises was highly diversified, with most enterprises operating globally (57.3%) and on the European market (21.3%). Polish capital was the dominant capital in the capital structure (74%). Most of the respondents in the study were Heads of HR Departments (32%), Chief Accountants (14%), HR Directors (13.3%) and Financial Directors (11.3%).

## 4. Measurement Model

The research model designed and applied here is an adaptation of the Skandia Navigator model by Edvinsson and Malone (1997) and the methodology proposed by Chen (2008). The measurement was conducted with respect to three GIC components: green human capital, green organizational capital, and green relational capital. The research model is illustrated in Figure 2.

***Figure 2***. *Research Framework*




***Source***: *Own creation.*

A total of 30 indicators were used in the analysis:

- 12 indicators of green human capital (indicators marked with symbols HC1-HC12)
- 10 indicators of green organizational capital (indicators marked with symbols OC1-OC10)
- 8 indicators of green relational capital (indicators marked with symbols RC1-RC10).

A list of all of the above indicators is presented in Table 3.

***Table 3.*** *GIC measurement indicators*

| Symbol | Indicator |
|---|---|
| HC1 | Employees have knowledge about environmental protection |
| HC2 | Employees show environmental behavior in the workplace |
| HC3 | Employees participate in training developing their environmental skills and knowledge |
| HC4 | Environmental skills and knowledge of employees are verified at periodic reviews |
| HC5 | Employees are rewarded for engagement in environmental projects and showing initiative in project submission |
| HC6 | Responsibilities related to environmental protection are included in job descriptions |
| HC7 | The organization implements disciplinary actions (such as warning, penalty, suspension, dismissal) against employees breaching environmental protection provisions or rules |
| HC8 | All employees are kept up to date about environment-friendly actions of the organization |
| HC9 | The company applies a system of incentives to develop "green" competencies |
| HC10 | Employees receive regular feedback about their effectiveness in the achievement of environmental objectives |
| HC11 | The company includes environmental criteria in the processes of recruitment |
| HC12 | The company prefers to employ candidates with green competencies |
| OC1 | Achievement of environmental objectives is a crucial element of a corporate strategy |
| OC2 | The organization operates an environmental management system |
| OC3 | The organization appoints a person responsible for environmental management |
| OC4 | The organization has a clear set of rules and provisions regarding employee conduct in relation to environmental protection |
| OC5 | The organization has environmental audits performed |
| OC5 | The organization has a motivation system to achieve environmental objectives |
| OC6 | The organization implements innovative environment-friendly projects (including technological solutions) |
| OC8 | The organization is fostering green organizational culture |
| OC9 | The company runs an environmental analysis of the product life cycle (evaluation of environment-friendly properties based on energy, resource and material use and environmental emissions in all life phases) |
| OC10 | The company has a system of environmental knowledge sharing |
| RC1 | Environmental values are an essential part of the company's mission |
| RC2 | Environmental criteria are accounted for at product distribution |
| RC3 | The organization cooperates only with partners following high environmental standards |
| RC4 | The company applies green marketing (for example by taking up actions encouraging environment-friendly behaviors in customers) |
| RC5 | Environmental criteria are accounted for when choosing suppliers |
| RC6 | The company provides its external stakeholders with reports about environmental impact |
| RC7 | The company is committed to green image development for the stakeholders |
| RC8 | The company is involved in charity work for various environmental initiatives |

***Source:*** *Own creation.*

## 5. Research Results

The purpose of the research studies conducted by the author among 150 producing enterprises was to assess the level of implementation of GIC-forming practices. The results of the research are presented in Table 4.

***Table 4.*** *Performance of actions supporting GIC development in Polish enterprises (N=150)*

| GIC component | Symbol of action | Number of enterprises performing the action | Percentage of young enterprises performing the action (%) | Average level of implementation of the GIC component (%) | Level of maturity (grade scale 1-5) |
|---|---|---|---|---|---|
| GHC | HC1 | 122 | 81.3 | 46.9 | III |
| | HC2 | 137 | 91.3 | | |
| | HC3 | 77 | 51.3 | | |
| | HC4 | 55 | 36.7 | | |
| | HC5 | 54 | 36.0 | | |
| | HC6 | 77 | 51.3 | | |
| | HC7 | 92 | 61.3 | | |
| | HC8 | 103 | 68.7 | | |
| | HC9 | 43 | 28.7 | | |
| | HC10 | 35 | 23.3 | | |
| | HC11 | 27 | 18.0 | | |
| | HC12 | 23 | 15.3 | | |
| GOC | OC1 | 101 | 67.3 | 54.5 | III |
| | OC2 | 101 | 67.3 | | |
| | OC3 | 70 | 46.7 | | |
| | OC4 | 100 | 66.7 | | |
| | OC5 | 92 | 61.3 | | |
| | OC5 | 52 | 34.7 | | |
| | OC6 | 59 | 39.3 | | |
| | OC8 | 75 | 50.0 | | |
| | OC9 | 67 | 44.7 | | |
| | OC10 | 101 | 67.3 | | |
| GRC | RC1 | 86 | 57.3 | 45.8 | III |
| | RC2 | 90 | 60.0 | | |
| | RC3 | 61 | 40.7 | | |
| | RC4 | 52 | 34.7 | | |
| | RC5 | 68 | 45.3 | | |
| | RC6 | 66 | 44.0 | | |
| | RC7 | 76 | 50.7 | | |
| | RC8 | 50 | 33.3 | | |
| Average level of GIC implementation | | | | 49.1 | III |

***Source****: Own creation.*

The author's analysis of collected data demonstrates that the level of implementation of individual GIC-creating practices in Polish enterprises was diversified and ranged from 15.3% to 91.3%. It was established that entities most frequently performed the following actions related to GHC fostering:

- environmental attitudes in the workplace (paper or energy-saving etc.) were reported in 91.3% of the studied entities;

- employee environmental knowledge was declared by 81.3% of the studied entities;
- employees were informed of environmental activities pursued in the organization in 68.7% of the studied entities.

Next, concerning GOC fostering, the largest percentages were reported in:

- implementation of the system of environmental management and including environmental objectives in the company strategy - found in 66.7% of the studied entities;
- implementation of the system of environmental knowledge sharing was observed in 66.7% of the studied entities;

Implementing a set of rules and provisions regarding employee conduct about environmental protection was reported in 66.7% of the studied entities.

The lowest level of implementation was recorded in the area of GRC. Here, the studied entities most often included environmental criteria when distributing products (60%) and included environmental values in the company mission statement (57.3%). Simultaneously, the analyzed enterprises relatively rarely engaged in charitable environmental initiatives or conducted green marketing. The above practices were declared only by every third entity. Solely 44% of the studied companies provided their external stakeholders with reports about environmental impact. This state of affairs raises doubts about the real care about green image development reported by one-half of the studied entities. Data included in the reports show at what point a given organization is and what it intends to achieve in the nearest future. This constitutes a foundation for the coordination and monitoring of GIC-oriented processes. The reports demonstrate the degree of involvement in environment-friendly practices, reveal top achievements in the field, and draw a roadmap in response to new challenges. Therefore, they serve as additional support in the process of GIC management.

However, in Poland, few entities have availed of the instrument. Environmental audits have not been extremely popular, either, as they were drafted by a mere 34.7 of the studied companies. Similarly, only 36.7% of the entities had environmental skills and knowledge of employees verified at periodic reviews. In light of these facts combined, we can assume that Polish managers do not appreciate environmental effectiveness monitoring and do not show due engagement in this respect.

Nonetheless, the largest gap was observed concerning GHC-oriented practices. Only 15.3% of the studied entities preferred candidates having green competencies, and solely 18% included environmental criteria in the recruitment process. However, another relatively unpopular activity was to provide employees with feedback about their effectiveness in the performance of environmental objectives

(23.3%) and to motivate employees to develop green competencies pursued by every third company (28.7%).

Concerning the main research problem, it was determined that the implementation of GIC practices was 49.1%. This signifies a mere level III of maturity in GIC implementation in the adopted five-point scale. A similar level was further noted concerning individual GIC components. A slightly higher value concerning the average for GIC was reported in the case of GOC. The mean level of implementation of the above component was 54.5%.

## 6. Discussion

Green Intellectual Capital is frequently considered a new strategy of company development based on environmental protection (Susandya *et al.,* 2019). The studies of numerous authors evidence this. Chen (2008), who conducted his research on a group of Small and Medium-sized Enterprises (SMEs) in Taiwan, showed that all three forms of GIC have a considerable impact on the competitiveness of the studied subjects. The studies by Sidik et al. (2019) also demonstrated that GIC has a positive and essential impact on improving the competitive advantage of companies in the Indonesian production industry. Malik *et al.* (2020) determined that green intellectual capital and its three components (green human capital, green structural capital, and green relational capital) have a positive and significant effect on Pakistani companies' sustainable operations. Research findings of Gogan *et al.* (2016) and Haseeb *et al.* (2019) demonstrated that all elements of intellectual capital are crucial for improving corporate operational performance (Haseeb *et al.,* 2019). On the other hand, Berzkalne and Zelgalve (2014) and Kianto *et al.* (2014) confirmed the importance of intellectual capital in creating an added value.

The above arguments justify the need to implement the GIC model and highlight the question of companies' respective maturity. However, to conduct a GIC diagnosis is not easy due to the complexity of its components, mutual relations, and the intangible nature of its component assets. Chen (2008) carried out a pioneer study in the field. In order to diagnose GIC, he suggested a set of meters (measures) corresponding to three GIC components. The results of the research are presented in Table 5.

***Table 5.*** *GIC measurement meters (measures)*

| Green Intellectual Capital | | |
|---|---|---|
| Green Human Capital | Green Structural Capital | Green Relational Capital |
| GHC1: The contribution of environmental protection of employees in our firm | GSC1.The management system for environmental protection in our firm is superior to that of our major competitors.<br>GSC2 Our firm is more innovative | GRC1 Our firm designs products and/or services in compliance with the environmentalism |

| | | |
|---|---|---|
| is better than our major competitors<br>GHC2 Employee competence with respect to environmental protection in our firm is better than that of our major competitors.<br>GHC3 The product and/or service qualities of environmental protection provided by the employees of this firm are better than our major competitors.<br>GHC4 The amount of cooperative teamwork with respect to environmental protection in our firm is more than that of our major competitors.<br>GHC5 Our managers fully support our employees in achieving their goals with respect to environmental protection | with respect to environmental protection than are our major competitors.<br>GSC3 The profit earned from environmental protection activities of our firm is greater than that of our major competitors.<br>GSC4 The ratio of investments in R&D expenditures to sales for environmental protection in our firm is more than that of our major competitors.<br>GSC5 The ratio of employees to the total employees in our firm who are engaged in environmental management is more than that of our major competitors.<br>GSC6 Investments in environmental protection facilities in our firm are more than those of our major competitors.<br>GSC7 Competence in developing green products in our firm is better than that of our major competitors.<br>GSC8 The overall operational processes for environmental protection in our firm work smoothly.<br>GSC9 The knowledge management system for environmental management in our firm is favorable for the accumulation of the knowledge of environmental management. | desires of our customers.<br>GRC2 Customer satisfaction with respect to environmental protection of our firm is better than that of our major competitors.<br>GRC3 The cooperative relationships concerning environmental protection of our firm with our upstream suppliers are stable.<br>GRC4 The cooperation relationships about environmental protection of our firm with our downstream clients or channels are stable.<br>GRC5 Our firm has good cooperative relationships concerning environmental protection with our strategic partners. |

***Source**: Compiled on the basis of (Chen, 2008).*

Chen's methodology was used by Yong *et al.* to examine the relationship between GIC and Green Human Resource Management (GHRM). The authors conducted a study with the participation of 112 large producing companies in Malaysia and, with the application of the regression analysis, the authors showed that green human capital and green relational capital impact green human resource management. The research revealed that green structural capital was not significantly related to GHRM (Yong *et al.*, 2019). It was less important than GHC and GRC.

Then, Yusoff *et al.* (2019) carried out a GIC diagnosis among 168 small and medium-sized manufacturing enterprises in Malaysia. The study's main objective was to gain insight into the perception of green intellectual capital (GIC) among manufacturing SMEs in Malaysia. Eighteen variables presented in Table 6 were used in the measuring. The results revealed the existence of green human capital

(GHC) and green relational capital (GRC) in the manufacturing SMEs organizations, as the mean scores were all above 5.0 (Yusoff *et al.*, 2019). Like the studies of Young *et al. (*2019), the lowest rate was reported concerning GSC.

***Table 6.*** *Mean of GIC Perception in Malaysian manufacturing sector*

| Indicators of GIC | Items | Mean (according to seven-point interval scale) | Mean of significance rates |
|---|---|---|---|
| **Green Human Capital** | The employees in this company involve a positive productivity and contribution towards environmental protection. | 5.45 | 5.34 |
| | The employees in this company have an adequate competence towards environmental protection. | 5.21 | |
| | The employees of this company provide high product and service qualities towards environmental protection. | 5.34 | |
| | The cooperative degree of teamwork towards environmental protection is performed at high levels in this company. | 5.17 | |
| | The managers can fully support their employees to achieve their jobs of environmental protection. | 5.52 | |
| **Indicators of Green Structural Capital** | This company has a superior management system of environmental protection. | 4.93 | 4.59 |
| | This company has a high ratio of employees of environmental management from its total employees. | 4.08 | |
| | This company makes an adequate investment in environmental protection facilities. | 4.71 | |
| | The overall operation processes towards environmental protection in this company operate efficiently. | 4.87 | |
| | The knowledge management system in this company is favorable for the accumulation and knowledge sharing of environmental management. | 4.74 | |
| | This company has formed a committee to progress on key issues in environmental protection. | 4.73 | |
| | This company has established detailed rules and regulations of environmental protection | 4.76 | |
| | This company has established a reward system for accomplishing environmental tasks | 3.87 | |
| **Green Relational Capital** | This company designs its products or services in compliance with the environmental desires of its customers. | 5.29 | 5.23 |
| | The customers are satisfied about this company's environmental protection. | 5.39 | |
| | The cooperative relationships of this company with its suppliers towards environmental protection are stable. | 5.10 | |
| | The cooperative relationships of this company with its clients towards environmental protection are stable. | 5.18 | |

| | | | |
|---|---|---|---|
| | The cooperative relationships of this company with its strategic partners towards environmental protection are stable. | 5.17 | |

***Source:*** *Compiled on the basis of (Yusoff et al. 2019).*

The studies integrate well with the studies conducted by the author of this research article among 150 Polish manufacturing companies. The study revealed a gap in the implementation of GIC-forming practices. Half of the practices leading to GHC, GOC, and GRC formation covered by the research were performed only in one-half of the studied subjects. The widest gap under Polish conditions was reported in terms of green recruitment. Every 5th studied entity pursued green recruitment. The low popularity of green recruitment among Polish companies was signaled in the author's previous research in the year 2018 on a group of 300 enterprises. The study demonstrated that only every 10th enterprise preferred candidates having green competencies and experience in environmental projects, and solely 13% of the companies verified the environmental knowledge and skills of candidates during recruitment (Bombiak, 2020). The situation is a reason for concern; this lack of interest in acquiring employees presenting environmental experience and attitude largely limits the ability to build GIC in the future. GHC is the key GIC component and plays a critical role both in GSC and GRC development. Helena *et al.* (2010) showed that human capital is the foundation of product and process innovation and management innovation, including but not limited to eco-innovation. Environmental competencies of employees, their creativity, and involvement in environmental actions constitute the basis for green corporate strategy development.

Still, the author's underlying problem in the studied entities appears to be a lack of knowledge about GIC among the management. The studies revealed that as many as 74.4% of the analyzed managers did not know the term GIC. This fact must be considered the principal reason behind the low implementation of practices oriented at GIC-development in Poland. The implementation of the GIC model requires senior management to have specific competencies in the respective subject area. Nonetheless, the case of Poland is not an isolated one. The issue of limited knowledge about GIC has been signaled by Yusliza *et al.* (2020), who researched Malaysia's manufacturing companies.

## 7. Conclusions

Environmental protection is a serious challenge for contemporary enterprises facing the need to balance economic expansion and environment-friendly actions. GIC is a unique resource supporting environmental corporate management. It comprises employees representing high environmental awareness and knowledge about environmental protection, the structures, and systems allowing implementation of clean production and a network of relations with stakeholders facilitating sustainable operations throughout the entire supply chain. Therefore, GIC is a resource supporting sustainable development and company competitiveness thanks to the enhanced image, cost reduction, improved customer relations, acceptance of

local authorities and communities, and increased employee satisfaction and loyalty. However, its formation entails several systemic actions leading to increases in value concerning human, organizational, and relational capital. Negligence within any of the three components may limit the abilities to develop GIC. It stems from GIC component correlations, which either strengthen or weaken them.

The research in the implementation of the GIC model undertaken by the author demonstrated that Polish enterprises failed to apply the full range of practices that lead to GIC development. On a positive note, all enterprises have taken up at least some actions related to GIC development, even though the implementation of the majority of practices was low. Hence, we can conclude that Poland's GIC model implementation is still in an initial development phase. This indicates both lack of expertise about GIC among the managing staff and a shortage of systemic approaches as seen by selective activity performance. GIC model in Polish enterprises is intuitive and seems to be related to economic and legal circumstances rather than corporate awareness of GIC fostering. Given the above, it is hard to speak of a systemic approach to GIC management.

Another vital cause of such a limited level of implementation of practices oriented at GIC creation and lack of knowledge may be limited investment possibilities, above all, at COVID-19 epidemics. This is because the fostering of GIC necessitates investment in its individual components, i.e., environmental training for employees or rewarding green competence development. Green organizational culture promotion is also time-consuming. However, designing and patenting environmental protection technologies is not only time- but also resource-consuming. What is more, one ought to note that human and organizational capital is typically associated with longer returns on investment than in the case of investment in tangible or financial assets, which may reduce manager interest.

Enterprises who wish to enhance their GIC while aiming at cost reduction may try to focus on GRC development. This strategy is highly encouraged, particularly in organizations with limited expertise and experience in solving environmental issues, for it allows entities to broaden environmental cooperation with others. Furthermore, it makes it possible to seek knowledge jointly with customers, suppliers, communities, or governments, which may facilitate the taking of decisions regarding business models leading to environment-friendly manufacturing. Additionally, deepening relationships with customers and suppliers who cultivate ecological values strengthen green reputation, reinforcing the remaining GIC components.

Grounding company operations on GIC may be beneficial for the production sector. Manufacturing industries in Poland and other developed countries may increase cleaner production performance by including the concept of GIC development into their strategies of environmental management. As determined by the research study, many managers are unaware of the concept of GIC management. To promote the idea in business circles, extensive research must be carried out on the impact of GIC

on sustainable development, and good GIC practices should be presented in environmental reports. This would mean a real basis for changes in the approach to GIC management and an increased practical appreciation of this intangible asset.

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