

## Chapter 8

# Challenges in Green Intellectual Capital and Knowledge Management in Sustainability and Industry 4.0

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### **ABSTRACT**

*The conceptual model proposed in this study is used to serve a guide for Industry 4.0 to understand the effect of GIC (green intellectual capital) and GKM (green knowledge management) on sustainability. Green challenge in Industry 4.0 has increasingly become a hot topic in both academia and practice. Among the Industry 4.0 topics, digital chain monitoring has a great impact on the performance of the company. The study of the industrial digital chain is a great green challenge in the 21<sup>st</sup> century in order to understand and manage the flows of green information. Knowledge of the human, relational, and structural (including technological aspects) will help to better understand and management the effects of traceability on sustainability. Several of the concepts and variables in the suggested model can easily be managed by organizations if they carefully measure their green intangible nature with smart sensors.*

### **INTRODUCTION**

As companies entered into the 1990s, knowledge has become one of the most important strategic resources and one of the key economic resource and the dominant and perhaps even the only source of competitive advantage. Researchers have paid a great attention to the topic of intangible assets, often referred to as intellectual capital in the early 1990s. Intellectual Capital operates as the most important contributor to justify the value difference between market value and book value of many organizations. Intellectual capital has become critical to sustaining competitive advantage, organizational success, innovation, superior organizational performance, core differentiator operator, improve new product

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development performance, enhance shareholder value, create a framework that allows for describing all resources at the firm's disposal and how they interact to create value, organizational performance, etc.

Green challenge in industry has increasingly become a hot topic in both academia and practice. Green challenge refers to the development or improvement of products and processes about saving energy, controlling pollution, recycling waste, and implementing environmental management. Green innovation is related to products, processes, and services to protect environments, which is a process that firms continuously launch and implement green activities involved in energy saving, pollution prevention, and environmental quality improvement to eventually achieve economic benefits (Chen, 2008). The shift from pollution control to prevention is a good first step, but companies must go further and there is more synergy than conflict between the conventional and environmental paradigms (Porter and van der Linde, 1995, Pujari et al. 2003, Eiadat, Kelly et al. 2008).

The industry 4.0 paradigm is currently one of the domains that presents high challenges for research and manufacturing experts. Among the industry 4.0 topics, digital chain monitoring has a great impact on the performance of the company. Currently, Meski et al. (2019), Dev et al. (2020 a, b), Jabbour et al. (2020) are interested in the study of the industrial digital chain in order to understand and manage the flows of green information generated and exchanged. The principles and technologies of Industry 4.0 can influence how products are manufactured, as well as customer's perceptions of the value of products and green innovation. The use of knowledge-based frameworks is very trendy in the industrial field and represents one aspect in industry 4.0. The effectiveness, reliability and efficiency of this type of system depend heavily on how the knowledge base is structured and managed.

Sustainability has become a topic of interest for both academics and practitioners. A wide discussion and debates about the concept of sustainability, its importance and the way to achieve it are pervasive. The economic profits of business activities have increased prosperity and living conditions globally; however it leads to environmental destruction and social inequality directly and indirectly.

Although the aim of sustainability is to keep balance of multidimensional performances, its meaning are inconsistent. In general, sustainability refers to the organizational aim to achieve profit and improve social development while accounting for environmental aspects.

Green Intellectual Capital is defined as sum of tangible resources or knowledge associated to the environmental protection or innovation (Chen, 2008, Liu, 2010, Huang and Kung, 2011). Three main components of GIC namely green human capital (GHC), green structural capital (GSC) and green relational capital (GRC). Few papers have focused on the green aspects of intellectual capital (GIC) and knowledge management (GKM) (Delgado et al. 2014, Yusoff et al. 2019, Yong, 2019, Wang et al. 2020). Nowadays, due to increasing concerns regarding environmental issues, it is essential to integrate the management of green intellectual capital and green knowledge management on Industry 4.0.

The conceptual model proposed in this study is used to serve as a guide for manufacturing firms to understand the management of GIC and GKM on Sustainability. The model (see Figure 1) suggests that without direct attention to green intellectual capital and green knowledge management, the development of Industry 4.0 and sustainability may not ultimately be defined as successful. Figure 1 shows how the model suggested draws from the need of enhancing the disclosure and management of data, information, knowledge and key green intangible performance indicators across the industry value chain. This is the traceability challenge in green innovation agenda.

In developing this argument, first, it is reviewed the Industry 4.0 and Business Sustainability' challenges, namely on traceability and interoperability of different sensors from different points of the Supply Chain. Then, it is described the impact of green intellectual capital, and green knowledge management

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